#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1	58544	18	0	0	0	0	This is a clear and well-written chapter with arguments and assessments easy to follow and well illustrated. (Janice Lough, Australian Institute of Marine Science)	thank you
2	61446	18	0	0	0	0	There are many statements in the chapter along the lines of "confidence in attribution to climate change is very low". I think this wording is misleading as it starts with a statement "confidence in attribution to climate change" which sounds like a strong or clear result. I think it would be better to say something along the lines of "there is very low confidence in being able to attribute these trends to climate change". (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	throughout the chapter, this wording has been checked and revised in a number of places to achieve the clarity requested by the reviewer
3	62069	18	0	0	0	0	Excellent draft chapter. Very good synthesis of the available litteraure. It is easy to read. Unfortounately should be reduced and eliminate a lot of information due to adjust to the permitted number of pages. (Avelino Suarez, Institute of Ecology and Systematic, Cuban Environmental Agency)	thank you
4	62580	18	0	0	0	0	The chapter has 742 references, out of which 128 (17%) are from the chapter authors. (INDIA)	noted
5	62581	18	0	0	0	0	Out of these 742 references, only 54 (7%) are on developing countries. It is suggested that a more balanced approach could be adopted. (INDIA)	We have approached the Indian government in order to obtain, a) the data underlying this particular analysis, and b) more specific recommendations as to what a "more balanced approach" could imply. Unfortunately, we have not had a response before our deadline. Given that we have been unable to find additional literature from developing countries, a "more balanced approach" could only mean removing literature concerning the developed countries. We were unable to identify any meaningful approch to suppress this literature.
6	62582	18	0	0	0	0	A quick check on the total universe of articles in peer-reviewed journals since AR4 (2007) indicates that there are almost 2000 in journals of Science Direct, 30 in Francis and Taylor, approximately 5000 in Wiley and 279 in JSTOR totaling to around 7500 articles in all on topic covered in this chapter. The chapter has captured almost 11% of existing literature. (INDIA)	As mentioned above, we have approached the Indian government in order to obtain a list of the references mentioned here, but have not seen a response before our deadline. Since we have made extensive literature searches ourselves, we are convinced that the majority of the references mentioned here would fall into one of the three following categories: i) they have already part of earlier IPCC assessments, ii) they are discussed in detail by another chapter of this report, in which case our tracable account refers to that chapter, or iii) they are irrelevant to the problem of detection and attribution of observed impacts of climate change.
7	62583	18	0	0	0	0	Out of total 7500 articles mentioned as above, almost 2000 are on developing countries (around 26%) and issues related to them. It indicates that there is a large enough pool of articles to be picked up on developing countries to be cited in this chapter. The authors may like to take a look at it. (INDIA)	See the responses to comments 5 and 6.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
8	62679	18	0	0	0	0	The Executive Summary and some contents are well done, but some concepts or definitions seem that need to explore or explain clearly, e.g., the definitions of the climate system and natural system are different from the IPCC previous reports. AR4_SYR shows that "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level (Figure 1.1)., topic 1, P30" Obviously, the climate system in AR4 report includes so called natural system in the chpater 18, p7. Secondly, the definition of Oceans in subtitle 18.3.4 seems not so clear? It might be reasonable to change "Oceans" to "Ocean systems", just like Coastal systems under the subsection 18.3. Then, the subsection 18.3.4 could remain only the content of "Impacts on Oceans Systems ....." and move the original subsection 18.3.4.2 to the subsection 18.5 as one of the regions in the world. Thereafter, it would also be helpful for the IPCC reports to keep consistency or balance among chapters and the reports.In addition, some concepts may be a little confusing. Table 18-8 which has been cited by SYR and SPM shows that the observed impacts of CC on marine ecosystem and coastal process across eight major world regions such Africa, Europe etc. However, how could we understand that some marine ecosystems appear across the continent regions? E.g., as for Europe in table 18-8, it sounds a little strange that NE Atlantic seems to be located in the Europe continent region? And some similar examples could easily be found in the table 18-8. This might be due to the concept problems. AR5-WG2 outline shows that there is an Ocean region, too, although it is somewhat different from the previous IPCC reports. WG2 SODs also show there are several ocean subregions defined by ch30, 5, 28 etc. The marine ecosystem and coastal processes might be better to be included in the Ocean and polar regions, not in the continent regions. Perhaps, the chapter 18 could give a table for observed impacts of CC on marine ecosystem across the ocean, polar regions and coastal areas to replace table 18-8, not across the continents such as Eurpope, Asia etc? Actually, Executive Summary also indicates the impacts of CC on all contients and in most oceans (P3) or covering all continents and the oceans (P5), respectively. (RONGSHUO CAI, Third Institute of Oceanography)	This comment contains a number of helpful remarks that have been considered during the preparation of the Final Government Draft. We have strived to achieve maximum consistency with earlier reports and also the rest of the AR5. We note that the regional assignments have been subject to extensive debate during the approval process of our current outline and can therefore not be changed unilaterally in this chapter.
9	66290	18	0	0	0	0	I was expecting to see some update of the meta-analysis undertaken in the AR4, but it appears that this has not been undertaken? There is no supplementary material this time, so I am assuming that this job was regarded as simply to ambitious to attempt. However, I think some attempt has been made at an update by Rosenzweig and Neofotis (2013) - see next general comment. (Timothy Carter, Finnish Environment Institute)	It was an early decision made by the authors of chapter 18, and discussed several times at author meetings, also with Dr Carter in the room, that this earlier meta-analysis could not be repeated for AR5. The primary reason is the exponential growth in scientific literature (documented by chapter 1 and also the Technical Summary of this report). A second reason is that our goal was to go further in also analysing literature about human and social systems which are topics that are not accessible to the same meta-analysis techniques employed by Rosenzweig and Neofotis. Our alternative approach was to intensively liaise with regional and sectoral chapters, aiming to overcome the key shortcoming of the AR4 approach which was insufficient linkage between detection and attribution of observed impacts on the one hand, and sensitivities and vulnerabilities on the other. We believe that the higher level of integration with the other chapters has reduced the problems of within-chapter consistency throughout the AR5 report. The reasoning for our approach has now been more clearly stated in the Final Government Draft.
10	66291	18	0	0	0	0	I'm sure the authors are aware of this, but it is important that the recent review by Rosenzweig and Neofotis (WIREs Clim Change 2013, 4:121–150. doi: 10.1002/wcc.209) be detected, assimilated and attributed in this chapter! (Timothy Carter, Finnish Environment Institute)	During the early stage of work on this chapter, we have approached Dr Rosenzweig about any updates to her own assessment. We received encouraging advice but were not told about the forthcoming WIREs paper. When this paper came to our attention, we were already well into the SOD preparation and found that we could not revise our analysis to take this paper into account in a more profound way.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
11	66292	18	0	0	0	0	Unlike Chapter 1 of the AR4, this chapter places a lot of reliance on the core thematic and regional chapters to undertake relevant literature analysis on D/A of impacts (statements on P11 and P35). That is understandable, given the large amount of new literature, but it also has some dangers. First, it isn't clear where the reader/reviewer is supposed to look for key literature on this topic - is it here or is it scattered among the other chapters? Second, is the author team satisfied that the other chapters include authors on their team with sufficient knowledge and expertise to do full justice to the D/A issue, which is quite a specific and demanding research area? For example, just looking at the Europe chapter (23), I would expect to find the most comprehensive account of detection and attribution of observed impacts of any region in the world (based on the AR4 analysis, at least). Instead, what I discover is a short, two paragraph section addressing "Effects of observed climate change in Europe", reference to a Table (23-6) and mention of some other sections of the chapter that treat impacts (both observed and projected) without a specific "observed impacts" focus. Table 23-6 proceeds to offer some confidence statements regarding a number of observed impacts and their attribution to changes in climate factors , citing a very limited set of references and presumably applying expert judgement from the chapter team. This is a good effort, but one wonders how comprehensively they have been able to cover the main observed impacts occurring in Europe among the many other issues they are supposed to be assessing. How valid are their judgements, and how well has the literature been reviewed and assessed? Or is chapter 18 able to pick up the slack and complement missing information from this (and other) core chapters? For sure, some of the chapters do an excellent job of covering this issue. However, I'm not sure that all of them are properly equipped for this, which means the coverage is patchy. Without an ability to assemble evidence in a more systematic manner, a synthetic overview cannot be obtained. So using the approach described up front, can the chapter 18 author team be reasonably confident that no major literature has been missed, especially considering the regional and sectoral gaps in information that were emphasised in AR4 Chapter 1? (Timothy Carter, Finnish Environment Institute)	To the question, "where should the reader look", our answer is that chapter 18 aims to synthesise the information on detection and attribution in regional and sectoral chapters. That means, if the reader wants the synthesis then she should read chapter 18. If, in contrast, she wants to read about detection and attribution of, say, impacts in Europe, then she should read that chapter. Whether chapter 18 authors are "satisfied" with the skills of authors in other chapters is not a question we feel appropriate to reply to. We can say, however, that we have used every possible method we could think of to share our own experience with detection and attribution with the authors of other chapters, through cross-chapter meetings, numerous webinars adapted to most time-zones and hundreds of one-to-one e-mail exchanges with chapter authors. The criticism made for the Europe chapter could certainly be forwarded to the authors of that chapter. Chapter 18 does not see its role in "picking up the slack" - instead we have tried to hard to convince other chapters to enhance the information wherever we found shortcomings in their assessment. Overall, when asked whether we are "reasonably confident that no major literature has been missed", we can only state that a large number of highly competent authors, across sectoral and regional chapters as well as chapter 18, have made substantial efforts to not miss any literature.
12	68229	18	0	0	0	0	We have a serious concern about particular methodology for presenting results of detection and attribution in chapter 18. (RUSSIAN FEDERATION)	We respond to the specific issues raised in the following comments one by one.
13	68230	18	0	0	0	0	As it is stated in the Executive Summary, serious problems still remain both on methodology of detection and attribution (especially with regard to anthropogenic effects) and on the coverage of various systems in publications. This relates, for example, to climate impacts on livestock (page 5, 1st paragraph), a spatial scale of detected climate-driven changes (page 5, lines 39-40), possibility to attribute observed changes in processes and systems to anthropogenic climate change (page 5, lines 44-46). (RUSSIAN FEDERATION)	It must be noted that, as pointed out by the Russian Federation, problems arise due to the different ways of applying methodology in the publications assessed by the IPCC. Chapter 18 represents a major effort to assess this literature - but the underlying methodological problems in some of the studies cannot be amended by the assessment. Nonetheless, the assessment has aimed to account for methodological shortcomings wherever possible, notably during the assessment of confidence in the attribution. The short references made in the remainder of the comment to various sections of the SOD have been followed.
14	68231	18	0	0	0	0	In spite of remaining methodological problems and lack of reliable publications, the ch. 18 author team resolutely presented numerous diagrams with results of detection and attribution and even characterizations of confidence. (RUSSIAN FEDERATION)	The specific purpose of several diagrams in chapter 18 is to unambiguously expose the limited confidence in some of the assessed literature. We are not aware of a more appropriate way to illustrate the problems noted by the Russian Federation.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
15	68232	18	0	0	0	0	However, the diagrams do not give enough information on the spatial scale and subject range of the impacts (to what part of the globe the statement is applicable and which of the earth's systems typically are affected by climate change). Are climate change induced trends typical for certain physical and biological systems and processes, for certain regions / continents? This information can not be derived from the diagrams presented. It also remained unclear, who assigned particular grades for confidence at the diagrams, whether those were authors of respective publications, or an author of the other chapters of AR5, or the authors of ch. 18. (RUSSIAN FEDERATION)	For the first part of the comment, we were indeed unable to condense ALL information into the diagrams - it is still necessary to read the text of chapter 18 to obtain a summary of the knowledge pertaining to the questions raised by the Russian Federation. For the second part, it is the authors of chapter 18 that have made the assessment of confidence, taking into account all information provided by the authors of the underlying studies.
16	68233	18	0	0	0	0	Methodology for detection and attribution is given in a very general manner in the chapter. A transparent example of the end-to-end application of the proposed methodology would be extremely helpful. Description of mathematical basis (with respective references) of the methodologies employed for assigning confidence levels would be especially important. (RUSSIAN FEDERATION)	A tradeoff exists between more detailed methodological considerations and the presentation of factual results of our assessment. In the final draft, we have had to significantly reduce the section about methods in order to create space for the assessment of actual impacts of climate change.
17	68234	18	0	0	0	0	Serious additional efforts on ch. 18 are required. (RUSSIAN FEDERATION)	Such efforts have been made.
18	74080	18	0	0	0	0	If alternative definitions of attribution or detection from the default ones are being used for any of the assessments, this must be spelled out. (UNITED STATES OF AMERICA)	We have further sharpened the treatment of definitions in this chapter.
19	74081	18	0	0	0	0	Is there a way to synthesize information that is relevant to extremes as well as those that are relevant to averages? For example there is lots of discussion about impacts due to extremes but it could be useful to provide a synthesized section that connects the impacts related to extremes on both ends (highs and lows) but also to relate the impacts due to increases in averages. So when talking about temperature, for example, there are extremes but there are also increases in high temperatures and increases in low temperatures. How are those impacts detected and attributed? The idea is just an additional way to organize the chapter. Obviously this is a suggestion and could pose lots more work for the authors. (UNITED STATES OF AMERICA)	The treatment of extremes has received considerable attention in the final revision of this chapter.
20	74082	18	0	0	0	0	Much of the discussion of the effects of climate change on the poor in developing countries is also true of the poor in richer, developed countries - even the U.S. Also, consider thresholds like those associated with poverty traps. See Hallegatte, Stì©phane, and Valentin Przyluski. "The economics of natural disasters: concepts and methods." World Bank Policy Research Working Paper Series. 2010. (UNITED STATES OF AMERICA)	This reference has been consulted and we agree with the general statement by the United States of America. However, we have been as rigorous as possible in our assessment of the literature about detected and attributed impacts of climate change, and we have been unable to find more than what is presented in the chapter.
21	74083	18	0	0	0	0	Reasons for Concern: It is important to treat these in their proper context. If these are in fact a response to the UNFCCC objective to avoid dangerous anthropogenic interference with the climate system, then the findings must draw from what we can detect and attribute to anthropogenic forcing. Given the broad definition used for climate change in this report, this is a distinct subset and conclusions that broadly reflect climate change are not sufficient. (UNITED STATES OF AMERICA)	We note the comment but we do not agree. If a certain degree of warming or hydrological change demonstrably causes a certain level of impacts, then knowledge about this presents a significant contribution to the risk assessment. This information is valuable even if factors other than greenhouse gas forcing have contributed to the observed change in climate. We note of course that this must be made clear in the assessment and we have aimed to use unambiguous language about climate change.
22	74084	18	0	0	0	0	Tables: Need more specific information on time periods and rates of change. Figures: Need to clarify definition of attribution, since it appears that its definition varies in very similar figures. (UNITED STATES OF AMERICA)	To the degree possible, time periods and rates of change have indeed been squeezed into the material presented in our tables. It must be noted, however, that many studies are not explicit about these parameters. In other cases, precise statements about time periods and rates of change would not have found sufficient space in the tables. This may sound unsatisfactory, but the principle has been that, in the majority of cases, the assessment has addressed the "last few decades".

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
23	74085	18	0	0	0	0	The chapter sets an appropriate and useful standard for detecting climate impacts on physical and biological systems when it states formal detection studies provide robust evidence of where climate changes impacts [are] already being observed and where they are not, supporting near-term planned adaptation if and where necessary. (Page 6, Lines 19 - 20). Unfortunately it is not possible to follow the application of this standard within the chapter, because publications supporting detection of impacts (cf. Table 18-1, page 80, column 5 and reference footnotes) are not categorized as such. The criterion emphasized in Chapter 18, the presentation of negative results in detection of change and/or attribution of causes, does not appear to have been applied elsewhere in the AR5. To give but one example, from AR5 Chapter 6, Page 134, Table 6-5 (Responses and attribution), Phenology, the response of changes in salmon related to long-term warming (Kovach et al. 2012) is not balanced against the finding cited in Chapter 28 of lack of changes in salmon timing in the absence of long-term warming (Mundy and Evenson 2011 in references Chapter 28 but incorrectly cited, see comments on Chapter 28, Start Page Number 31, Start Line Number 8, End Page Number, 31 End Line Number, 9). (UNITED STATES OF AMERICA)	It is correct to say that not at all chapters have subscribed to the rigorous definitions proposed by chapter 18. However, all chapters now appear to be clearly stating what definitions they use. More importantly, chapter 18 authors have re-assessed the evidence presented by other chapters and applied consistent standards of confidence assessment for detection and attribution to the material presented there. While this procedure may occasionally seem to indicate inconsistencies between statements in sectoral or regional chapters and chapter 18, this was in fact a way to have a consistent assessment for the entire report. Careful inspection of the statements in other chapters, alongside chapter 18, will reveal the nature of the definitions that have been applied.
24	74086	18	0	0	0	0	The literature on the economics of natural disasters provides many useful insights into a study of the economic effects of climate change. See: Hallegatte, Stì©phane, and Valentin Przyluski. "The economics of natural disasters: concepts and methods." World Bank Policy Research Working Paper Series. 2010. Cavallo, Eduardo, and Ilan Noy. "The economics of natural disasters: a survey." 2009. (UNITED STATES OF AMERICA)	see response to comment 20
25	74087	18	0	0	0	0	The treatment of Reasons for Concern is not in keeping with the high-level of scientific rigor displayed in the rest of the chapter. Definitions for three of the five reasons of concern (risks from extreme weather events, aggregate impacts and risks of large-scale discontinuities) have changed from previous IPCC Assessments and notably from the key literature source cited (Smith 2009). As such it appears that the authors are using the same examples of warm water corals and the Arctic to show progress on most fronts. This comes across as the authors reaching to show progress, while ignoring the lack of conclusive observational information on droughts, floods, aggregate impacts as previously defined, thermohaline circulation and Greenland and West Antarctic ice sheets. (UNITED STATES OF AMERICA)	The entire synthesis section has been reconsidered, revised and shortened in the light of this and other useful comments. It is however not surprising that the most affected large-scale systems of the planet, such as the Arctic and warm water corals, appear in more than one RFC. The current treatment of the five RFCs should leave no ambiguities on this matter.
26	74088	18	0	0	0	0	There is a lot of common ground in the economic components of chapters 18 and 19. I would recommend reviewing references to ensure consistency (e.g., work by Hallegatte cited in chapter 19 is also relevant to chapter 18). (UNITED STATES OF AMERICA)	We have reviewed economy-related references as well as hundreds of other references, striving for consistency, throughout this process.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
27	74089	18	0	0	0	0	This report uses a different definition of climate change than UNFCCC along with different definitions of detection and attribution than in other parts of IPCC AR5. This is confusing and must be addressed. To make things even more confusing, throughout the text the authors use alternative definitions to the ones they propose at the beginning (e.g., Table 18-11a and related text). The disadvantage of this choice for presenting D&A findings is that it creates a great potential for miscommunication and misinterpretation of the chapter findings. While the assessments in the chapter may be quite reasonable for the specific definitions that were (apparently) used to develop them, we expect that they will be frequently misinterpreted, leading to incorrect statements in the press, political speeches, etc. - misinterpretations that go beyond what the science says and that could undermine the credibility of the science and science communication with the public and policymaker. That would be a steep price to pay. We are not quite clear on the advantages of the revised/mixed system other than it is far easier to make detection and attribution statements (since the bar is lower so there are a whole lot more of these statements and they generally have relatively high confidence levels, especially compared to what they would have with the more conventional WG1/Ch. 10 definitions of D&A). Notably, the authors not only use different definitions of attribution within the chapter, but also (at least in the case of tropical cyclones and other phenomena in Table 18-11a and related text) are apparently using different definitions of detection within the chapter. The are three basic paths the authors could follow as a remedy. The first option, which we recommend, is to scrap this alternative/mixed system and adopt definitions of detection and attribution that are being used in WG1 Ch. 10 (i.e., detection means that an observed change is unlikely to have occurred due to internal climate variability alone; and attribution is the process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence. Here we would recommend evaluating the relative contribution of anthropogenic climate forcing to the observed change. This would of course require a full re-write/re-evaluation of the assessments of the chapter. The second (less desired) option is to: 1) clear up some problems resulting from the choice of new definitions, specifically related the different definitions of detection, etc. used even within the chapter for certain phenomena, such as tropical cyclones. 2) make clear how certain well-studied forms of low-frequency climate variability (such as the Atlantic multidecadal variability or AMO, and Pacific interdecadal variability or IPO) are interpreted in terms of the concept of "climate change" in this chapter and be consistent with this usage throughout; 3) make sure that for each assessment of detection or attribution within the chapter, it is precisely stated or clear which of the different definitions of detection/attribution/climate change are being used; and 4) add many more text reminders of the varying (and nonconventional) definitions throughout the text to try to reduce the occurrence of confusion and misunderstanding on the part of readers. Each table and figure caption needs an explicit reminder of which definition (hopefully only one) is used within the table. A third option could be to choose terms other than detection and attribution for this chapter and define them as entirely separate from those terms used in WG I. (UNITED STATES OF AMERICA)	We appreciate the concerns being expressed here, and offer the following responses. First, using the WG1 approach of only considering phenomena that can be directly attributed to anthropogenic greenhouse gas forcing is simply impossible, except at some meta-analytic level limited to biological systems. This is so, not because of a weakness in the current literature, but due to the simple fact that, on virtually every single location on Earth, anthropogenic climate change is but one out of several environmental drivers. Second, not discussing impacts of other climatic changes than those caused by anthropogenic greenhouse gas emissions, would mean depriving the reader of substantial information required for the full risk assessment. Third, even if there was such a basis for a total rewrite of the analysis, then the review procedures of the IPCC would make such a rewrite impossible. Our work with the review comments for this chapters SOD has indicated two problems: first, our use of language, throughout the chapter, can still be improved with respect to insisting, again and again, on our single definition, and second, the selective reading by some reviewers will still generate the notion that we are not following our own definition. The preparation of the final draft has been made with the utmost efforts to avoid the first of these two problems. For the second, there is nothing that can be done.
28	74090	18	0	0	0	0	While Reasons for Concern can be a useful organizing principle for a part of the chapter, more work is needed to rigorously relate observed impacts to the framework. In particular, the methods for assignment of confidence levels in detection and attribution are not well explained. The criteria for assigning those levels of confidence need to be defined in the chapter. The chapter lacks rigorous quantification in the description of the studies of the observed impacts, e.g., time periods, rates of change, etc. The cross-talk between this chapter and the other systems and regional chapters is an achievement. However, these interactions did not fully mine all the relevant observed impacts studies. See and cite the recent review by Rosenzweig and Neofotis (2013). On the coverage of attribution, the use of the term "attribution" for both causation by climate change and causation by anthropogenic climate change is confusing to the reader. Differentiating between these two definitions is important throughout the chapter. In order for observed impacts to qualify rigorously as contributing to a Reason for Concern, they need to be linked methodologically to anthropogenic climate change. If they are not, then how these assignments are being justified needs to be explained. See Rosenzweig and Neofotis (2013) for a synthesis and map of specific anthropogenic climate change attribution studies. (UNITED STATES OF AMERICA)	In the Final Government Draft, the Reasons for Concern now are even less of an "organizing principle" for chapter 18. In the light of this and other comments, we have reduced the assessment regarding RFCs to the point that we found it necessary to hand over appropriate information to the risk assessment being made in chapter 19. The assessment of confidence is being made throughout the chapter, with criteria and principles being explained even more clearly than before. Throughout chapter 18, "attribution" refers to the role of climate change (anthropogenic or otherwise) in a given impact - this has always been the case, also in earlier drafts, but perhaps not been made sufficiently clear. The Rosenzweig and Neofotis paper came to our attention very late in the process. It has been cited but could not be used as a basis for a total rewrite of the chapter, given this had been reviewed several times already. We believe that our alternative approach, using the cross-chapter interaction in WGII, has independent merits and provides greater consistency.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
29	76833	18	0	0	0	0	I think the authors have done a tremendous job in pulling the chapter together to such a stage and commend them on their ambition in Figs 18.3 to 18.7 but I also have very strong concerns about the philosophy of what they have done when it comes to detection and the implementation for both "detection" and "detection and attribution" in terms of tracability. I do not like the structure of the WGII report in which detection and attribution is spread throughout the report and then is synthesised in chapter 18 as this add an extra layer of complexity in terms of tracing statements back from the SPM into the chapters. But if it has to be this way then more work needs to be done by Chapter 18 in tracing statements back to the source statements in the various chapters. One way to do this would be to explicitly state in the source chapters when a calibrated statement on detection and/or a calibrated statement on detection and attribution is being made. To take an example of why there is a problem. Fig 18.2 has an assessment of groundwater depletion. Groundwater depletion is detected with medium to high confidence (Fig 18-3; referring to 3.2.4) despite a statement in 3.2.4 that "detection of changes in groundwater systems is rare". I'm afraid that examples like this make me start to lose confidence in the whole enterprise. However it isn't too late of course, because you have another round to make clear where the assessments in chapter 18 come from and make them fully traceable to and justified by the underlying sections and I think it would really be worthwhile thinking out how you can do that so that you can realise your ambition in the finished product. (Peter Stott, UK Met Office)	We thank the reviewer for the positive statement and express that we totally agree with the call for further improvement of the tracable accounts from chapter 18 to the various sectoral and regional chapters and their underlying references. Most of the work during finalisation of the draft has actually been focused on precisely this point. As a result, all chapters now have a more systematic treatment of confidence assessment, and, where the criteria being used deviate from our criteria this has been clearly stated. All authors have made maximum efforts to ensure proper cross-referencing.
30	76834	18	0	0	0	0	Concerning the philosopy of the WGII definition of "detection", I will provide an example of where I find the concept of detection as applied in WGII troubling. This is that of disaster losses (Fig 18-7: very high confidence in detection and very low confidence in detection and attribution). I am taking this as an illustrative example. This appears in Fig 18-7 as very high confidence in "detection" and very low confidence in "detection and attribution" This is based on an asseessment that includes statements like "no detectable trends in normalized losses consistent with anthropogenic climate change," and "failed to detect trends consistent with anthropogenic climate change" And a conclusion that "there is limited evidence of a trend in the economic impacts of extreme weather events that is consistent with a change driven by observed anthropogenic climate change." This gives the very low confidence in "detection and attribution". But what is also being seen is a very clear trend in disaster losses that has been "detected" with very high confidence as outside the range of what might be considered normal behaviour in the absence of climate change, where the reference normal behaviour "may be stationary or non-stationary and the nature of that reference needs to be spelled out clearly". Thus, according to the chapter, a very clear trend is detected with very high confidence that is a change beyond what might be considered normal behaviour. So the assessment has decided it is not normal behaviour to act in such a way as to increase the value of exposed assets, although as it says on page 29 much of this increased exposure is due to population growth and growing value of assets. Now this is a value judgement of what is normal behaviour but an increase of exposure due to increasing population and wealth seems quite normal and expected behaviour to me. (Peter Stott, UK Met Office)	This assessment, and a few others, have been updated across the WGII report according to a consistent calibrated set of definitions.
31	76835	18	0	0	0	0	The definition of detection in WGII is important because in the SPM there is a statement that "The degree to which .. the detection of stronger early warning signals for expected impacts, can contribute to a more comprehensive risk assessment for dangerous anthropogenic interference with the climate system." So there is an implicit expectation, in the SPM at least that detection of changes matters for drawing conclusions about climate change. Yet many of the high confidence in detection statements sitting off the diagonal in the figures in chapter 18 are presumably nothing to do with anthropogenic or natural climate change even though the detection question is supposed to be dealing with changes in systems that would not be expected in the absence of climate change. The problem comes with the "normal behaviour" clause. It might be "normal behaviour" for disaster losses to increase with population and wealth or it might not as chapter 18 seem to conclude. But if this is not normal this detection of abnormality is then being used as evidence for "detection" and implicitly at least for evidence of something going wrong in some way potentially as the SPM puts it as early warning signals for a more comprehensive risk assessment for dangerous anthropogenic interference with the climate system. Again there is no evidence from the report I can see that supports increases in disaster losses as evidence for dangerous anthropogenic interference with the climate system. Personally I don't see the value of the x axis of the Figures unless they are posited as actually observational statements : there is very high confidence in an increasing trend in disaster losses seems an uncontroversial statement. My hunch is that this is what the authors intend for this axis - ie for impacts in the lower right to indicate aspects that are clearly changing but which have not been shown to be do with anthropogenic climate change. (Peter Stott, UK Met Office)	see response to comment 30

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
32	76836	18	0	0	0	0	I have some other concerns about the conclusions which relate to the need for traceability. To take an illustrative exmple : the reduction in lake and river ice duration and thickness which is discussed directly in chapter 18 rather than being discussed elsewhere in the report (although the cross reference in Fig 18.3 is wrong). Here the reference is to the WGI report chapter 4 which of course is an observational chapter. So apparently (but I may have misunderstood whaty ou are doing here because there isn't a lot of information to go on) you have assessed a high confidence in detection and a high confidence in detection and attribution based on the observational chapter 4 in WGI, which is not a detection and attribution statement at all. (Peter Stott, UK Met Office)	Our chapter focuses on the detection and attribution of long-term changes in natural and human systems to observed climate change. Thus, the WGI Chapters 2 and 4 assessments concerning long-term changes in the behaviour of rivers and lakes that result from observed atmospheric changes are very much detection and attribution assessments of the impacts of climate change.
33	78017	18	0	0	0	0	I have read the ES and introduction, and parts of the technical text but ran out of time. The chapter has much improved since the FOD, it provides now much more detail, and is really interesting to read and much easier to understand where assessments come from, really impressive. (Gabi Hegerl, University of Edinburgh)	Thank you!
34	78020	18	0	0	0	0	It is not always clear to me how detection and attribution is meant to deal with confounders - in some cases, confounders are listed as impediments to detection (e.g. 18.3.1.2 top), in others to attribution. This could be clarified, maybe in the introduction, and a consistent framework would be really useful - or an explanation why that wouldnt be a good idea if it isnt. For example, disaster losses sometimes say that no change beyond changes in exposure is detected, and in other places there is low confidence in attribution due to confounders. I am also wondering if it wouldnt be useful to also state confidence for attribution in non-climatic factors (eg the exposure for disasters) in the attribution statement, it seems you often have confidence in that, and so a statement of low confidence in attribution to anthropogenic climate change is in some ways misleading, as you are confident in attribution - to something else. I think it would be good to state that. (Gabi Hegerl, University of Edinburgh)	We have addressed this comment throughout the chapter and believe that the role of confounders now is made clear, wherever the underlying information was available.
35	78998	18	0	0	0	0	There are many statements in the chapter along the lines of "confidence in attribution to climate change is very low". I think this wording is misleading as it starts with a statement "confidence in attribution to climate change" which sounds like a strong or clear result. I think it would be better to say something along the lines of "there is very low confidence in being able to attribute these trends to climate change". (Richard Jones, Met Office Hadley Centre)	We have looked at every single one of these statements and agree that there was risk for misunderstanding. We have made the best possible effort to clarify language in the sense indicated by the reviewer.
36	79638	18	0	0	0	0	Chapter does not address impacts outside physical science despite references to the increased use of social science analysis in chapter 1. There is evidence around for example migration, see UK Foresight report from 2011 that could have been brought in to this analysis. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	We do not agree, the chapter includes a full assessment of the literature on health, agriculture, security and other topics outside the physical sciences, and it also includes an assessment of the literature on migration as an observed phenomenon. The chapter is not about foresights or sensitivities.
37	79639	18	0	0	0	0	I would, however, note that chapter 18 on detection of impacts is restricted to the physical science impacts. This is particularly interesting as chapter 1 highlights how AR5 and the underlying science analysis now embraces social science aspects to a far greater extent. This trend has not found its way into chapter 18. (UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND)	See response to comment 36 - we believe that the reviewer has not actually studied the chapter 18 SOD.
38	81262	18	0	0	0	0	Authors should coordinate with Chapter 12 to ensure consistent findings regarding climate change and conflicts. (Monalisa Chatterjee, IPCC WGII TSU)	We have aimed at maximum coordination across chapters. Since we were working towards the same deadline, some inconsistencies may remain, but we hope to have minimized those. It must be noted, again, that our assessment concerns exclusively the detection and attribution of observed impacts of climate change. In some chapters, the assessment of observations forms part of a broader vulnerability analysis. Observations may sometimes support the understanding of vulnerabilities even if they do not in themselves support a rigorous attribution statement.
39	82781	18	0	0	0	0	1) Overall -- The chapter team has developed a strong 2nd-order draft. In the final draft, the chapter team is encouraged to continue prioritizing compact and rigorous assessment, effective figures, clear writing, and high specificity. (Katharine Mach, IPCC WGII TSU)	Thank you

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
40	82782	18	0	0	0	0	2) Coordination across Working Group II -- In the context of chapter 18, coordination across chapters is especially important, and the chapter team is strongly encouraged to continue its efforts to ensure harmonized and coordinated assessment. The chapter team should strive to harmonize its assessment text with corresponding material in the sectoral and regional chapters, and most especially, it should ensure that its key findings reverberate appropriately with the core conclusions emerging in other chapters. Where chapter 18 cross-references other chapters, the references should continue to be at the level of specific chapter sections. Additionally and importantly, where chapter 18 uses only cross-references to other chapters in support of statements within chapter 18, the chapter 18 author team bears full responsibility for ensuring a rigorous and comprehensive traceable account is available in the cross-referenced sections, for the statement within Chapter 18. (Katharine Mach, IPCC WGII TSU)	All noted and accounted for during the revision of the entire chapter
41	82783	18	0	0	0	0	3) Harmonization with the Working Group I contribution to the AR5 -- In developing the final draft, the chapter team should also ensure all cross-references to the Working Group I contribution are updated, with discussion of climate, climate change, and climate extremes referencing the assessment findings in that volume. Where cross-references are made, wherever possible and appropriate they should specify the specific relevant sections of Working Group I chapters, instead of generic references to whole chapters. (Katharine Mach, IPCC WGII TSU)	see response to comment 40
42	82784	18	0	0	0	0	4) Presentation of uncertainty language within parentheses -- As much as possible, the chapter team should present calibrated uncertainty language within parentheses at the end of sentences. Such placement maximizes the directness and clarity of statements. Wherever possible, formulations such as "there is high confidence that" should be nixed and replaced by "(high confidence)" at the end of the sentence. (Katharine Mach, IPCC WGII TSU)	see response to comment 40
43	82785	18	0	0	0	0	5) Italicizing uncertainty language -- The chapter team should ensure that all calibrated uncertainty language, including summary terms for evidence and agreement, levels of confidence, and likelihood terms, is italicized within the chapter. Casual usage of likelihood terms should continue to be avoided. (Katharine Mach, IPCC WGII TSU)	see response to comment 40
44	82786	18	0	0	0	0	6) Report release -- The chapter team should be aware that the final drafts of the chapters will be posted publicly at the time of the SPM approval, before final copyediting has occurred. Thus, the chapter team is encouraged to continue its careful attention to refined syntax and perfected referencing. (Katharine Mach, IPCC WGII TSU)	We believe we were already the winners of this particular competition for the SOD, but we will aim to stay at this level of ambition
45	82787	18	0	0	0	0	7) Tightening the assessment and supporting a maximally rigorous executive summary -- In developing the final draft, the chapter team is encouraged to further tighten each section so that the core nuanced key findings emerge clearly from each section with full and traceable support. Continuing with such focus, the chapter team should aim to shorten and tighten the assessment as much as possible, ideally reducing the text by 10 pages. (Katharine Mach, IPCC WGII TSU)	see response to comment 40
46	82788	18	0	0	0	0	8) Informing the summary products -- To support robust and insightful summary products for the report, the chapter team is encouraged to maximize nuance and traceability in its key findings, continuing to use calibrated uncertainty language effectively. The chapter team is encouraged to consider themes emerging across chapters, indicating for example how extreme events have affected human and natural systems to date and reveal adaptation deficits. The chapter team is also encouraged to continue summarizing its assessment in effective tables. (Katharine Mach, IPCC WGII TSU)	see response to comment 40

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
47	84451	18	0	0	0	0	GENERAL COMMENTS: I congratulate the author team for all their work on the SOD. Please see my detailed comments for suggestions related to ES findings and their traceable accounts, cross-chapter coordination, refining figures and tables, calibrated uncertainty language, and various specific clarifications. I have three general comments. (1) The chapter needs a careful read to ensure consistency between the executive summary and underlying chapter text, as well as between characterizations in Chapter 18 and in other chapters. I have tried to point out cases where there seem to be differences in my specific comments, but it is important to do a comprehensive comparison across chapter material and continue cross-chapter coordination as the final drafts are prepared. In this process, please make clarity of ES findings a priority, including timeframe and geographic coverage for observed changes presented. (2) I would recommend a reformulation of section 18.5. While short synopses with detailed summary tables is a good idea, the tables succeed more than the synopses, which are so abbreviated that they read as overgeneralizing without direct citations or cross-references, nor calibrated uncertainty language (all of which do appear in the tables). In a few cases, the information in tables provides a different impression than the section text. Given this, options include adding citation/cross-reference support to sections 18.5.1-8, or condensing the synopses in these sections further to summaries that explicitly link to the table entries (perhaps even as individual paragraphs in the current 18.5.9). The main information in these sections that is not captured in the tables is on changes in climate, which could be retained in close to its current form. (3) I would also recommend further consideration of options for section 18.6, ideally in consultation with Chapter 19. I expected this section to present new information on observed impacts relevant to each reason for concern, and to provide assessment based on this evidence of whether current temperature increase is already associated with a transition away from white (e.g., to yellow) in terms of the RFC color gradient or not. I found the current explanation for each category (sometimes couched as "confirming" a reason for concern, sometimes couched in other terms) somewhat confusing, and have made further specific comments related to the section text where clarification would be useful. Again, this section should also be coordinated with Chapter 19 to ensure consistency and a smooth handoff from assessment of changes to date (realized risks) to assessment of future risks. Please specifically consider the described scope of aggregate impacts in 19.6.3.5 compared to that here. Chapter 19's discussion focuses on nonmonetary aggregations, while here the focus is on monetary aggregations. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 40
48	84452	18	0	0	0	0	SUMMARY PRODUCTS: In preparing the final draft of your chapter and particularly your executive summary, please consider the ways in which your chapter material has been incorporated into the draft SPM and TS. For chapter 18, this includes presentation of observed impacts in section A.i, anthropogenic interference with the climate system in Box SPM.6/TS.7, and figures and tables associated with these sections. Are there opportunities for presenting chapter findings and material in a way that further supports broad themes highlighted in the summary products and that facilitates additional cross-chapter synthesis in specific findings or figures/tables? Do the existing summary product drafts suggest additional coordination that should occur between Chapter 18 and other chapters at LAM4? (Michael Mastrandrea, IPCC WGII TSU)	See response to comment 46
49	85218	18	0	0	0	0	Again ruined by the facts; that the globe is not warming, that the Northern Hemisphere has yet another cold winter and that the relative sea level is not rising (Vincent Gray, Climate Consultant)	We do not understand the comment as it does not relate to the assessment of the scientific literature being made by the IPCC. We note that none of the statements made here by the reviewer is supported by published scientific studies. We do appreciate all constructive remarks that help us improve our work.
50	59021	18	1	0	102	0	Impacts and adaptation always occur in local and regional scales. There are many peer-reviewed non-English publications analyzing the impacts and adaptation in various countries and regions of the world. Unfortunately, few such publications have been cited in this chapter and other chapters of the WG II report. One reason for the ignorance of the publications is the unbalanced distributions of the authors especially in this chapter. It would be better if there were more authors whose native languages are not English, for example Russian, Chinese and Japanese, and they would be responsible for assessing the non-English publications. (Guoyu Ren) (Guoyu Ren, National Climate Center)	We agree with the reviewer that addition of competent authors from different parts of the world might have provided additional literature. The composition of the authors' team has been determined by the IPCC Bureau under observation of all IPCC rules, and with approval of the IPCC Plenary. However, the first and second order drafts of our chapter have been reviewed very widely, providing ample opportunities for experts throughout the world to provide additional reference material, and much new material has reached us in this way. This does of course still not preclude omissions of essential sources.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
51	59022	18	1	0	102	0	In a few of sections, some of the latest publications have not been cited, and they heavily rely on the relative chapters of the GW I and WG II reports, and a few of review articles. This could be improved by inviting more authors to attend the important work.(Guoyu Ren) (Guoyu Ren, National Climate Center)	It would have been helpful if the reviewer had named the publications that have been overlooked (if any). Enlarging the authors team would not by itself have improved the coverage. Instead, the role of the expert and government reviewers was to direct our attention to any information that has been overlooked, and much such material has found its way into the chapter by this way.
52	59023	18	1	0	102	0	The "reasons for concern" concept is good. However, assessment bias may result if it is taken as the guiding ideology in preparing this chapter and the other chapters of the WG II report, because the authors will be encouraged to seek and rely on the studies dealing with the major negative impacts from climate change, and will hardly make an objective evaluation of the impacts having actually occurred in varied sectors and regions. On the other hand, the needs for adaptation demand a more objective assessment of both the negative and positive impacts of climate change. Perhaps another concept, "useful for adaptation", is better for guiding the preparation of the WG II report. (Guoyu Ren) (Guoyu Ren, National Climate Center)	We are not aware of any "ideology" that has been used for guidance in the preparation of this report. As far as studies of positive impacts of recent climate change are concerned, these have been taken into account to the degree that they could be identified. More specific remarks about possibly overlooked literature would have been of great help for the completion of this chapter.
53	59024	18	1	0	102	0	A bigger problem may arise from the inconsistent definitions for "climate change" between IPCC and UNFCCC. When this chapter concludes that certain impacts (e.g. changes in floods frequency due to climate change in the executive summary) have been detected, and some of the impacts can be attributed to climate change with confidence, climate researchers and the authors themselves all understand that the impacts have not been necessarily caused by the anthropogenic climate change or global warming, and only some of the some might result from the GHG induced climate change. However, Policy-makers have their own usage of the term, and they will have a different understanding of the detected impacts and their causes. The problem has not been well solved even by introducing term "anthropogenic climate change" for some of the assessment conclusions, and a serious confusion will result from the different usages of the terms. (Guoyu Ren) (Guoyu Ren, National Climate Center)	We are fully aware of the problem to adequately communicate the technical aspects of the problem to policymakers. However we are unaware of a better way to minimize the problem than being explicit about the nature of the definitions as we have tried to be throughout the process. During preparation of the final draft, additional efforts have been made to escape any risk of possible misunderstanding by using consistent language.
54	57760	18	1	1	1	1	it should be relatively easy for table 18-4 to add some agricultural impacts (e.g. Europe 2003, Russia 2010) which can then be referred to in chapter 7 and some regional chapters. (David Lobell, Stanford University)	We have added Russia 2010 and US 2012 to the table. Thank you for the suggestion.
55	62680	18	2	1	2	35	Suggestions as the above mentioned. As we know, AR5 WG2 outline defines that Ocean system as a global and sectoral chapter and the (Open) Oceans as a regional chapter and both of them have been assessed on global and regional scale, respectively. It is suggested that Ocean Systems should be as one of natural systems under section 18.3, the (Open) Oceans could be referred to as a region under section 18.5, e.g. "18.5.9 the Ocean", and the "18.5.9 Impacts across Regions" could be changed to "18.5.10 ..." (RONGSHUO CAI, Third Institute of Oceanography)	Indeed, Oceans is now one single system in section 18.3. For the regional assessment, all material has now been drawn together into table 18-8, which deals with coastal and marine ecosystems. We believe this fully addresses the earlier inconsistency that is mentioned by the reviewer.
56	60068	18	3	1	5	53	This section is inconsistent in applying attribution statements. Some statements do not mention whether the impacts can be attributable to climate change, while others do. This is confusing, particularly where some statements, such as (pg. 4 lines 16-17) on artic ice melt, are attributable to climate change but this isn't stated. One may assume that no attribution statement means that the impact is not attributable to climate change. (AUSTRALIA)	The IPCC report is about climate change, and chapter 18 is about the detection and attribution of observed impacts of climate change. It is therefore not necessary to make every single phrase of the chapter contain the word climate change. We have nevertheless worked hard to avoid any misunderstanding throughout the chapter.
57	68116	18	3	4	0	0	Each conclusion in the executive summary should be followed by confidence level assessment and the writing style should be standardized in WG II report. It is suggested to make additions and modifications according to the Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties (6-7 July 2010) to avoid inconsistent formulations like “medium to high confidence”. (CHINA)	This has been followed to the degree possible. However, for the "summary of the summary", that is the highest level of aggregation, it is not always meaningful to assign a confidence level.
58	82789	18	3	4	0	0	Harmonization of Key Findings in Executive Summary -- The chapter 18 author team should carefully check all key findings presented in the executive summary to ensure they are harmonized with the conclusions of relevant sectoral and regional chapters. (Katharine Mach, IPCC WGII TSU)	Noted

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
59	82790	18	3	4	0	0	Time Frames and Geographic Regions for Key Findings-- For key findings in the draft executive summary, the chapter team should ensure that it appropriately characterizes the time frames over which impacts have been observed (and attributed to climate change) and their corresponding geographic scope. The chapter team should especially ensure that statements are not overgeneralized. (Katharine Mach, IPCC WGII TSU)	Noted
60	60069	18	3	4	5	52	Executive Summary: Generally, this summary is not easy to interpret without reading the chapter itself. An up-front description of detection and attribution needs to be included. All confidence statements need to be clear whether they relate to detection and attribution, and the statements should be worded consistently throughout the summary. (AUSTRALIA)	Our goal was to inform, first and foremost, about the factual aspects of detected impacts of climate change. We have considered whether statements on methods and definitions should precede factual statements in the Executive Summary but have concluded that this would not be helpful for the reader. Those wanting to find guidance about the definitions that have been applied throughout the chapter find appropriate information the introduction and in the section on methods.
61	64760	18	3	4	5	52	There needs to be more consistency in the use of the terms 'climate change' versus' anthropogenic climate change' among the bulleted statements. Why is anthropogenic called out on page 3, line 54, but not in other statements. Providing clarity at the beginning by defining the first time it is used what is meant by 'climate change' (includes natural and anthropogenic) as elegantly described in WGII Chapter 4, would be greatly improve the readability of the chapter and enhance the communication of the findings to inform policy makers. (Robert Webb, NOAA OAR ESRL)	The mentioned example has been changed and now reads, more appropriately, "due to climate change and atmospheric CO2 increase". Throughout, the references to climate change have been checked for consistency.
62	64761	18	3	6	3	6	change 'climate change' to 'changes in climate" (Robert Webb, NOAA OAR ESRL)	we have changed language as suggested in first para of ES
63	66849	18	3	6	3	6	Delete comma after 'biological' (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
64	76839	18	3	6	3	7	What is meant by climate change ? Both anthropogenic and natural ? In which case of course high confidence in detection and attribution for impacts of observed climate change does not necessarily imply implications for anthropogenic interference in the climate system. I understand the caveat at page 5 line 44-46 but even in the absence of many end to end attribution studies is it not possible to come to a multi-step assessment of attribution to anthropogenic climate change ? (Peter Stott, UK Met Office)	see response to comment 60
65	78879	18	3	6	3	7	It is not clear whether all types of impacts have been detected on all continents, or only some on some. Please rephrase to remove ambiguity. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	We do not see this ambiguity. Had we been wanting to say "all types of impacts on all continents", then we would have said so. In the current phrasing, all we say is that there some impacts on each continent.
66	82791	18	3	6	3	7	The chapter team should strongly consider presenting calibrated uncertainty language for this finding. (Katharine Mach, IPCC WGII TSU)	We found that this was not meaningful to do at this high level synthesis statement.
67	60070	18	3	6	3	8	… in most oceas.' Why is 'most' used? Has warming not been seen in all oceans? If not, please indicate which ocean has not experienced impacts. (AUSTRALIA)	We recognize that the statement was misleading and now refer to all oceans.
68	64762	18	3	7	3	7	replace 'This conclusion' with 'The detection of climate change impacts' since is unclear that the first sentence of the chapter is actually a conclusion rather than a statement. (Robert Webb, NOAA OAR ESRL)	We agree and have rephrased the entire sentence more fundamentally.
69	82792	18	3	9	3	9	Would it be more accurate to say "levels of confidence"? (Katharine Mach, IPCC WGII TSU)	We do not think so.
70	64763	18	3	9	3	10	This sentence needs clarification. 'The level of confidence in attribution of observed impacts to shifts in rainfall patterns is lower.' Is the reduced level of confidence in attribution 1) because of difficulties in showing causality illustrating that the observed impacts are the result of shifts in rainfall patterns or 2) because of difficulties in showing causality linking observed shifts in rainfall patterns to anthropogenic climate change. I suspect the latter and thus a slight rewrite of the sentence "The level of confidence is lower in the attribution of the impacts of observed shifts in rainfall patterns to anthropogenic climate change." (Robert Webb, NOAA OAR ESRL)	First of all, we have moderated the statement to say that the level of confidence is "generally lower" (there are exceptions). Second, given space limitations, we could not extend the discussion of these issues in the Executive Summary.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
71	58291	18	3	10	3	10	Replace "rainfall" with "precipitation". (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	we have changed language as suggested
72	60071	18	3	10	3	10	This paragraph states, 'There is emerging evidence of ocean acidification'. Has there not been evidence already and therefore it is not just 'emerging'. (AUSTRALIA)	According to our assessment and that of other chapters, the evidence for any IMPACTS of ocean acidification can only be classified as "emerging", despite the clear evidence of acdification itself.
73	64927	18	3	10	3	10	“to shifts in precipitation amounts and patterns is generally lower than for warming.”. (“generally” because there are some attributions with high confidence in the literature.) (J. Graham Cogley, Trent University)	we have rephrased this para, and differentiation is no longer made.
74	64929	18	3	10	3	10	"to shifts in precipitation amounts and patterns is generally lower than for warming.”. (“generally” because there are some attributions with high confidence in the literature.) (J. Graham Cogley, Trent University)	we have rephrased this para, and differentiation is no longer made.
75	82793	18	3	12	3	14	The chapter team should consider presenting calibrated uncertainty language for this finding. (Katharine Mach, IPCC WGII TSU)	We do not see how this could be done, except by adding uncertainty language to every single entry in the list. Indeed, this statement is meant as an introduction to the subsequent statements where the uncertainty is specified system-by-system.
76	82794	18	3	18	3	18	The chapter team should assign calibrated uncertainty language for this statement. (Katharine Mach, IPCC WGII TSU)	The uncertainty statement has been there and still is.
77	82795	18	3	18	3	20	Is it possible to specify a timeframe over which these impacts have occurred, broadly? Also, this paragraph should be carefully coordinated with chapter 3. (Katharine Mach, IPCC WGII TSU)	At this level of aggregation, we find it impossible to make more than only very vague statements with respect to timeframe and have thus chosen to not make them at all.
78	58292	18	3	19	3	19	Replace " seasonal ice in many lakes and rivers" with "lake and river ices" (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	The summary had to be reduced in length and this statement has therefore been removed.
79	77582	18	3	19	3	19	There seems to be a bit of a mismatch between the bold headline (which deals with glaciers) and seasonal ice in non-glaciated areas. (Francis Zwiers, Pacific Climate Impacts Consortium)	The summary had to be reduced in length and this statement has therefore been removed.
80	84453	18	3	19	3	20	Section 18.3.1.3 states high confidence in the trend of later freeze-up and earlier break-up, but does not comment on attribution of that trend. Please ensure consistency. In addition, I note that here, it is specified that a "major" part of changes can be attributed to climate change, but in most other cases major/minor is not specified, which may lead to confusion in interpretation. Please consider this when revising the executive summary. (Michael Mastrandrea, IPCC WGII TSU)	The summary had to be reduced in length and this statement has therefore been removed.
81	64928	18	3	20	3	20	"… to climate change, including past climate change”. That is, try to capture the idea of committed change in the ES: with very high confidence, glaciers will continue to shrink even if the climate stops changing, because they are still too large for the present-day climate. Cf. Bahr, D.B., M.B. Dyurgerov, and M.F. Meier, 2009, Sea-level rise from glaciers and ice caps: a lower bound, Geophysical Research Letters, 36, L03501, doi:10.1029/ 2008GL036309. (J. Graham Cogley, Trent University)	We have been unable to relate this comment to our text.
82	82796	18	3	22	3	22	What is meant here by "changes"? It would be preferable to specify this more precisely. (Katharine Mach, IPCC WGII TSU)	The revised text now refers to permafrost extent only, although this is a simplification of matters.
83	82797	18	3	22	3	23	In place of "over the past years and decades" it would be preferable to indicate more clearly the relevant time frame. (Katharine Mach, IPCC WGII TSU)	The summary had to be reduced in length and this statement has therefore been removed. Please also see our response to comment 77.
84	69437	18	3	22	3	25	The chapter clearly mentions that the permafrost in the arctic has receded and on the other hand ice layer in Antarctic region has increased and hence the generalisation of decrease of ice layer of whole permafrost region seems not an accurate summary of the chapter. (NETHERLANDS)	The statement on sea ice in Antarctica has been corrected.
85	58911	18	3	24	3	24	The statement that the permafrost boundary has been moving polwards and to higher elevations is somewhat problematic and should be reconsidered. There is no clear or easily observable "permafrost boundary" in nature but an extremely complex pattern of permafrost patches in wide transition zones/belts. For this reason something like a "permafrost boundary" is not part of internationally coordinated permafrost monitored (GTN-P in GCOS/GTOS). Exact documented/measured knowledge about the "permafrost boundary" and its change, therefore, simply does not exist. It would be safer to limit the statement to the documented trends of permafrost warming/thawing and active layer thickening/subsidence from thaw settlement. The term "area reduction" might also be acceptable even though already more speculative (Wilfried Haeberli, University of Zurich)	We changed this term in the Exec Summary and throughout the text, now referring to permafrost thawing and warming.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
86	82798	18	3	25	3	25	How should the reader interpret this description--has a major or minor part been attributed to climate change? (Katharine Mach, IPCC WGII TSU)	The simplified statement no longer has this ambiguity.
87	84454	18	3	25	3	25	Per my comment on the previous paragraph, major/minor is not specified here. In addition, this medium confidence assignment is not clear from 18.3.1.3. (Michael Mastrandrea, IPCC WGII TSU)	The simplified statement no longer has this ambiguity.
88	78021	18	3	27	0	31	Would be useful to crosslink this to WG1 ch10, and make sure its consistent as the drought attribution is assessed as very uncertain given data issues and modelling (Gabi Hegerl, University of Edinburgh)	Drought is no longer mentioned in the Executive Summary, but in the text we reference SREX Ch3 and/or WGI Ch2 for meteorological drought, or elsewhere for other types of drought. We do not reference WGI Ch10 that frequently because the anthropogenic contribution to observed climate change is not the main focus of our chapter.
89	58293	18	3	27	3	27	Replace "due to changing rainfall or melting glaciers" with "due to changing precipitation and melting cryosphere" (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	we have changed language as suggested
90	84455	18	3	27	3	28	Section 18.3.1.2 states that it is difficult to link observed changes in water quality to climate change, which seems to differ from the impression provided here. In addition, the medium confidence in a link between sediment transport and changes in hydrological systems is not clear from 18.3.1.4 and should be clarified. (Michael Mastrandrea, IPCC WGII TSU)	There is some evidence for changes in water quality and sediment flow and we found that it is sufficient to support the summary "mean confidence" now.
91	59025	18	3	27	3	31	How has the frequency of floods been altered by climate change? increased or decreased? and also has it increased or decreased due to anthropogenic climate change? (Guoyu Ren) (Guoyu Ren, National Climate Center)	Flood frequency has been altered, sometimes increased and sometimes decreased, depending on the region. No attribution of changes in flood frequency is being made to anthropogenic climate change (which does not preclude the vulnerability assessment that is made in other chapters).
92	74091	18	3	27	3	31	In the executive summary and other sections there is talk about droughts and floods and impacts but not about the severity of droughts and floods. The authors should consider including a discussion and/or assignment of confidence related to the severity of droughts and floods. (UNITED STATES OF AMERICA)	To the degree that the underlying literature allows such an assessment, this has been taken into account.
93	82799	18	3	27	3	31	Is it possible to specify broadly the timeframe over which these impacts have occurred? The paragraph should also be carefully coordinated with chapter 3. (Katharine Mach, IPCC WGII TSU)	At this level of aggregation, we find it impossible to make more than only very vague statements with respect to timeframe and have thus chosen to not make them at all.
94	64930	18	3	28	3	28	The assessment of medium confidence should perhaps be “low to medium confidence”, given the highly variable findings about water quality and sediment transport summarized in WGII Chapter 3. (J. Graham Cogley, Trent University)	This would have been an option, however, we have opted for the generic statement of medium confidence at this level of summary.
95	64931	18	3	28	3	28	The assessment of medium confidence should perhaps be “low to medium confidence”, given the highly variable findings about water quality and sediment transport summarized in WGII Chapter 3. (J. Graham Cogley, Trent University)	same comment as 94, see our response there
96	66850	18	3	28	3	28	Delete comma after 'quality'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
97	74092	18	3	29	3	30	For drought and flood changes, what is meant by "altered by climate change" here? That the changes are larger than would be expected from natural changes in climate alone? Or that drought and flood have been altered by climate change, but the "climate change" includes contributions from internal climate variability (AMO, etc.), which would mean that the definition of climate change from the first part of the WG2 SPM is being used. This is a good example of the ambiguities in the report. Also if the former definition is being used, the assessment is overly confident for flooding, as will be discussed in another comment. (UNITED STATES OF AMERICA)	see response to comment 91
98	84456	18	3	29	3	31	Intensity is also mentioned in the text (18.3.1.2, which should be added to the line of sight). (Michael Mastrandrea, IPCC WGII TSU)	We have reassessed drought responses to observed climate change and found these to be ambiguous throughout the literature - our statements to this point in the Executive Summary have therefore been removed.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
99	58107	18	3	30	3	30	suggest to" add intensity" after duration. (Liyong Xie, Shenyang Agricultural University)	see response to cmment 98
100	58294	18	3	30	3	30	Is the "duration of drought" here means "duration of meteorological drought"? (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	see response to cmment 98
101	58295	18	3	30	3	30	Citation 18.3.1.1 should be 18.3.1.2 (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	all crossreferencing has been revised since also the section numbering has changed
102	64932	18	3	30	3	30	“altered” should probably be “increased”. I am not aware of any reports that droughts have become shorter in any region. (J. Graham Cogley, Trent University)	see response to cmment 98
103	82800	18	3	30	3	30	It would be preferable to specify which regions are relevant. (Katharine Mach, IPCC WGII TSU)	see response to cmment 98
104	82802	18	3	35	3	36	The chapter team may consider presenting calibrated uncertainty language for this statement. Additionally, is it possible to indicate more precisely what is meant by "impacted"? (Katharine Mach, IPCC WGII TSU)	At this level of an introductory summary statement we find it impossible to assign a signle confidence level. Regarding the more specific impacts, the following paragraphs should provide sufficient information.
105	82801	18	3	35	3	43	These paragraphs should be carefully coordinated with chapter 4. Additionally, is it possible to specify broadly the relevant time frame for the observed impacts? (Katharine Mach, IPCC WGII TSU)	Coordination with chapter 4 has been particularly close, with one particular LA (Paul Leadley) being a member of both teams. At this level of aggregation, no more specific information about time frames could be given.
106	69438	18	3	36	3	38	The change in productivity is given to be medium confidence in executive summary but the confidence level for productivity seems not to be explicitly reported in the main text of the chapter 18. (NETHERLANDS)	Productivity and biomass changes are now more clearly discussed in 18.3.2.2, along with appropriate confidence statements.
107	60072	18	3	36	3	39	It is not clear whether the sentence is trying to say that climate change can be attributable to the changes observed in phenology, productivity or geographic range. Please clarify this sentence. (AUSTRALIA)	It is the other way around, some changes in phenology or productivity are attributed to climate change. The text has been revised to avoid any ambiguities.
108	60073	18	3	37	3	37	It would be worthwhile defining 'phenology'? It is not a term in common usage. (AUSTRALIA)	The definition is given in section 18.3.2, and the crosslink to that section is given at the end of this paragraph.
109	64933	18	3	37	3	37	“phenology”: this word appears twice in the ES, but is not defined until Box 18-2 (P10 L24); it is defined again at P16 L17. It is sufficiently likely to be unfamiliar to readers that it should perhaps be defined in the ES, and it should certainly be in the WGII Glossary. (J. Graham Cogley, Trent University)	We refer to the response given to comment 108 and note that some technical statements in hydrology may be equally unfamiliar to experts in ecology than is the case in the opposite direction. We hope that the crosslink to the respective section is sufficient to overcome this problem, because a full set of definitions of all technical terms, throughout the Executive Summary, would make this summary unreadable.
110	84457	18	3	37	3	38	Section 18.3.2.2 states high confidence in an increase in productivity, but low confidence in attribution to climate change. It is not clear how these intersect with the medium confidence here. In addition, Chapter 4 states high confidence in range shifts and changes in abundance and phenology, which is not completely consistent with the confidence assignments here. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 106
111	58106	18	3	38	3	38	"Elevated rates of extinction cannot be attributed to climate change" should complement confidence; or add "so far" after climate change (Liyong Xie, Shenyang Agricultural University)	The statement now reads "The majority of species extinctions ... cannot be attributed reliably to climate change". Being a clear "cannot", we have not assigned confidence to this statement.
112	60074	18	3	38	3	38	Elevated rates of extinction cannot be attributed to climate change.' Suggest that this phrase should say 'has not been', 'is not' or 'cannot presently'. Pleasealso provide the degree of certainty of this claim. (AUSTRALIA)	see response to comment 111
113	60075	18	3	38	3	38	The statement "Elevated rates of extinction cannot be attributed to climate change" is a very definitive statement and not a good representation of the discussion in 18.3.2.3. It can be interpretted that climate change does not influence species extinction, but climate change has been noted as a causal factor in some extinctions. Low agreement/low confidence terminology should be used for consistency. (AUSTRALIA)	see response to comment 111. We do not agree that this interpretation is possible. If there is no rigorous attribution, then we have to say so. This does in no way lead to the conclusion that climate change does not influence species extinctions.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
114	61447	18	3	38	3	38	Should this statement have a confidence assessment? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	see response to comment 111
115	64764	18	3	38	3	38	Suggest the authors Include a level of confidence to inform policy makers for the sentence "Elevated rates of extinction cannot be attributed to climate change." (Robert Webb, NOAA OAR ESRL)	see response to comment 111
116	78999	18	3	38	3	38	Should this statement have a confidence assessment? (Richard Jones, Met Office Hadley Centre)	see response to comment 111
117	82803	18	3	38	3	38	For this final sentence of the paragraph, is it possible to specify a level of confidence? (Katharine Mach, IPCC WGII TSU)	see response to comment 111
118	84458	18	3	38	3	38	Section 18.3.2.3 states very low confidence in attribution of extinctions, which is different than saying elevated rates cannot be attributed to climate change. Please ensure consistency. (Michael Mastrandrea, IPCC WGII TSU)	The ambiguity has been removed through the revision of the corresponding section
119	78022	18	3	40	0	43	This is another case where the bold statement sounds much more certain than the text afterwards 'linked' sounds very strong please make consistent (Gabi Hegerl, University of Edinburgh)	We agree and have revised this statement accordingly.
120	63669	18	3	40	3	43	Please insert this para in the TS (p.9, l.20). (GERMANY)	We have no authority over the TS but trust that all our findings are taken into account by the TS author team.
121	84459	18	3	40	3	49	It appears that the last paragraph of section 18.3.2.3 is also relevant to this finding (note very high confidence in detected changes, compared to high here). (Michael Mastrandrea, IPCC WGII TSU)	The ambiguity has been removed through the revision of the corresponding section
122	76840	18	3	42	3	42	What is meant by detection here ? Detection of change relative to what ? If normal behaviourin the absence of climate change is being defined separately for each system then do you need to specify here what the normal is ? (Peter Stott, UK Met Office)	Yes, this was ambiguous and has been fully revised.
123	82804	18	3	42	3	42	Would it be appropriate to specify a major or minor role here? (Katharine Mach, IPCC WGII TSU)	Statement has been fully revised.
124	82805	18	3	45	3	45	In place of "several major terrestrial ecosystems," the chapter team should consider specifying which are meant. (Katharine Mach, IPCC WGII TSU)	This is precisely what follows in this paragraph.
125	77583	18	3	46	3	48	The formulation, which has the form "for this …., for that …." seems a bit awkward. (Francis Zwiers, Pacific Climate Impacts Consortium)	Statement has been fully revised.
126	66851	18	3	48	3	48	Insert 'the' after 'as'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
127	60076	18	3	48	3	49	The statement " The recession and degradation of the Amazon forest cannot be attributed to climate change" is very definitive, and could be interpreted that climate change has had no influence. Suggest using the 'very low confidence' terminology as in section 18.3.2.4, or change 'cannot' to 'has not been', 'is not' or 'cannot presently'. (AUSTRALIA)	Again, not detecting something does not mean it isn't there. This chapter assesses the literature about detection and attribution - statements about vulnerabilities are made by other chapters. It goes without saying that our assessment is the PRESENT state of knowledge: if we were to add this disclaimer, then it would have to be added to every single sentence of the chapter.
128	61448	18	3	48	3	49	Should this statement have a confidence assessment? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	"Cannot" is a deliberately absolute statement and cannot, in our view, be associated with a confidence assessment.
129	64765	18	3	48	3	49	Suggest the authors Include a level of confidence to inform policy makers for the sentence " The recession and degradation of the Amazon forest cannot be attributed to climate change." (Robert Webb, NOAA OAR ESRL)	see response to comment 128
130	79000	18	3	48	3	49	Should this statement have a confidence assessment? (Richard Jones, Met Office Hadley Centre)	see response to comment 128
131	84460	18	3	48	3	49	As with the extinctions statement, section 18.3.2.4 says very low confidence in attribution, which is not the same as cannot be attributed. Please ensure consistency. (Michael Mastrandrea, IPCC WGII TSU)	The ambiguity has been removed through the revision of the corresponding section

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
132	77584	18	3	53	3	54	"The physical and chemical properties" seems rather broad and non-specific - wouldn't it be better to say that ocean surface temperatures have warmed over many parts of the ocean, and that there is broad evidence of ocean acidification? Also, without a calibrated assessment, these statements could be viewed as being statements of certainty - which would conflict with assessments of ocean warming and acidification elsewhere in the AR5. A further point is that acidification would be considered to be an impact of CO2 emissions, but not necessarily climate change (although climate changes, affecting things like ocean mixing and ventilation processes, would have a role). (Francis Zwiers, Pacific Climate Impacts Consortium)	The sentence is an introduction to the paragraph about oceans, confidences being provided for the more specific statements to follow. Acidification is not mentioned specifically here, but it falls under chemical properties of course. Throughout the chapter, we have followed the guidance that was given to us about direct impacts of increasing atmospheric CO2 which causes ocean acidification as well as changes in the physiology of terrestrial plants. That guidance has stated that these processes, while not technically being considered climate change driven, are driven by the same anthropogenic greenhouse gas emissions and therefore fall under the assessment to be made by the IPCC.
133	84461	18	3	53	3	54	This first sentence should be associated with a confidence statement. WGI Chapter 6 presents high confidence relevant to these changes. In addition, the timeframe of the past 60 years is not mentioned in the corresponding chapter text. (Michael Mastrandrea, IPCC WGII TSU)	The sentence is an introduction to the paragraph about oceans, confidences being provided for the more specific statements to follow.
134	82806	18	3	53	4	4	The chapter team should specify a level of confidence for this statement, coordinating the paragraph with Chapters 6 and 30. (Katharine Mach, IPCC WGII TSU)	see response to comment 133
135	64766	18	3	54	3	54	suggest replacing 'due to' with 'primarily in response to' (Robert Webb, NOAA OAR ESRL)	We have strived to the highest possible brevity and therefore retained "due to".
136	58296	18	4	1	4	2	Replace "facilitated by changes in the distribution of sea ice" with "facilitated by decreasing of sea ice" (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	After shortening of the text, this sentence is no longer there.
137	82807	18	4	6	4	9	This paragraph should be carefully coordinated with chapter 6's key findings. Also, over what time frame have these impacts been observed? (Katharine Mach, IPCC WGII TSU)	As a result of the coordination with ocean chapters, we no longer make a statement on ocean productivity here.
138	84462	18	4	6	4	9	Please consider consistency with Chapter 6, which presents high confidence for related statements. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 137
139	78018	18	4	7	0	9	is there a confidence sttement - otherwise it sounds like a certainty (Gabi Hegerl, University of Edinburgh)	see response to comment 137
140	64767	18	4	8	4	9	Suggest the authors Include a level of confidence to inform policy makers for the statement "climate change has contributed to an increase in the frequency, geographical distribution, and severity of hypoxic areas in the ocean." (Robert Webb, NOAA OAR ESRL)	Also for this point, as a result of the coordination with ocean chapters, we no longer make a statement on ocean productivity here.
141	61449	18	4	11	4	13	Can an attribution statement be included here? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	There is now a high confidence statement for coral reef impacts throughout the chapter.
142	79001	18	4	11	4	13	Can an attribution statement be included here? (Richard Jones, Met Office Hadley Centre)	see response to comment 141
143	77585	18	4	16	4	16	Something seems to be missing here - again, I think the words need to be a bit more specific. I assume that "composition" refers to the mix of multi-year ice and new ice that is present in the Arctic, so something like that should be said so that readers do not imagine some other kind of change in composition. Also, as written, one could be excused for wondering how composition could shrink. (Francis Zwiers, Pacific Climate Impacts Consortium)	This statement has been removed - certain elements have been merged with other statements where appropriate, and the amguity is gone.
144	61450	18	4	16	4	17	Can an attribution statement be included here? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	see response to comment 143
145	79002	18	4	16	4	17	Can an attribution statement be included here? (Richard Jones, Met Office Hadley Centre)	see response to comment 143
146	79003	18	4	16	4	17	Should this statement be in the cryosphere section? (Richard Jones, Met Office Hadley Centre)	see response to comment 143
147	59026	18	4	16	4	18	It is good to indicate if or in what extent the shrinking of Arctic sea ice has been attributed to anthropogenic climate change. (Guoyu Ren) (Guoyu Ren, National Climate Center)	see response to comment 143
148	71553	18	4	17	0	0	Add s to indigenous peoples - (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	we have changed language as suggested

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
149	77586	18	4	17	4	17	I think the authors should avoid the practice of reporting a confidence range (medium to high in this case). The interpretation could be that there is high confidence in some aspects of this statement, and only medium confidence in others, or it could be that the authors think they can differentiate more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have high confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have removed these cases to the degree possible, but in some instances it appeared still meaningful to communicate the fact that in some cases there is a lower or higher confidence than there is in others.
150	71554	18	4	20	0	22	Consider rephrasing - it is convoluted and an important message is hard to understand (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	This statement has been removed - certain elements have been merged with other statements where appropriate, and the amguity is gone.
151	64934	18	4	20	4	22	I am sceptical of this assessment, at least as currently worded. The global-average rate of sea-level change can surely be attributed to climatic change with very high confidence. Local confounding factors such as tectonic subsidence of large deltas, glacio-isostatic adjustment and the self-gravitational effects of water mass redistribution ought not to compromise this conclusion to the extent implied by the present wording. (J. Graham Cogley, Trent University)	see response to comment 150
152	82808	18	4	20	4	22	This finding should be clarified. Is detection possible at all? (Katharine Mach, IPCC WGII TSU)	see response to comment 150
153	84463	18	4	20	4	22	Please specify whether "coastal systems" in line 20 refers to both human and natural systems. In addition, does "preclude the confident detection" mean "cannot be detected"? This could be clearer. Finally, it would be useful to state what can be attributed for the Arctic as implied in line 22. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 150
154	82809	18	4	24	4	26	The chapter team should consider presenting calibrated uncertainty language for these statements. (Katharine Mach, IPCC WGII TSU)	Again, at this level of aggregation we do not find the use of calibrated uncertainty statements feasible.
155	76952	18	4	28	4	29	The wording is awkward and redundant. Reverse the clauses and it is more straightforward: Agricultural crop yields have changed in many regions in response to climate, even accounting for changes in technology and other non-climate factors. (Marc Levy, Columbia University)	Statement has been fully revised.
156	58105	18	4	28	4	30	suggest to add "with adequate adaptation" after "… due to warming and higher CO2". (Liyong Xie, Shenyang Agricultural University)	see response to comment 155
157	74093	18	4	28	4	33	Ag crop yields have changed due to warming etc. but how about the relation to other factors such as rainfall (heavy events) and droughts. Perhaps there should be a discussion on the relation of crop yields to extremes in precipitation if the literature on detection warrants. (UNITED STATES OF AMERICA)	The statement now refers to climate change which includes both warming and changes in precipitation.
158	82810	18	4	28	4	33	The timeframe for these impacts should be specified. (Katharine Mach, IPCC WGII TSU)	At this level of aggregation, we did not find the assessment of time frames feasible.
159	59027	18	4	29	4	30	A higher confidence (medium to high confidence) can be assigned to the conclusion that yields have increased in mid to high latitude regions due to warming and higher CO2. (Guoyu Ren) (Guoyu Ren, National Climate Center)	Our statement now clearly reflects this fact.
160	84464	18	4	29	4	30	Section 18.4.1.1 states high confidence that warming has benefited crop production in such regions, while Table 18-9 states low confidence for the UK. Please ensure consistency across all sources or explain differences. (Michael Mastrandrea, IPCC WGII TSU)	All crosslinks have been checked and revised where necessary.
161	60077	18	4	31	4	33	Please provide the degree of certainty for the agricultural market claim. (AUSTRALIA)	Wherever we conclude that something CANNOT be attributed, no confidence statement is given, due to the absolute nature of the statement.
162	66852	18	4	33	3	33	Insert 'to the' after 'due'. (Peter Burt, University of Greenwich)	we have changed language as suggested
163	62394	18	4	33	4	33	Chapter 18 - The word 'to' is missing in the line. The phrase should read due 'to' presence of other drivers (INDIA)	we have changed language as suggested
164	78019	18	4	35	0	39	The confidence statement (very low) seems to be in direct contradiction to the bold statement above - please rephrase the bold sentence to make consistent (Gabi Hegerl, University of Edinburgh)	A full reassessment of the underlying material has led us to remove this statement, we now conclude that there is only limited evidence for climate change impacts on fisheries.
165	82811	18	4	35	4	39	Discussion of fisheries currently on lines 6-7 could be moved to this paragraph, perhaps? The general time frame for statements here should be specified. (Katharine Mach, IPCC WGII TSU)	see response to comment 164
166	85155	18	4	35	4	39	Is not overfishing a major confounding factor which should be mentionned ? (Michel Petit, CGIET rue de Bercy)	see response to comment 164

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
167	74094	18	4	35	4	40	The statement that fisheries "at high latitudes" have increased in productivity is somewhat misleading in being overly broad, in that it refers to the North Atlantic and Barents Sea and it is not applicable to the North Pacific and adjacent high latitude waters. Average Spring sea ice cover in the northern Bering Sea south of the Bering Strait has fluctuated about the same mean value since 1961 (cf Mundy, P. R., and Evenson, D. F. 2011. ICES Journal of Marine Science, 68: 1155-1164.) and future changes in Spring sea ice cover are unlikely because spring sea ice is decoupled from Arctic summer ice cover of the preceding year (Stabeno et al. 2012 Deep Sea Research II 65-70; 14-30.). The lack of ice in the summer above the Arctic Circle has little impact on spring ice extent in the northeastern Bering Sea above 60N (Stabeno et al. 2012). The marine productivity of the northeastern Bering Sea is dominated by the sea ice cover in March/April and the corresponding persistence of the oceanographic feature known as the "cold pool." Dominance of the spring cold pool which is independent of summer Arctic ice and a complex of other biological and oceanographic features enumerated by Cooper et al. 2012 Deep Sea Research II 65-70, 141-162, make predictions about future trends in spring productivity at these latitudes (~ 60 ‰ÛÒ 66N) problematic. (UNITED STATES OF AMERICA)	see response to comment 164
168	84465	18	4	39	4	39	Section 18.5.7 does not seem directly relevant to this finding. (Michael Mastrandrea, IPCC WGII TSU)	We agree and have removed this statement.
169	84466	18	4	41	4	42	A confidence assignment is needed for this finding. Chapter 11 presents medium confidence for related statements. (Michael Mastrandrea, IPCC WGII TSU)	We have reassessed the literature and now come to the conclusion that there is insufficient evidence for this issue.
170	61451	18	4	41	4	43	The statement of "attribution" in bold seems to be a contradiction with the very low confidence in attribution in the following sentence. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	see response to comment 169
171	79004	18	4	41	4	43	The statement of "attribution" in bold seems to be a contradiction with the very low confidence in attribution in the following sentence. (Richard Jones, Met Office Hadley Centre)	see response to comment 169
172	82812	18	4	41	4	43	The logic of these 2 sentences with respect to one another should be refined. Also, is a major or minor part of the disease increases being attributed to climate change? (Katharine Mach, IPCC WGII TSU)	see response to comment 169
173	58297	18	4	42	4	43	Is it acceptable to assess that the increasing trend of Dengue fever and malaria were attributed to climate change only with very low confidence? A higher confidence can be assigned. (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	see response to comment 169
174	84467	18	4	42	4	43	This statement on dengue and malaria differs from statements in the chapter text/tables (which also differ themselves). Section 18.4.5 discusses malaria in East Africa, but not dengue. Section 18.5.6 presents high confidence in detection and medium confidence in attribution of increase in the frequency and extension of dengue in Central and South America. Table 18-9 state high confidence in detection and low confidence in attribution for increase in frequency and extension of dengue, as well as high confidence in detection and medium confidence in attribution for increase in frequency and extension of malaria in Central and South America. Please ensure consistency across these discussions, including the representation in the executive summary. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 169
175	71555	18	4	45	0	0	change groups to peoples (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	we have changed language as suggested
176	74095	18	4	45	4	47	The inclusion of cultural identity here is odd and not consistent with the key finding on Pg 5 lines 1-2 nor supported by the text in the chapter. Suggest deleting "cultural identity". (UNITED STATES OF AMERICA)	The statement has been changed to say "cultural values" and should now be consistent with the respective section and also other chapters in the report.
177	82813	18	4	45	4	47	Overlap with lines 16-18 could be reduced. Additionally, what is the general time frame for these statements? For the attributed impacts, is a major or minor part being attributed? (Katharine Mach, IPCC WGII TSU)	The statement in lines 16-18 has been removed and there is hence no overlap anymore.
178	84468	18	4	45	4	47	For clarity, I would suggest moving the "medium confidence" to the end of the bold sentence. I also note that this paragraph overlaps with lines 16-18 above. (Michael Mastrandrea, IPCC WGII TSU)	The change has been made and the statement in lines 1--18 has been removed.
179	85154	18	4	47	4	48	Have we not more than a medium confidence in the fact that "Climate impacts on Arctic indigenous groups have been detetected and attirbuted to climate change" ? This implies that it is quite possible that no change at all has occured. This is not consistent with chapter 28, page 4, line 25 and line 35, where impacts on health, well-being and fod security are reported with hign confidence (Michel Petit, CGIET rue de Bercy)	Indeed, scientific studies provide no more than medium confidence that such changes have occurred. However, this makes it unlikely that no change at all has occurred. In addition, the vulnerability of Arctic livelihoods is high even in the absence of rigorous attribution of observed impacts (as is described by other chapters).

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
180	64935	18	4	49	4	49	I do not know what a “livelihood asset” is. (J. Graham Cogley, Trent University)	This econometric term now is no longer used in this section.
181	82814	18	4	49	4	50	The chapter team should present calibrated uncertainty language for this statement. Additionally, the chapter team could consider indicating that this statement is being made (presumably) independently from climate change. (Katharine Mach, IPCC WGII TSU)	The treatment of extreme events has been revised and a confidence statement is now given.
182	59028	18	4	49	4	52	"with a documented contribution of climate change and variability in some cases". In most cases, when term "climate change and variability" is used, researchers will understand that the "climate change" is the anthropogenic change in climate, and the "variability" is usually the natural decadal to multi-decadal climate variation. What are the authors meaning by saying so here? (Guoyu Ren) (Guoyu Ren, National Climate Center)	see response to comment 181
183	60078	18	4	49	4	52	This section refers to both "extreme climate events" and "extreme weather events". Please clarify if this difference is intentional, and, if so, what the different is. (AUSTRALIA)	see response to comment 181
184	63670	18	4	49	4	52	Confidence level is missing. (GERMANY)	see response to comment 181
185	64768	18	4	49	4	52	Suggest the authors Include a level of confidence to inform policy makers for the statement "Extreme climate events have impacted natural and physical livelihood assets, incomes, public health, and social institutions. Economic losses due to extreme weather events have increased globally, mostly due to increase in wealth and exposure, but with a documented contribution of climate change and variability in some cases." (Robert Webb, NOAA OAR ESRL)	see response to comment 181
186	60079	18	4	50	4	52	This statement seems to go against what is stated later in the chapter, e.g. section 18.4.4.1 pg 30 - 'there is limited evidence of a trend in the economic impacts of extreme weather events that is consistent with a change driven by observed anthropogenic climate change'. Provide consistency. (AUSTRALIA)	see response to comment 181
187	66853	18	4	51	3	51	I don’t know what is meant by 'exposure' here. (Peter Burt, University of Greenwich)	Exposure means that more assets are exposed to possible extreme events, implying that even in the absence of a change in extreme events themselves greater damage has occurred. Conversely, it also implies that the increase in damage cannot be taken as an indicator of a climate change induced impact.
188	84469	18	4	51	4	52	Please specify which cases are referred to here. Specific types of events, or events of a certain type with specific characteristics? (Michael Mastrandrea, IPCC WGII TSU)	Instead of adding more specifics, we have found it necessary to further reduce the statement. It now only reads "Economic losses due to extreme weather events have increased globally, mostly due to increase in wealth and exposure, with a possible influence of climate change (low confidence). [18.4.3]"
189	58298	18	4	51	4	53	For impacts of extreme events, please check results from SREX. (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	Yes, full crossferencing to SREX has been made.
190	82815	18	4	52	4	52	Which cases are meant? It would be helpful to specify this. (Katharine Mach, IPCC WGII TSU)	see response to comment 188
191	71556	18	5	1	5	5	perhaps inlcude reference to the adaptation that is taking place - and that this will shape impacts - this is mentioned later in the text. --- It may not be feasible but I am missing a tighter focus on to multiple stressors and have they interact to shape impacts. It is noted that such factors exist, but this could be strenghtened. It is important to convey that climate change alone almost never impact society - we always consider the multiple factors when assessing vulnerabilty and perhaps we have to do the same when assessing detection and attribution. (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	We have revised these paragraphs to the degree that this was possible using material from the relevant chapters. It remains our conclusion that rigorous attribution of adaptation is difficult given the current state of the literature.
192	82816	18	5	1	5	5	This paragraph should be coordinated with Chapter 13 to ensure consistency and harmonized assessment. (Katharine Mach, IPCC WGII TSU)	see response to comment 191
193	84470	18	5	1	5	5	Please clarify whether the bold finding implies that there are some cases where impacts have been detected with confidence or whether evidence is limited in all cases, as implied by the nonbold sentences. This finding and underlying chapter text also should be discussed and coordinated with Chapter 13. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 191
194	58299	18	5	3	5	3	Replace "impact of climate on" with "impact of climate change on" (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	we have changed language as suggested

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
195	66854	18	5	4	5	4	Delete comma after 'migration'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
196	78880	18	5	7	5	8	This sentence does not communicate well; "supports assessment of current conditions" - what is the result of the assessment? I think what you want to say is that observed impacts, when assessed in the RFC framework, provide evidence that some of those reasons for concern are already being realised. Rephrase? (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	The entire assessment of RFCs has been revised, taking this and other comments into account.
197	82817	18	5	7	5	8	The chapter team should consider presenting calibrated uncertainty language for this finding. (Katharine Mach, IPCC WGII TSU)	see response to comment 196
198	82818	18	5	10	5	10	It would be helpful to clarify what is meant by "risk assessment" here--in terms of impacts to date, I assume? It would seem strongly preferable to leave assessment of future risks to Chapter 19. (Katharine Mach, IPCC WGII TSU)	All discussion of risk assessment now refers to chapter 19 where it belongs
199	78023	18	5	12	0	15	is there detection and attribution there? It doesn't really come across… (Gabi Hegerl, University of Edinburgh)	see response to comment 196
200	58300	18	5	12	5	12	What is the definition of the "unique and threatened systems"? (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	We have attempted to give the shortest possible definitions, otherwise referring to previous IPCC reports and the underlying literature.
201	82819	18	5	12	5	20	For the described increases in risks, it would be helpful to clarify further that the chapter team is referring to risks "observed" to date, rather than future risks, leaving assessment of future risks to Chapter 19. (Katharine Mach, IPCC WGII TSU)	see response to comment 198
202	84474	18	5	12	5	37	It would be useful to consider the terminology used in this section, as observed impacts provide insight into risks related to each reason for concern, but risks themselves are forward-looking and thus outside the scope of this chapter--they cannot be "observed." I would suggest a clear distinction in these descriptions, focusing on observed impacts relevant to each category and what level of risks has been "realized" in each case. (Michael Mastrandrea, IPCC WGII TSU)	We have adapted the terminology to the best of our abilities.
203	77587	18	5	14	5	14	I think the authors should avoid the practice of reporting a confidence range (medium to high in this case). The interpretation could be that there is high confidence in some aspects of this statement, and only medium confidence in others, or it could be that the authors think they can differentiate more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have high confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	We certainly did not see ways to use more levels of confidence, but we have reconsidered all confidence statements and made them more specific to the systems being discussed.
204	84471	18	5	14	5	18	The paragraph on coral reefs on page 4, lines 11-14 states very high confidence, while high confidence is mentioned here in lines 14 and 18. The meaning of this difference is unclear if intended. (Michael Mastrandrea, IPCC WGII TSU)	All coral reef statements now are considered to have high confidence.
205	64936	18	5	15	5	15	I do not think you can "confirm a reason [for a concern]". This usage appears elsewhere in the chapter. It should be replaced by something like "reinforce this concern". (J. Graham Cogley, Trent University)	We agree, this was unfortunate wording in the SOD and has now been replaced by more appropriate statements.
206	82820	18	5	15	5	15	"confirm"--as in confirming risks for temperature increase realized to date? (Katharine Mach, IPCC WGII TSU)	see response to comment 205
207	78881	18	5	15	5	37	The repeated phrase "confirms reasons for concern" is unclear. Suggest rephrasing "… that some aspects of this reason for concern are already becoming reality", or something along those lines? (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	see response to comment 205
208	84472	18	5	15	5	37	As mentioned in my general comments, it is not clear what "confirm" means in lines 15, 31, and 36. Does this mean that risks to unique and threatened systems is an appropriate category in the reasons for concern, or does this imply a certain realized risk level associated with current temperatures? (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 205

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
209	74096	18	5	17	5	18	Citing coral as evidence of extreme weather events is weak justification for increases for extreme weather events as a whole. This treatment would be more robust and more consistent with previous reports and the underlying literature if it discussed droughts, floods, cyclones, extreme precipitation and other events commonly understood to be extreme weather events. In these cases, as discussed in the report, detection and attribution is far less certain. (UNITED STATES OF AMERICA)	We disagree. Coral reef dieback has been clearly attributed to high temperature events in tropical oceans and represents therefore the only case where an impact can be attributed directly to climate-change affected extreme events. We know this comes as a surprise but all other systems have significant confounders while the temperature effect on bleaching has not.
210	77588	18	5	17	5	20	Should there also be a mention of health impacts here, particularly as a consequence of extreme heat? (Francis Zwiers, Pacific Climate Impacts Consortium)	We have chosen to maintain these impacts inside the summary statement beginning with "Elsewhere…".
211	82821	18	5	18	5	18	When the chapter team refers to confirming the reason for climate-related concern, the statement should be qualified further to indicate that the statement is based on observed impacts for one very specific system. Appropriate nuance should be ensured in the key findings here. (Katharine Mach, IPCC WGII TSU)	see response to comment 205
212	59029	18	5	22	5	25	"Impact of climate change have now been documented globally, covering all continents and the ocean (high confidence)". Here do the authors mean anthropogenic climate change or the UNFCCC climate change? (Guoyu Ren) (Guoyu Ren, National Climate Center)	As was stated in the SOD and now even more prominently in the FGD, impacts treated in chapter 18 are impacts of climate change. For the few cases where this was possible, attribution to anthropogenic climate change has also been reported, but this is the exception and it is always clearly marked as such.
213	84473	18	5	22	5	25	It would be useful to consider the available information about multidimensional vulnerability (e.g., Chapter 13) relevant to this reason for concern. (Michael Mastrandrea, IPCC WGII TSU)	We do not agree, as our assessment is about impacts, not about vulnerability.
214	57655	18	5	22	5	31	Distribution of impact and aggregate impacts original referred to impacts on human welfare. Don't change a concept just so that it fits into some outline; change the outline instead. (Richard S.J. Tol, Vrije Universiteit Amsterdam)	We are not sure what is meant by "the outline" - the only outline we work with is the IPCC WG2 Plenary Approved Outline. On the specific issue here, as is explained in our "approach" section, and more fully in chapter 1, the RFC concept has evolved since the TAR; we therefore find out treatment consistent with that evolution.
215	64769	18	5	23	5	25	How does this sentence rise to the level of 'reason for concern' if "research coverage is still insufficient and too heterogeneous" to move beyond the local case studies. (Robert Webb, NOAA OAR ESRL)	The reviewer has missed the point. These statements interrogate the evidence with respect to every one of the known RFCs; for this particular one our finding is that detection and attribution does not allow to make any specific statement.
216	58912	18	5	27	5	27	Again (cf. comment above), changes in permafrost extent are much less safely known than changes in permafrost conditions (thermal state and maximum summer thaw depth) (Wilfried Haeberli, University of Zurich)	We now refer to ice volume, which we believe is a more appropriate measure.
217	82822	18	5	27	5	31	The chapter team's interpretation of aggregate impacts should be coordinated with Chapter 19. (Katharine Mach, IPCC WGII TSU)	This has been done at LAM#4 in Bled.
218	77589	18	5	28	5	28	I think the authors should avoid the practice of reporting a confidence range (medium to high in this case). The interpretation could be that there is high confidence in some aspects of this statement, and only medium confidence in others, or it could be that the authors think they can differente more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have high confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 203
219	82823	18	5	28	5	28	"limited evidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	done
220	82824	18	5	29	5	30	Care should be taken regarding the statement about economic losses, ensuring appropriate qualification and coordination with chapter 10. (Katharine Mach, IPCC WGII TSU)	This coordination has taken place very efficiently through the person of Dr Eberhard Faust who for this reason was invited to be a CA of chapter 18.
221	82825	18	5	31	5	31	"confirm"--as in confirming risks for temperature increase requested to date? This could be clarified. (Katharine Mach, IPCC WGII TSU)	see response to comment 205

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
222	82826	18	5	33	5	34	Would it be more accurate to say that risks from large-scale singularities have yet to be "realized"? "Robust evidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	We do not find "realized" clearer than "observed", and, yes, we have italicized calibrated uncertainty language.
223	74097	18	5	33	5	37	Citing corals and Arctic biota as evidence of robust evidence of this RFC is shifting the definition of this from previous assessments and the underlying literature. This should be focused on the large scale singularities such as deglaciation of Greenland and West Antarctica as well as thermohaline circulation. To use the very real changes seen in corals and the Arctic as the rationale for unique and threatened systems is legitimate and compelling. To stretch to use those same changes for risks from extreme weather events and large scale singularities reads like a stretch to change definitions to show observed increases. (UNITED STATES OF AMERICA)	We believe that our synthesis section provides appropriate arguments for the choices that appear only as summaries here. Ultimately, the disappearance of the coral reef biome, along with the major carbon cycle feedbacks it is involved in, appears to have all qualifications of a large-scale singularity. Likewise, loosing an entire marine-terrestrial coupled system, again with major feedbacks, such as is happening in the Arctic, appears to us being justified in this category.
224	82827	18	5	34	5	35	Consistency with page 3, lines 45-49, should be ensured. (Katharine Mach, IPCC WGII TSU)	Text has been revised accordingly.
225	82828	18	5	36	5	37	Again, "confirms" in what sense? (Katharine Mach, IPCC WGII TSU)	see response to comment 205
226	66855	18	5	39	5	39	Replace first 'of' with 'in the'. (Peter Burt, University of Greenwich)	done
227	84475	18	5	39	5	40	Can any broad statements be made about what regions have more or less evidence available? (Michael Mastrandrea, IPCC WGII TSU)	We felt that the Executive Summary is already longer than it should be and have chosen not to add any more information here.
228	82829	18	5	39	5	46	The chapter team should consider combining these paragraphs. (Katharine Mach, IPCC WGII TSU)	We felt that the Executive Summary is already longer than it should be and have chosen to delete the second paragraph of these two.
229	66293	18	5	39	5	52	These are the main conclusions on joint attribution, which is treated rather superficially in this chapter. It is also somewhat surprising that the only apparent attempt to seek anthropogenic attribution out of the assessed material refers to attribution of impacts of extremes, which on the face of it would appear to be one of the most difficult attribution challenges there is! The attempt is made in Figure 18-5, and doesn't really succeed due to a mis-match of events with impacts. Why couldn't something similar have been attempted for large-scale climate trends (robustly attributed to anthropogenic forcing) in concert with large-region, well established impact trends? The data should be more comprehensive for undertaking such an analysis than was the case for AR4, so has this been attempted in the literature, or should it be attempted in this assessment? (Timothy Carter, Finnish Environment Institute)	As was explained earlier, it was beyond the reach of this chapter to perform a full meta-re-analysis of the available scientific literature, which has grown exponentially since the AR4. Instead, we have based our work on the cross-chapter interaction. This has considerably broadened our topical and regional coverage, at the expense of a more formal analysis of the type that is being proposed here.
230	84477	18	5	40	5	46	The nonbold sentence in lines 40-41 overlaps with the bold sentence in lines 45-46. Consider combining these paragraphs to reduce redundancy. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 228
231	64937	18	5	41	5	42	“to improve knowledge about detection”. I do not see what timeliness has to do with this point. (J. Graham Cogley, Trent University)	In our wording, timeliness refers to the need of identifying impacts quickly, not after a long delay of collecting evidence on changed frequencies of some events.
232	82830	18	5	42	5	42	Would it be more accurate to say "impacts of extreme events" here? (Katharine Mach, IPCC WGII TSU)	Sentence has been rephrased and now reads "Research to improve the conceptual basis, timeliness and knowledge about detection and attribution is needed in particular for human systems. [18.2, 18.7]"
233	84476	18	5	42	5	42	It would be useful to add 18.1 to the line of sight here. (Michael Mastrandrea, IPCC WGII TSU)	Not 18.1, but 18.2
234	58301	18	5	44	5	44	What does "all changes in climate" means? (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	see response to comment 228
235	59030	18	5	44	5	46	A better wording. But how smaller is the number of the robust attribution studies? (Guoyu Ren) (Guoyu Ren, National Climate Center)	see response to comment 228
236	60080	18	5	44	5	46	This section should clarify the difference between the studies of 'climate change' and 'anthropogenic climate change'. (AUSTRALIA)	see response to comment 228
237	64770	18	5	44	5	46	This is a critically important point that should be elevated and inserted as the second paragraph in the executive summary on page 3, line 11 (Robert Webb, NOAA OAR ESRL)	see response to comment 228 - however the differentiation between "anthropogenic climate change impacts" and "all climate change impacts" has now been emphasised more clearly than before.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
238	78882	18	5	44	5	46	I feel this is of such importance (and the chapter otherwise so easily misinterpreted) that this statement deserves to be lifted up front and integrated into the statement on P3L6-8. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	see response to comment 237
239	66856	18	5	46	5	46	Why is 'anthropogenic' in italics? (Peter Burt, University of Greenwich)	see response to comment 228
240	84478	18	5	46	5	46	Section 18.2.1.3 could be the most relevant line of sight here. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 228
241	84479	18	5	52	5	52	This should be Box 18-2 instead of 18-1. (Michael Mastrandrea, IPCC WGII TSU)	Also this paragraph has been removed from the final Executive Summary due to space constraints.
242	66857	18	6	5	6	5	Insert comma after 'and'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
243	66858	18	6	6	6	6	Delet 'out' to remove tautology. (Peter Burt, University of Greenwich)	done
244	77590	18	6	13	6	14	The juxtaposition of words here could suggest to some that assessments are considered to be just part of the body of literature. (Francis Zwiers, Pacific Climate Impacts Consortium)	We do not quite see this problem, however the sentence has been shortened and should therefore be even less ambiguous.
245	71557	18	6	16	0	0	change a word to: coupled human - environmental systems - not natural (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	This point has been debated at length and the chapter authors have in the end concluded that "environmental systems" might not be understood correctly by many readers unfamiliar with the environmental science literature.
246	84480	18	6	19	6	20	Is this a feasible approach to informing adaptation? Can detection studies provide robust evidence at a scale directly relevant to adaptation? It would be useful to revisit its feasibility at the end of the chapter based on the material assessed. (Michael Mastrandrea, IPCC WGII TSU)	We did not see space, nor suitable material, to properly revisit this issue. We are convinced that stakeholders in need of adaptation indeed do consider the evidence of detected and attributed impacts carefully, therefore we have now addressed this issue in the first introductory paragraphs.
247	77591	18	6	20	6	20	Insert "are" at the beginning of this line. (Francis Zwiers, Pacific Climate Impacts Consortium)	correct, but this paragraph has been rewritten
248	82831	18	6	20	6	20	More nuance could be appropriate here, as a variety of types of information informed planned adaptation. (Katharine Mach, IPCC WGII TSU)	see response to comment 246
249	82832	18	6	22	6	25	It could be appropriate to acknowledge that detection and attribution is a very important component, also very importantly complemented by future-oriented risk assessment. (Katharine Mach, IPCC WGII TSU)	The linkage to the risk assessment in chapter 19 is part of our synthesis and discussed there.
250	84481	18	6	22	6	26	Although outside the scope of this chapter, it would be useful to point to assessment of future risks in Chapter 19 and many other chapters of the report as another key element of the evidence base. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 249
251	66859	18	6	25	6	26	Reference for quoted text required. (Peter Burt, University of Greenwich)	The reference has now been removed due to space limitations
252	62681	18	6	28	6	28	Is "anthropogenic climate" missing "change", i.e. should it be refered to as "anthropogenic climate change"? (RONGSHUO CAI, Third Institute of Oceanography)	correct, but this paragraph has been rewritten
253	77592	18	6	28	6	28	Insert "change" after "anthropogenic climate". (Francis Zwiers, Pacific Climate Impacts Consortium)	correct, but this paragraph has been rewritten
254	78024	18	6	29	0	33	I wonder if in this part of the text it wouldn't be useful to reiterate what you mean by climate change - it comes later but would be helpful herel, also to avoid confusion with some perceptions that equate climate change with anthropogenic climate change (Gabi Hegerl, University of Edinburgh)	While this section has been substantially rearranged and also shortened, this point should now stand out more clearly.
255	84482	18	6	31	6	32	Please clarify what is meant by "full and partial attribution" here. (Michael Mastrandrea, IPCC WGII TSU)	statement has been removed
256	74098	18	6	38	7	17	AR4 conclusions about human systems were on detection, not attribution to anthropogenic climate change. Also, "less obviously" wording (p. 7 line 7) is awkward. (UNITED STATES OF AMERICA)	Statement has been fully revised.
257	82833	18	7	1	7	1	"likely" should be italicized for clarity. (Katharine Mach, IPCC WGII TSU)	done

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
258	66860	18	7	24	7	24	Delete comma after 'impact'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
259	77593	18	7	26	7	27	This statement doesn't seem to be very clear - is it making the point that adaptation is regarded as an impact (something we are driven to do as a consequence of climate change)? If so, does this implicitly represent an assessment that there are not yet any examples of adaptation that have been undertaken in anticipation of projected climate change? However, such as assessment would be a bit off the mark, because there are examples of infrastructure, such as the Confederation Bridge connecting Prince Edward Island to the Canadian mainland, that have been built taking projections of future change into account. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have dropped this statement from the document.
260	64938	18	7	27	7	29	“Third, …”: this statement assumes silently that anthropogenic climatic change is due to agents that are well-mixed in the global atmosphere. It is true that the FCCC mentions only “greenhouse gases”, but even in this restricted set not all of the species are well-mixed. (J. Graham Cogley, Trent University)	We have edited this to note that the effects could be local, regional and global for both anthopogenic and non-anthropogenic sources of greenhouse gases.
261	59031	18	7	27	7	30	"Third,.....are typically affected by local or regional climate change, ...be difficult." "local or regional" should be replaced by "both anthropogenic and natural climate changes ", as even in larger spatial scales the natural climate change or variability can not be overlooked. (Guoyu Ren) (Guoyu Ren, National Climate Center)	We have made your suggested edit.
262	66861	18	7	29	7	29	Split infinitive: move 'best' to after 'impacts'. (Peter Burt, University of Greenwich)	We have dropped this sentence for clarity.
263	82834	18	7	37	7	37	Would it be more accurate to say "coupled" here instead of "connected"? (Katharine Mach, IPCC WGII TSU)	We have made this edit.
264	62682	18	7	37	7	42	Some suggestions for definition of "three subsystems" as the above mentioned general comments. (RONGSHUO CAI, Third Institute of Oceanography)	We are unsure which "above mentioned general comments" are referred to here.
265	60081	18	7	38	7	42	Is the terminology "natural system" useful? It seems to imply that neither climate nor humans are natural, which is confusing and incorrect. Please use a different term, or define the terms and their implications clearly. (AUSTRALIA)	Semantically, we can agree with the reviewer, however "natural" is widely being used in this sense, and we have therefore maintained it here.
266	77594	18	7	52	7	52	Given the context, it might be a bit more accurate to say "If an observed change produced by the human system impacts the climate system…" (replacing "in" with "produced by"). I think this would more clearly indicate that human decisions drive things like greenhouse gas emissions that impact the climate system. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have dropped this sentence and written a clearer statement of this in 18.2.1.1.
267	66862	18	8	8	8	8	Insert 'the' after 'across'. (Peter Burt, University of Greenwich)	We have dropped this opening sentence for manuscript length purposes and since it did not add to the substance of the chapter.
268	82835	18	8	12	8	13	"a specified baseline" instead of "normal behavior in climate change" could go further to make this definition fully consistent with usage across the volume. (Katharine Mach, IPCC WGII TSU)	We used the new glossary definition for DCCI now, which does exactly that.
269	74099	18	8	12	8	21	The definitions of detection and of attribution both refer to "climate change," without clarifying whether this refers only to anthropogenic climate change, or to any climate change (including natural variability). One can presume that the latter is intended, but it would be good to be 100% specific about this, since these are crucial definitions (UNITED STATES OF AMERICA)	We have made this clear in section 18.2.1.1 and again in a separate paragraph following the definitions.
270	82836	18	8	14	8	15	Would it be more accurate to simply say that this chapter considers observed changes for which climate change is hypothesized as a driver? (Katharine Mach, IPCC WGII TSU)	We have simplified the language to make the detection statement consistent with the DCCI deifnition. Under this definition a hypothesis is not enough. It requires a test of the hypothesis.
271	74100	18	8	15	8	15	The phrase "in not just considering any observed changes" is poorly composed and unclear. At a minimum, "in considering not just any observed changes" would be better. Even better would be "in that it does not ecompass any observed change." (UNITED STATES OF AMERICA)	We have dropped this statement completeley as it has been replaced by the new deifnition of detetcion of impacts.
272	64939	18	8	16	8	16	“stationary” is a technical term and should be either explained or avoided in an assessment for a general readership. And I am not sure that glaciers are a good example of stationary “reference” behaviour (whatever that might be; is the text trying to allude to glaciers at equilibrium with an unchanging climate, and thus exhibiting only natural variability?). (J. Graham Cogley, Trent University)	Stationary is standard term in the literature, which means that the moments of a distribution do not change through time. It involves a stochastic element.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
273	77595	18	8	16	8	16	I don't think either of these examples of "reference normal" behaviour are particularly good. I'm not an economist, and I'm not sure that the economics community would know how to describe a normal state of economic activity (an economist would have to weigh in on that; it would be hazardous for the chapter to offer this as an example unless economics lies well within the expertise of one of its authors). I am also not an expert on glaciers, but my understanding is that the current widespread retreat is occuring against a backdrop of long-term retreat that predates the modern industrial era. See, for example, 4.3.3.1, WG1 AR5. This again begs the question, what would be considered to be reference normal behaviour for such systems during the past 150 years (ie, in the absence of anthropogenic forcing)? Simple stationarity is probably not the right answer. (Francis Zwiers, Pacific Climate Impacts Consortium)	The person who wrote this is an economist (Auffhammer). Stationary is standard term in the literature, which means that the moments of a distribution do not change through time. If GDP has a trend (which it has since the industrial revolution) then it is non-stationary. I have replace economic avtivity with gross world product.
274	64771	18	8	25	8	29	This is a very important foundational statement for the chapter that is unfortunately ignored in much of the following analysis and findings. (Robert Webb, NOAA OAR ESRL)	No suggested changes in this comment. We note your concern.
275	77596	18	8	26	8	26	I'm not sure that this problem is particular to time series analysis, so I would suggest replacing "It is a particular problem" with "For example, this can be a problem". (Francis Zwiers, Pacific Climate Impacts Consortium)	We have dropped this sentence.
276	76953	18	8	28	8	28	Sentence should not begin with "This" -- ambiguous referent (Marc Levy, Columbia University)	We have replaced "This" with "The above"
277	78025	18	8	34	0	0	Would this be a useful place to say that this concern doesn't apply to process models where the model is tuned to something other than climate change (Gabi Hegerl, University of Edinburgh)	We have dropped this paragraph and replaced it with a reference to Stone et al. 2013, which discusses these issues in detail.
278	82837	18	8	36	8	39	Could citations be provided with relevant examples? (Katharine Mach, IPCC WGII TSU)	We have dropped this paragraph for space reasons. This is discussed in Stone et al. 2013.
279	84483	18	8	36	8	39	Are there examples of these studies in the literature that should be cited here? (Michael Mastrandrea, IPCC WGII TSU)	We have dropped this paragraph for space reasons. This is discussed in Stone et al. 2013.
280	66863	18	8	38	8	38	Insert comma after 'but'. (Peter Burt, University of Greenwich)	We have dropped this sentence for space reasons.
281	66181	18	8	48	0	0	Jessica et al (2013) empirically tested the space-for-time assumption by constructing orthogonal datasets of compositional turnover of plant taxa and climatic dissimilarity through time and across space from Late Quaternary pollen records in eastern North America, then modeling climate driven compositional turnover. Predictions relying on space-for-time substitution were ~72% as accurate as "time-for-time" predictions. (Jessica L. Blois, John W. Williams, Matthew C. Fitzpatrick, Stephen T. Jackson, and Simon Ferrier. Space can substitute for time in predicting climate-change effects on biodiversity, 2013. www.pnas.org/cgi/doi/10.1073/pnas.1220228110) (International Centre for Integrated Mountain Development (ICIMOD))	The text is about estimating the sensitivity, not predictive ability. We note the references, but have not included them I the chapter.
282	84484	18	9	1	0	0	Box 18-1: Given the widespread usage of "climate sensitivity" as shorthand for "equilibrium climate sensitivity" in a specific physical science sense, I would recommend using "sensitivity to climate change" or another alternative to avoid confusion. (Michael Mastrandrea, IPCC WGII TSU)	We have changed this to "sensitivity to climate", which is what we mean and is different from "sensitivity to climate change".
283	77597	18	9	3	9	3	Some readers will be confused by this title because they will understand "climate sensitivity" to be the sensitivity of the climate to, for example, CO2 doubling. In particular, the "equilibrium climate sensitivity" (the eventual warming that would occur if CO2 were doubled and then held constant) is a standard metric of the potential for warming that is extensively used (and abused) in the policy community. Climate sensitivity here refers not to the sensitivity of the climate, but rather, to the sensitivity of a system to climate change. So it seems to me that "system sensitivity" [to climate change] would provide a clearer description of what is discussed in this box. Would it be possible to change the title so that it reflects the thing that is sensitive (e.g., human systems) rather than the agent that produces the sensitivity (climate change in this case). (Francis Zwiers, Pacific Climate Impacts Consortium)	We have changed this to "sensitivity to climate", which is what we mean and is different from "sensitivity to climate change".
284	79005	18	9	3	9	3	Suggest changing "Climate sensitivity" which has a specific "WG1-type" meaning to "Sensitivity to Climate" (as is used in line 5). (Richard Jones, Met Office Hadley Centre)	We have made this change.
285	82838	18	9	3	9	3	Wording here should be clarified to ensure that the reader does not interpret "climate sensitivity" as "equilibrium climate sensitivity." (Katharine Mach, IPCC WGII TSU)	We have changed this to "sensitivity to climate", which is what we mean and is different from "sensitivity to climate change".
286	60082	18	9	3	9	27	The term 'climate sensitivity' is used in this box inconsistently with the glossary definition. (AUSTRALIA)	We have changed this to "sensitivity to climate", which is what we mean and is different from "sensitivity to climate change".
287	74101	18	9	11	9	11	This should be Mann and Emanuel (2006). Also the reference has errors. (UNITED STATES OF AMERICA)	We have changed the reference and moved thisbox into the human systems section.
288	76954	18	9	12	9	12	Do you mean the LACK OF a long observational weather time series? (Marc Levy, Columbia University)	Yes we do. We have changed this.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
289	77598	18	9	18	9	18	I don't think there is consensus on a hot summer being a "weather event". Most meteorological services would consider a forecast of seasonal mean conditions (for the next season) as a climate forecast, not a weather forecast, since they would be forecasting not individual weather events, but rather, seasonal mean conditions. The community that studies weather and climate extremes makes a similar kind of distinction. See for example Karl et al., 2008 (CCSP, 2008: Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Thomas R. Karl, Gerald A. Meehl, Christopher D. Miller, Susan J. Hassol, Anne M. Waple, and William L. Murray (eds.)]. Department of Commerce, NOAA's National Climatic Data Center, Washington, D.C., USA, 164 pp.) (Francis Zwiers, Pacific Climate Impacts Consortium)	The labeling of a hot summer as a climate event or weather event is not consistent across fields. For instance in many event attribution studies this sort of event is labeled a weather event. For the sake of the argument in this box, we have chosen to stick with weather in order to be clear that we are not talking about a long-term trend "event".
290	66864	18	9	20	9	20	versus' should be in italics. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
291	84485	18	9	23	9	27	An example would help clarify the point being made here. (Michael Mastrandrea, IPCC WGII TSU)	We have added a discussion of Schlenker et al. 2005
292	64940	18	9	24	9	24	I do not understand "an observed measure of climate under climate change". Does it mean "observations of the changing climate"? If so, "measures of observed climate" at L26 could become "climate observations". (J. Graham Cogley, Trent University)	We have made the suggested change
293	66865	18	9	25	9	25	'via' should be in italics. (Peter Burt, University of Greenwich)	We have dropped this sentence and replaced it with an example.
294	74102	18	9	26	9	27	This is confusing text on its own. Please give an example of what is meant. (UNITED STATES OF AMERICA)	We have dropped this sentence and replaced it with an example.
295	77599	18	9	34	9	35	It's not clear how Table 18-1 suppors this statement. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have dropped this entire paragraph for space reasons.
296	64772	18	9	36	9	39	The first approach to attribution of impacts to climate change is not robust for the reasons present in this chapter on page 8, lines 25-29, and thus insufficient for an IPCC assessment for inform policy makers. (Robert Webb, NOAA OAR ESRL)	We have dropped this paragraph from the chapter.
297	64773	18	9	40	9	43	The Parmesan et al 2011 paper make a very powerful statement that "The biological world is responding rapidly to a changing climate, but attempts to attribute individual impacts to rising greenhouse gases are ill-advised." that the IPCC should embrace. This second approach to attribution of impacts to climate change is robust and describe the analysis process to produce valuable information on the impacts of local to regional changes in climate that can be communicated to decision makers. (Robert Webb, NOAA OAR ESRL)	We note this comment but derive no need for change of our text from it.
298	82839	18	9	42	9	42	Would it be helpful to specify further that the complexity of the causal chain is especially relevant in coupled human-natural systems? (Katharine Mach, IPCC WGII TSU)	We have added this to the sentence in the rewritten paragraph.
299	84486	18	9	45	9	54	A difference as depicted in Figure 18-2 is that climate observations do not come directly into the single-step approach, although ostensibly the climate model used has already been compared against observations to a certain extent. It would be worth mentioning this point in the discussion here. (Michael Mastrandrea, IPCC WGII TSU)	Correct. Considering that the single-step/multi-step distinction featured infrequently in our chapter assessments, however, we have now removed this discussion entirely.
300	64941	18	9	47	9	49	This sentence is unclear to me, perhaps because it does not mention the fundamental fact that the model(s) must be run with and without the forcing that is of interest. The test for attribution is which among the model runs best match the observations. (J. Graham Cogley, Trent University)	see response to comment 299

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
301	64774	18	10	10	10	13	This Rosensweig (2008) approach is problematic. In contrast, the approach used and described in AR5 WG2 Chapter 4 is highly defensible vast improvement because it documents connections of impacts to changes in regional to local climate (both natural variability and anthropogenic climate change) and will only go further (given the challenges in making causal linkages between observed regional to local changes in climate conditions and anthropogenic climate change) when there is robust detection and attribution of the regional to local climate conditions. Using this approach, valuable information on the impacts of local to regional changes in climate can be communicated to decision makers without waiting for the robust detection and attribution of local to to regional climate change that may be forthcoming as the science advances and/or time series of observations become sufficiently long to detect local to regional trends that can be demonstrated to be the result of anthropogenic global climate change. Suggest the Chapter 18 authors embrace and promote the approach used in AR5 WG2 Chapter 4 to climate change impact detection and attribution rather than a pattern matching approach that ignores the critical role causality and can lead to erroneous conclusions as pointed out two pages earlier in this chapter on page 8. (Robert Webb, NOAA OAR ESRL)	Ch4 provides a comprehensive discription of confounding factor for terrestrial ES, and their approach is concepturally identical to ours.
302	66182	18	10	13	0	0	Simliarly Drought-Induced Reduction in Global Terrestrial Net Primary Production during (2002-2009) was reported by Zhao and Running(2010). Maosheng Zhao and Steven W. Running, 2010. Drought-Induced Reduction in Global Terrestrial Net Primary Production from 2000 through 2009. Science 20 August 2010 VOL 329 (International Centre for Integrated Mountain Development (ICIMOD))	Noted. We only used one citation as an example here.
303	78026	18	10	17	0	37	Very interesting box - would it be useful to discuss confounders here though? Some large scale confounders could be conceivable (maybe habitat loss for extinctions or something like it) that could cause similar spatial associations? (Gabi Hegerl, University of Edinburgh)	We have dropped this box for space reasons.
304	66866	18	10	19	10	19	Mismatch of singular and plural tenses: change 'are' to 'is'. (Peter Burt, University of Greenwich)	see response to comment 303
305	64775	18	10	19	10	22	The problem with using associative or regression rather identifying causal linkages is that one can produce a result of detected and attributed anthropogenic climate change impact in a location where there is no detected and attributed anthropogenic climate change. For example, if multidecadal climate variability produces an observed regional change in climate that is similar to the expected change due to anthropogenic climate change, the observed climate impact can be incorrectly attributed to anthropogenic climate change or can be grossly overestimated and unfortunately lead to erroneous conclusions as pointed out two pages earlier in this chapter on page 8. (Robert Webb, NOAA OAR ESRL)	see response to comment 303
306	60421	18	10	26	0	0	Is this the same Chen et al. 2011 as in line 21? There are 2 Chen et al 2011's in the references, but with different Chen's. (David Parker, Met Office Hadley Centre)	see response to comment 303
307	77600	18	10	26	10	27	I agree that synthesis across multiple species can do this - but don't we still need to be convinced that they are not all being affected by a common set of confounders to actually increase confidence? Perhaps the subsequent text can add that confidence is increased when it is evident that the species/ecosystems and locations are not all affected by a small number of common confounding influences (e.g., development pressure). (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 303
308	66867	18	10	34	10	34	Use of etc is imprecise and tells the reader nothing. Please give all relevant examples (or use 'for instance'). (Peter Burt, University of Greenwich)	see response to comment 303
309	66868	18	10	34	10	34	'a priori' should be in italics. (Peter Burt, University of Greenwich)	see response to comment 303
310	71558	18	10	50	0	0	---- upwards should be specified -- increasing altitude or something like that. (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	We have changed this to "higher ground".
311	61965	18	11	9	0	0	Presumably risks of publication bias have been considered for AR5 as well? (Matthew Bunce, Institute of Marine Engineering, Science and Technology)	We discuss that later in this section. The material and techniques for a formal treatment are not available, so rather we qualitatively consider consistency and comprehensiveness across studies.
312	78027	18	11	9	0	10	I am not sure it is possible to separate by timescale, as at least climate varies on all timescales - I don't think its necessary to assume that either. This might be a better place to discuss that a longer timescale (longer records) allows better understanding of variability and if its only determining that recent changes are unusual compared to a time horizon, and the signal-to-noise ratio is higher for longer term changes (Gabi Hegerl, University of Edinburgh)	Section has now bee removed due to space limitations
313	66869	18	11	9	11	9	Delete 'time'. The use of the word here is tautologous, as 'time' is a 'period'. (Peter Burt, University of Greenwich)	language has been changed

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
314	66183	18	11	14	0	0	Spatially consistent and high temporal satellite datasets are also found useful to certain extent.Recent datasets on continuous satellite-derived global record of land surface evapotranspiration from 1983 to 2006 revealed changing patterns and impact of soil moisture stress(Zhang et al,2010). (Ke Zhang, John S. Kimball, Ramakrishna R. Nemani and Steven W. Running, 2010. A continuous satellite-derived global record of land surface evapotranspiration from 1983 to 2006 WATER RESOURCES RESEARCH, VOL. 46, W09522, doi:10.1029/2009WR008800, 2010) (International Centre for Integrated Mountain Development (ICIMOD))	This is useful feedback, yet this suggestion does not match the content of our chapter
315	77601	18	11	16	11	20	It would be useful to say something about the additivity or non-additivity of responses to different drivers. In the physical climate system, the assumption that the perturbations caused by external forcing on the system from different sources (GHGs, aerosols, etc.) add linearly has generally held up quite well, enabling a particular analytic approach that has been very successful. That concept is obviously much more difficult, if not impossible, to extend to the detection and attribution of the causes of observed changes in impacted systems, with the result that paradigms should not be expected to carry over easily. (Francis Zwiers, Pacific Climate Impacts Consortium)	Correct. We now mention how the processes by which climate change affect a system can be quite non-linear, including for instance threshold responses.
316	78028	18	11	24	0	26	This is an excellent place to link to WG1, and the finding that attributing regional climate changes to external drivers is difficult due to larger variability on regional scales, and due to impact of poorly constrained local other forcings such as land use change - you cite a paper, but in addition it would be good to backrefer to WG1 ch10 (can provide a section if needed) (Gabi Hegerl, University of Edinburgh)	see response to comment 312
317	64942	18	11	24	11	26	A strictly correct statement, but it omits anthropogenic drivers that are not globally well-mixed. (See comment at P7 L27-29.) (J. Graham Cogley, Trent University)	We have made this point and added your language.
318	74103	18	11	29	11	40	A discussion of publication bias is a welcome inclusion in this chapter but not effectively addressed by this paragraph. How have the methods for detecting and correcting publication bias in formal quantitative synthesis analysis (Rothstein et al. 2005) been applied to AR5 Chapter 18 or elsewhere in the AR5? How is the availability of information from the phenological monitoring network in the area of flowering, leafing and fruiting plants relevant to the broader literature incorporated into Chapter 18 and throughout the AR5? As noted in the text on Page 6, Lines 19-20, publication bias is readily apparent in that negative results are frequently not reported, and conclusions based on geographic areas with large volumes of observations, such as the North Atlantic, are incorrectly generalized to other parts of the globe (see also comments Chapter 18, Start Page Number, 4, Start Line Number, 35, End Page Number, 4, End Line Number, 40). If systematic steps have been taken to correct for publication bias in Chapter 18 and/or other Chapters of the AR5, this would be the place to so state, and if not, that should be so stated here. (UNITED STATES OF AMERICA)	We have added language at the end of this paragraph acknowledging this point.
319	63425	18	11	31	11	40	Publication bias, refer to availability os mostly greay literature?, It is not clear for me the context of this paragraph (Jose Marengo, CCST INPE)	No. It refers to papers that do not get written, submitted and/or published due to negative results.
320	66870	18	11	38	11	38	Delete comma after 'flowering'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
321	77602	18	11	45	11	46	Give references to these other chapters, or indicate where the references can be found (maybe in Rosenzweig et al?). (Francis Zwiers, Pacific Climate Impacts Consortium)	We have reverted this decision, removed the sentence here and now aim to directly reference all key sources directly in our chapter.
322	66294	18	11	46	11	49	If I understand correctly, this paragraph shifts much of the burden of literature review and analysis to the thematic chapters plus chapter 30 (with a similar statement on page 35 for regional chapters). This is a reasonable and pragmatic approach, but it does place quite some reliance on the quality of the assessment in these other chapters, some of which may not include detection/attribution experts on their author teams. How has this been cross-checked? Furthermore, should reviewers understand to look for details on D/A literature in the core chapters or in this chapter? (Timothy Carter, Finnish Environment Institute)	see response to comment 11
323	66871	18	11	48	11	48	Capital 'C' required for 'chapter' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
324	79006	18	11	48	11	48	Please give chapter names not just numbers. (Richard Jones, Met Office Hadley Centre)	We do not follow this recommendation in order to save space - we believe that these chapters are very quickly identifiable through the table of contents.
325	71559	18	11	49	0	0	not sure what methodlogical framework this is referring to. Please clarify. (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	we have deleted this part of the sentence as it was meaningless.
326	61452	18	11	49	11	49	What is the "methodological framework with these chapters" and where is it explained? (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	see response to comment 325
327	77603	18	11	49	11	49	I'm not sure what this means - do you mean that the chapters share a common methodological framework? If so, where is that introduced? (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 325
328	79007	18	11	49	11	49	What is the "methodological framework with these chapters" and where is it explained? (Richard Jones, Met Office Hadley Centre)	see response to comment 325
329	64943	18	12	3	12	4	Are there any islands on which the hydrological cycle is not affected by climate change? And is it necessary to say the effects differ from region to region? I would say just “by climate change everywhere.” (J. Graham Cogley, Trent University)	We carefully considered this comment and eventually reworded in: all continents and many islands, with different characteristics of change in different regions
330	60083	18	12	4	12	4	Please remove "on all continents and probably most islands". (AUSTRALIA)	We carefully considered this comment and eventually reworded in: all continents and many islands, with different characteristics of change in different regions
331	66872	18	12	5	11	6	Capital 'C' required for 'chapter' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
332	65148	18	12	5	12	5	The word "their" be removed or if at all required be changed by the word "its". (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	language has been changed
333	65149	18	12	6	12	6	The word "their" be removed or if at all required be changed by the word "its". (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	language has been changed
334	64944	18	12	9	12	9	Figure 18-3 seems broadly consistent with the corresponding elements of the figure accompanying Table 3-1. (J. Graham Cogley, Trent University)	Yes, thank you.
335	66873	18	12	15	11	15	Capital 'S' required for 'section' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
336	66874	18	12	17	11	21	Use of 'Ch' as an abbreviotion is a style change. Also, these are not chapters, they are sections (Sections!). I suggest either replacing 'ch' with 'Section' or leaving just the numbers, as is done elsewhere and the meaning is clear. (Peter Burt, University of Greenwich)	It is changed into Chapter and is an issue that is handled consistently across this chapter and report.
337	80413	18	12	25	13	45	Please consider to use calibrated language, since some changes have been assigned medium confidence only (WGI D&A of streamflow changes); Section 18.3.1.2 should also refer to WGI which is currently not the case. (Gian-Kasper Plattner, IPCC WGI TSU)	references to WGI, chapters 10 and 12 WGII chapter 3 have now been included
338	64945	18	12	27	12	28	“The regional surface water balance …”. Water use is not necessarily a loss term in the water balance. Some irrigation water may return to streams, as may some water drawn off for municipal and industrial uses. I would say “groundwater discharge/recharge” rather than the less explicit “inflow/outflow”. (J. Graham Cogley, Trent University)	We now say "The regional water balance is the net result of gains (precipitation, ice and snow melt, river inflow and groundwater recharge) and losses (evapotranspiration, water use and river outflow and groundwater discharge)".
339	59032	18	12	29	12	31	Total and direct solar irradiative received on surface are more important than temperature for evapotranspiration, and they should be included as a major factor (Gao et al., 2007: Gao, G., D.L. Chen, G.Y. Ren, Y. Chen, Y.M. Liao. 2006. Spatial and temporal variations and controlling factors of potential evapotranspiration in China: 1956-2000, Journal of Geographical Sciences 16, (1), 3-12)) (Guoyu Ren) (Guoyu Ren, National Climate Center)	We now say "Evapotranspiration, being a function of solar radiation, surface temperature, vegetation cover, soil moisture and wind, is affected by the changing climate, but also by changing vegetation processes and land cover."
340	60084	18	12	30	12	31	Please provide references for the information on evapotranspiration. (AUSTRALIA)	This is a general introductory paragraph that in our opinion needs no references. In the next paragraph is more specific and links to WGI, Chapter 10.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
341	79008	18	12	30	12	31	The CO2 effect on water use by vegetation should be mentioned here. (Richard Jones, Met Office Hadley Centre)	We have considered this but decided not do this in order to save space.
342	84487	18	12	33	12	38	Please cite specific sections of the WGI chapters referenced here. (Michael Mastrandrea, IPCC WGII TSU)	We now say "Change in river flow is a direct indicator of a changing regional water balance. Globally, about one-third of the top 200 rivers (ranked by river flow) show statistically significant trends during 1948–2004, with the rivers having downward trends (45) outnumbering those with upward trends (19) (Dai et al., 2009). More recent studies (Dai, 2011, WGI AR5 Chapter 12.5.5.8.2) suggest that regional reductions in precipitation in southwestern South America are primarily due to internal variability. River floods defined as impacts caused by the overtopping of river banks and levées have shown statistically significant increasing and decreasing trends in some regions. However, these may actually reflect internal climate variability and be affected by other counfounding factors such as human alteration of river channels and land use (3.2.7). "
343	78029	18	12	34	0	0	WG1 has 'medium condidence' in attribution of pcp changes (Gabi Hegerl, University of Edinburgh)	They also have that for extreme precipitation. WGI, AR5, Chapter 10, 10.6.1.2. Reference included.
344	82840	18	12	34	12	34	"medium confidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	done
345	77604	18	12	36	12	36	Regarding observed trends in extreme precipitation, perhaps it would also be appropriate to cite Westra et al., 2013, who survey trends in extreme precipitation at precipitation gauge stations across the globe. They find statitically significant upward trends at significantly more locations that would be expected by random chance and estimate a global sensitity in observed precipitation extremes to global mean temperature change that corresponds well to the Clausius-Clapeyron relation. Westra, S., L.V. Alexander, F.W. Zwiers, 2013: Global increasing trends in annual maximum daily precipitation. Journal of Climate, doi:10.1175/JCLI-D-12-00502.1. (Francis Zwiers, Pacific Climate Impacts Consortium)	included Westra et al 2013
346	78030	18	12	37	0	38	is there a likelyhood or confidence level? (Gabi Hegerl, University of Edinburgh)	see response to 342
347	84488	18	12	37	12	38	Does human influence here refer to anthropogenic climate change or other human activities like land use change? Please clarify. (Michael Mastrandrea, IPCC WGII TSU)	see new text in response to 342
348	74104	18	12	40	0	51	Concerning the trends in river flow and the differing definitions of "detection" and "climate change" used in the chapter, we checked on the Dai et al. 2009 reference and think it qualifies as a climate change detection under the lower bar generally used in this chapter, but not the higher bar used in WG I, Ch. 10. In other words, it's not convincing in terms of being a change that's unusual compared with natural climate variability (including internal variability). (UNITED STATES OF AMERICA)	see new text in response to 342
349	77605	18	12	41	12	42	I assume that the counts (45 and 19) refer to statistically significant trends, since all calculated trend coefficients are virtually certain not to be exactly zero, indicating that the observations have trends everywhere (this is just a description of what is seen in the obs - if you fit a straight line it will have some kind of slope, although the slope might not be statistical significant). (Francis Zwiers, Pacific Climate Impacts Consortium)	The reference relates to statistically significant trends
350	64776	18	12	42	12	44	As noted in Chapter 12 of IPCC AR5 WG1 the work cited here is no longer the most current and more recent studies (Dai, 2011; Hoerling et al., 2010; Seager and Vecchi, 2010; Seager and Naik, 2012) suggest that regional reductions in precipitation are primarily due to internal variability and the anthropogenic forced trends remain currently weak compared to those caused by internal variability within the climate system." (Robert Webb, NOAA OAR ESRL)	see response to comment 342
351	66875	18	12	43	11	43	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	ok
352	78031	18	12	44	0	0	might be useful to mention that Barnett et al. is analyzing temperature related changes in streamflow only (they controlled for pcp related changes as they didn't trust them) (Gabi Hegerl, University of Edinburgh)	Text has removed due to space limitations

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
353	60085	18	12	45	12	46	What has happened since 2000? It is unclear whether there was a negetive streamflow post 2000, or the study simply only looked at data up to 2000. (AUSTRALIA)	this study looked up to 2000; text removed due page count limitations
354	59033	18	12	47	12	49	For the Yellow River and other large rivers of China, there are a few of important publications, and they should be cited. These studies show, for example, that changes in key climatic variables relative to catchments water balance have occurred, and some of the trends are statistically significant and they have exerted obvious impacts on water resources on the catchments. It is still difficult at present, however, to make a robust attribution of the observed hydro-climatic changes to anthropogenic climate change (e.g. Qin, D. H., Ding, Y. H. and Su, J. L. (eds). 2005. Changes of Climate and Environment in China (Vol. 1), Beijing: Science Press (in Chinese); Ren, G.Y. (ed.). 2007. Climate Change and Water Resources in China, Beijing: China Meteorological Press. pp314 (in Chinese); Zhang, J.Y., G.Q. Wang (eds). Studies of Climate Change Impact on Water Resources. Beijing: Science Press. pp214 (in Chinese); Ren G.Y., H.B. Liu, Z.Y. Chu, et al. 2011. Climate change over eastern China and implications for South-North Water Diversion Project, Journal of Hydrometeorology, 12 (8): 600-617. DOI: 10.1175/2011JHM1321.1). (Guoyu Ren) (Guoyu Ren, National Climate Center)	we are removing specific regional examples for shortness, chapter 24 has the details
355	64946	18	12	48	12	51	The Amazon and La Plata basins are not very good examples of monsoon systems. (J. Graham Cogley, Trent University)	Recentl references include the South American Monsoon System as a relevant case. Anyway, text removed due to page count limitations
356	63426	18	12	51	12	51	Please refer to the Soth American Monsoon egion and not Amazon (Jose Marengo, CCST INPE)	Text removed due to page count limitations
357	63428	18	13	1	13	45	No metion to the droughts of Amazonia in 2005, 2010, and northeast Brazil in 2012, and to floods in Amazonia in 2009 and 2012. They impacted heavily in those regions, and references can be found in the Chapter 27 of WG2, plus Marengo et al (2013) listed in the reference section in Chapter 18, that has been accepted for publication. (Jose Marengo, CCST INPE)	we are removing specific regional examples for shortness, chapter 27 has the details
358	80446	18	13	3	0	8	I consider that the floods didn´t increase in the recent decades but it has been urnabizated in flooding areas. (Jonathan Gómez Cantero, Universidad de Alicante)	introductory paragraph rewritten: "River floods defined as impacts caused by the overtopping of river banks and levées have shown statistically significant increasing and decreasing trends in many regions. However, these may actually reflect internal climate variability and be affected by other counfounding factors such as human alteration of river channels and land use. "
359	82841	18	13	3	13	3	I think it might be clearer to say something like, "River floods, defined as..." (Katharine Mach, IPCC WGII TSU)	ok
360	64947	18	13	3	13	5	Delete “impact-relevant”. The definition specifies that any overtopping is a flood. (J. Graham Cogley, Trent University)	ok
361	66876	18	13	3	13	5	Do you mean globally or in various locations (ie all floods have increased in magnitude and frequency, or only some)? (Peter Burt, University of Greenwich)	introductory paragraph rewritten
362	69439	18	13	3	13	8	Please reconsider this paragraph. The statement in line 3 and 4 seems somewhat inconsistent with the rest of the paragraphs. The first statement infer the increase in the magnitude and frequency of the floods but in the next line questions that instrumental records of impact of this floods. And finally, it is referred that there is medium confidence level in global detection of flood which seems inconsistent with the first line which suggest rise in frequency and magnitude of floods. (NETHERLANDS)	see response to comment 361
363	78884	18	13	3	18	8	Unless the authors can provide a robust set of citations for the global increase in floods I don't believe the global statement is appropriate, even with a low confidence rating. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	see response to comment 361
364	64948	18	13	6	13	6	“highest annual discharge”. This instance of “flood” has a meaning different from that given at L3. (J. Graham Cogley, Trent University)	see response to comment 361
365	60086	18	13	6	13	8	Please specify whether the detection of changes in floods is climate change specific, or general changes, possibly due to other factors. The former is assumed. (AUSTRALIA)	see response to comment 361

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
366	77606	18	13	7	13	7	I think the authors should avoid the practice of reporting a confidence range (low to medium in this case). The interpretation could be that there is medium confidence in some aspects of this statement, and only low confidence in others, or it could be that the authors think they can differentiate more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have medium confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 361
367	74105	18	13	7	13	8	It's not clear where this "low to medium confidence in global detection of a change in floods" comes from. Does the text mean that flood changes are unusual compared to natural variability and internal climate variability (strong definition) or only that some statistically significant trends have been found for some flow measures, and these may actually reflect just internal climate variability (weaker definition). If it's the weaker definition you are using, OK. But if you are assuming the stronger definition, the references provided don't really make the case. In any case, you need to be explicit about what definition of detection is being used here. The low to medium claim is clearly stronger than that made in SREX, and without any clear justification, unless its because you've lowered the bar for detection. From Table 18.11a there seems to be distinction between inland and coastal flooding. If its just coastal flooding that is referred to by low to medium here, that should be clearly spelled out. (UNITED STATES OF AMERICA)	see response to comment 361
368	84489	18	13	7	13	8	Is there a specific reason why the range of low to medium confidence is given here, as opposed to one or the other? Please clarify (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 361
369	66877	18	13	8	13	8	The conclusion here is not borne out by the opening statement of the section on line 3. Please check. Do you mean there is only low to medium confidence in detecting floods due to climate change? (Peter Burt, University of Greenwich)	see response to comment 361
370	80447	18	13	10	0	11	No only the Central Europe has been affected by heavy rains and pluvial floods in the last years, also a lot of countries in the South region as Spain. (Olcina Cantos, 2010) (Jonathan Gómez Cantero, Universidad de Alicante)	We have removed "Central"
371	77607	18	13	10	13	10	Replace "increase" with "increases". What is a "supposable consequence"? This sounds like a consequence that is not observed, but that logic dictates that you might speculate about. In my view, it would be best not to speculate. (Francis Zwiers, Pacific Climate Impacts Consortium)	Corrected. Removed "supposable consequence for pluvial floods"
372	77468	18	13	10	13	14	Add: "The review on the world-wide impacts of climate change on rainfall extremes and urban drainage by Willems et al. (2012) has shown that typical increases in rainfall intensities at small urban hydrology scales range between 10% and 60% from historical control periods in the recent past (typically 1961-1990) up to 2100. These climate change impacts on extreme short-duration rainfall events may have significant impacts in terms of surcharge of urban drainage systems and pluvial flooding. Results so far indicate more problems with sewer surcharging, sewer flooding and more frequent CSO spills. o Extreme rainfall changes in the range 10-60% may lead to changes in flood and CSO frequencies and volumes in the range 0-400% depending on the system characteristics. This is because floods and overflows are due to exceedance of runoff or sewer flow thresholds and react to rainfall (changes) in a highly non-linear way (Willems et al., 2012). Ref: Willems, P., Olsson, J., Arnbjerg-Nielsen, K., Beecham, S., Pathirana, A., Bülow Gregersen, I., Madsen, H., Nguyen, V-T-V. (2012), 'Impacts of climate change on rainfall extremes and urban drainage', IWA Publishing, 252p., Paperback Print ISBN 9781780401256; Ebook ISBN 9781780401263 (Patrick Willems, KU Leuven)	Due to page count limitations this text has not been included. Refer to Chapter 3 for more details.
373	64949	18	13	13	13	13	This is obscure. "detectable" is an unfortunate word to use in a sentence discussing attribution, and I cannot reconcile the 20% increase of flood risk with Figure 3-1 (which is based on Figure 4 of Pall et al. 2011). Should it be 200%, near to the mode of the Pall aggregate distribution? (J. Graham Cogley, Trent University)	What Pall et al 2011 say is: "the increase in risk of occurrence of floods in England and Wales in autumn 2000 that is attributable to twentieth-century anthropogenic greenhouse gas emissions is very likely (nine out of ten cases) to be more than 20%." We had to shorten this statement considerably and it is now reading: In the UK, flood risk has increased due to anthropogenic forcing for events comparable to the 2000 "
374	77608	18	13	13	13	13	Suggest replacing "is detectable for a 20%..." with "resulted in a 20% …". The latter formulation states the attribution that is intended more directly. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 373
375	79009	18	13	13	13	13	This is unclear. What is a 20% increase in risk of an event that happened? Please rephrase/clarify. (Richard Jones, Met Office Hadley Centre)	see response to comment 373

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
376	66048	18	13	14	13	14	In the case of Mediterranean countries, a certain increase of minor floods (mainly flash-floods) have been found, mainly as a consequence of changes of hydrological conditions (i.e. uses of soil) and an increasing exposure and vulenrability in flood-prone areas, usually located near the coast. See as reference: Llasat, M. C., Llasat-Botija, M., Petrucci, O., Pasqua, A. A., Rosselló, J., Vinet, F., Boissier, L., 2013. Towards a database on societal impact of Mediterranean floods in the framework of the HYMEX project. Nat. Hazards Earth Syst. Sci., 13, 1–14, 2013. www.nat-hazards-earth-syst-sci.net/13/1/2013/ doi:10.5194/nhess-13-1-2013; (Maria-Carmen Llasat, University of Barcelona)	The new reference and text could not be included due to space limitations - we refer to chapter 3 for details
377	78032	18	13	16	0	24	explicitly give link to glacier melt - also where is the detection attribution here? The topic returns on the next page. (Gabi Hegerl, University of Edinburgh)	The link is provided and the corresponding section from the cryosphere section is moved to here to avoid mentioning the same issue twice. There is a detection statement regarding observed changes in lake number and area.
378	60087	18	13	18	13	18	Please remove 'anywhere in the world'. (AUSTRALIA)	ok
379	60422	18	13	20	0	0	The trends in lake cover were negative in the Hindu Kush and Karakorum but positive further east. (David Parker, Met Office Hadley Centre)	This has been corrected
380	66878	18	13	21	13	21	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
381	58913	18	13	22	13	22	A statement should be added pointing to the increasing long-term risk of floods from impact waves in new lakes triggered by rock avalanches released in glacier de-buttressed mountain flanks or in steep slopes withwith degrading permafrost (cf. Haeberli, W. (2013): Mountain permafrost — research frontiers and a special long-term challenge. Cold Regions Science and Technology. http://dx.doi.org/10.1016/j.coldregions.2013.02.004). This development relates to an important integrated aspect of climate change. (Wilfried Haeberli, University of Zurich)	We include such a statement in the section on landslides and avalanches.
382	77609	18	13	22	13	22	Replace "these lakes" with "glacial lakes" for clarity. (Francis Zwiers, Pacific Climate Impacts Consortium)	ok
383	60088	18	13	22	13	23	Please provide the degree of certainty, or references, for the claim of increased liklihood of GLOFs. (AUSTRALIA)	statement has been removed
384	64950	18	13	25	13	25	I cannot work out what a “more intense” drought might be, unless the sentence is about agricultural droughts in which the soil becomes “intensely” dry. If so, the sentence should be clarified. (J. Graham Cogley, Trent University)	Using the definition of intense droughts described in the cited reference - which is the SREX - several drought indices that generally point to the agriculture drought.
385	74106	18	13	25	13	29	If you are using a lower bar for detection in the report, then perhaps you can make stronger claims about drought changes than was done in SREX, which used more conventional definitions of detection and climate change. Alternatively, if you are using the same definitions as SREX, then this is an exception to your terminology defined in the introduction and needs to be clarified. The statements later in the section on Arctic sea ice, cryosphere, etc. are much clearer in terms of what you mean. (UNITED STATES OF AMERICA)	rephrased to " Since the 1950s some regions of the world have experienced more intense and longer droughts as measured by different drought indices, although a global trend cannot currently be established (Seneviratne et al., 2012), (WGII, AR5, Chapter 3, 3.2..2 WG1, Chapter10, 10.3.2.3, WG1, Chapter 12, 12.5.5.8.1)."
386	82842	18	13	25	13	29	The chapter team should also consider cross-referencing the working group 1 contribution to the 5th assessment report, beyond the special report on extremes. (Katharine Mach, IPCC WGII TSU)	done
387	60089	18	13	26	13	29	Please provide a reference/s for the sentence relating to drought conditions increasing. (AUSTRALIA)	see response to comment 385
388	65142	18	13	27	13	28	This increase is inconsistent with the statement in Table 18.7 and in Table 25.1 in Chapter 25.(Althoguht not comment on drought in Table 18.7 below. (Penny Whetton, Commonwealth Scientific and Industrial Research Organization - Marine and Atmospheric Research)	see response to comment 385
389	66185	18	13	29	0	0	The studies on relationship between Standardized Precipitation Index and the climate indices over Nepal using monthly climate data of last 33 years revealed that one of the causes for summer droughts is El Nino, while the winter droughts are related with positive Indian Ocean Dipole Mode Index (DMI)(Sigdel and Ikeda,2010). (M. Sigdel and M. Ikeda, 2010. Spatial and Temporal Analysis of Drought in Nepal using Standardized Precipitation Index and its Relationship with Climate Indices. Journal of Hydrology and Meteorology, Vol. 7, No. 1, Dec 2010: 59 – 74) (International Centre for Integrated Mountain Development (ICIMOD))	Reference reports to climate variability in Nepal. Should go to chapter 24, eventually.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
390	60091	18	13	31	13	32	Please provide confidence intervals and references for the claim that groundwater is decreasing, and that this is primarily attibuted to anthropogenic activites. (AUSTRALIA)	The text cites the references in the next sentence.
391	60090	18	13	31	13	34	Please re-write as two sentences. Split after 'activities', and remove 'such as'. (AUSTRALIA)	ok
392	77610	18	13	32	13	33	"For the 21st century" seems a bit unclear - would it be correct to say "detected in satellite data collected since year 2000"? In any case "detected by" should be replaced with "detected in", since the detection inference presumably depends upon some one doing the analysis of the satellite data. (Francis Zwiers, Pacific Climate Impacts Consortium)	corrected
393	66879	18	13	33	13	33	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
394	60092	18	13	39	13	40	Please provide confidence intervals and references for the claim that water quality will change with temperature. (AUSTRALIA)	included
395	74107	18	13	39	13	45	Temperature is one of the most important factors in eutrophication. There should be some discussion on this connection even if the connection is a non-linear response. If there is in general a high confidence that temperatures are increasing then there is a connection to eutrophication - even if indirectly. (UNITED STATES OF AMERICA)	Due to page limitations the reader is referred to the discussion in chapter 3, WGII.
396	78639	18	13	40	0	0	eutrophication (Mooij et al. 2005). It is difficult…. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	test has been rephrased
397	78638	18	13	41	0	0	here a reference could be included. Huber et al. 2008; where we tested climate impacts as modified by changes in eutrophication. Full reference see above. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	reference has been added
398	78640	18	13	41	0	0	in Adrian et al. 2009 we discuss confounding factors such as catchment effects, trohic state, biological interactions, recovery from acidification, groundwater, and habitat modification - for a set of abiotic and biotic response variable towards cliamte change for lakes. Adrian R, O'Reilly CM, Zagarese H, Baines SB, Hessen DO, Keller W, Livingstone DM, Sommaruga R, Straile D, Van Donk E, Weyhenmeyer GA, Winder M (2009). Lakes as sentinels of current climate change. Limnol. Oceanogr. 54 (6):2283-2297. There is a clear signal e.g. in Müggelsee that climate induced enhances in internal nutrient loads have fully counteracted the reduction in external loads in the early 1990ties. Hilt et al. in press. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	see response to comment 395
399	77611	18	13	41	13	41	Suggest replacing "untreated" with "inadequately treated" - treatment would not remove nutrients in all cases. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 395
400	82843	18	13	43	13	45	It would be helpful to specify the timeframe for these impacts. (Katharine Mach, IPCC WGII TSU)	see response to comment 395
401	62395	18	13	50	13	50	Components has been misspelt as 'Componentes' (INDIA)	corrected
402	82844	18	13	50	13	53	It would be preferable to provide line of sight references to the specific chapter sections that are relevant. Also, is it possible to indicate the approximate time frame for these impacts? (Katharine Mach, IPCC WGII TSU)	The time has been specified (past years and decades). However, we do not make reference to all the sections in chapters 4 and 10 of WGI where cryosphere aspects are treated, there are too many and this would not be helpful for clarity and reading.
403	84490	18	14	2	14	3	How does this assignment of high confidence intersect with the "likely" on page 13, line 52? Please clarify. (Michael Mastrandrea, IPCC WGII TSU)	The statements are taken from WG I chapter 10, but were now modified to increase consistency.
404	66880	18	14	4	14	4	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
405	60093	18	14	9	14	15	This section should be combined with the section on GLOFs in 18.3.1.2, p. 13. (AUSTRALIA)	Ok, this section has been moved to /combined with section 18.3.1.2.(Regional Water Balance)
406	84491	18	14	10	14	17	This material overlaps with the previous section. It is worth considering whether this material should be presented together in one or the other location. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 405

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
407	66881	18	14	13	14	13	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
408	66882	18	14	13	14	13	Change 'damages' to 'damage'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
409	59034	18	14	22	14	0	"in western and south-central China" should be changed to "in western and southwestern China". (Guoyu Ren) (Guoyu Ren, National Climate Center)	This text has been changed accordingly
410	66883	18	14	28	14	28	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
411	66884	18	14	28	14	28	Remove apostrophes: the years are not possessives. (Peter Burt, University of Greenwich)	corrected
412	64951	18	14	29	14	31	The average reader will have difficulty seeing the implications of this statement. Some context should be provided. (J. Graham Cogley, Trent University)	The statement has been simplified
413	66885	18	14	34	14	34	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
414	78641	18	14	40	0	0	more specifics on ice earlier break-up or later freeze-up: However, several factors modify this general trend. Because of the approximately sinusoidal form of the air temperature curve, the calendar dates on which the air temperature falls below and rises above 0 °C, which are crucial for the timing of ice-on and ice-off, respectively, are not linear functions of air temperature. Instead, they are arc cosine functions of air temperature, which implies that the sensitivity of the timing of ice-on, the timing of ice-off, and the duration of ice cover is greater in warmer regions than in colder regions, and will increase as the climate warms (Weyhenmeyer et al., 2004, 2011; Jensen et al., 2007; Livingstone & Adrian, 2009). Thus, the impact of climate warming on lake ice phenology will be disproportionately large in those areas where winters are mild or variable and the duration of ice cover on lakes is already short compared to those areas where winters are consistently cold and the duration of ice cover is much longer. Livingstone D.M. & Adrian R. (2009). Modeling the duration of intermittent ice cover on a lake for climate-change studies. Limnology and Oceanography, 54(5), 1709-1722. Weyhenmeyer G.A., Livingstone D.M., Meili M., Jensen O.P., Benson B. & Magnuson J.J. (2011). Large geographical differences in the sensitivity of ice-covered lakes and rivers in the Northern Hemisphere to temperature changes. Global Change Biology, 17, 268–275. Weyhenmeyer G.A., Meili M. & Livingstone D.M. (2004). Nonlinear temperature response of lake ice breakup. Geophysical Research Letters, 31(7), L07203, doi:10.1029/2004GL019530 Jensen O.P., Benson B.J., Magnuson J.J., Card V.M., Futter M.N., Soranno P.A. & Stewart K.M. (2007). Spatial analysis of ice phenology trends across the Laurentian Great Lakes region during a recent warming period. Limnology and Oceanography, 52(5), 2013-2026. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	This comment is much appreciated. We included the aspect on sensitivity but unfortunately, due to severe space limitations, are not able to go in any further detail.
415	66886	18	14	46	14	46	'in-situ' should be in italics. (Peter Burt, University of Greenwich)	ok
416	77612	18	14	49	14	50	I think I would tone this down slightly by deleting the emphasis on the 60% contribution to the change. This is only a single study that uses a specific downscaling and hydrologic modelling approach, so a lot of uncertainty remains. Also, the reader is not told what the observed changes were - so they would not be able to interpret the 60% contribution. (Francis Zwiers, Pacific Climate Impacts Consortium)	we have replaced "60%" by "significant"
417	66184	18	14	51	0	0	Decline in Snow Covered Area(SCA) and its to changing temperature was reported using MODIS based remote sensing data for the period 2002-2009 over Bhutan Himalayas (Deoraj et al,2011). (Deo Raj Gurung, Anil V. Kulkarni, A. Giriraj, Khun San Aung and Basanta Sreshtha.2011. Monitoring of Seasonal Snow Cover in Bhutan using Remote Sensing Technique. Current Science, Vol. 101, No. 10, 25 November 2011) (International Centre for Integrated Mountain Development (ICIMOD))	We appreciate this additional reference but unfortunately we cannot go to this level of regional detail in this subject due to space limitations (snow cover is more extensively addressed in IPCC WG I)

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
418	58914	18	14	54	15	1	Same comment as for page 3 (Wilfried Haeberli, University of Zurich)	Statement has been changed according to reviewer suggestion
419	77613	18	15	2	15	2	Should "hardly" be replaced with "not" (are there any studies?). (Francis Zwiers, Pacific Climate Impacts Consortium)	Statement has been changed according to reviewer suggestion
420	58915	18	15	3	15	4	Flow acceleration is also documented for creeping permafrost in the Brooks Range, Alaska (Daanen, R.P., Grosse, G., Darrow, M.M., Hamilton, T.D., Jones, B.M., 2012. Rapid movement of frozen debris-lobes: implications for permafrost degradation and slope instability in the south-central Brooks Range, Alaska. Natural Hazards and Earth System Sciences 12, 1521–1537. http://dx.doi.org/10.5194/nhess-12-1521-2012). This shows that similar processes are taking place at a much larger scale than just the Alps. (Wilfried Haeberli, University of Zurich)	The reference and some additional text have been included.
421	66887	18	15	4	15	4	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
422	63427	18	15	18	16	3	No examples on South America?, please refer to WG2 Chapter 27 (Jose Marengo, CCST INPE)	We checked Chapter 27 but could not find some evidence based reference to changes in landslides in South America.
423	77614	18	15	21	15	21	It is not exactly clear what is assessed to have medium confidence, whether that assessment is made by the authors or Wulf et al, and whether the evidence basis for the assessment includes more than one study. If there is only one study, is there sufficient evidence/agreement to warrent medium confidence? (Francis Zwiers, Pacific Climate Impacts Consortium)	We changed the sentence to make the relation more clear, and indicated low confidence.
424	82845	18	15	21	15	21	"medium confidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	done
425	66186	18	15	22	0	0	The daily 3 hr TRMM based satellite rainfall data during 1998-2008 revealed that the mountainous Himalaya has almost twice as many extreme events as the Ganges Plain or the Tibetan Plateau and are more common in the dry interior rather than the wet exterior of the orogen. This important finding suggests the location of profound surface erosion to be in the lee of the orographic barrier where barren landscapes are susceptible to intense rainstorm (Bodo,2013). (Bodo Bookhagen, 2010. Appearance of extreme monsoonal rainfall events and their impact on erosion in the Himalaya. Geomatics, Natural Ha rds and Risk Vol. 1, No. 1, March 2010, 37–50) (International Centre for Integrated Mountain Development (ICIMOD))	We take note of this suggestion but since it is not related to any changes (rather to process understanding) we can't see a justification to include it.
426	80592	18	15	24	15	24	"Dam construction is an important driver" not exact, should include "vegetation recovering". Namely "Dam construction and vegetation recovering are important drivers" (chaozong xia, academy of forest inventory and planning)	We included 'vegetation changes' as an additional driver.
427	76837	18	15	33	15	43	This is another illustrative example of the lack of full traceability and a lack of clarity with some of the attribution assessments. The assessment is for a medium-high confidence on detection and a medium confidence on detection and attribution of "soils and rock" and a high confidence of detection and a medium confidence of detection and attribution on "increasing frequency of Apline rock failures" (Fig 18.3) This paragraph contains a variety of different types of attribution statement which I would describe as follows : Sentence 1 (high/medium/low confidence depending on region/global) is an observational statement Sentence 2 (high confidence) is a statement attributing high-mountain rock slope failures to glacier retreat/permafrost degradation/high-temperature events Sentence 3 (medium to high confidence) is an end to end attribution statement attributing costs of tens of millions of dollars in the Swiss alps from rock fall to anthropogenic climate forcing. Sentence 4 (factual statement; no confidence) is a statement attributing glacier lake impacts and downstream damage to rock and ice avalanches from destabilised slopes. The next paragraph then goes on to say "other than for the above mentioned types of landslides there is no clear evidence that their frequency and magnitude has changed over the past decades". Then "In general detection of changes in the occurrence of landslides is complicated by incomplete inventories, both in time and space, and inconsistency in terminology". This then apparently supports either high (Apline rock failures) or medium to high (soils and rock) confidence on detection. It isn't clear to me what supports the assessment shown in Fig 18.3 - label 8 and label 11. (Peter Stott, UK Met Office)	We have completely restructured and reworded this paragraph and considered this review comment.
428	66888	18	15	34	15	34	Insert 'is' after 'There'. (Peter Burt, University of Greenwich)	corrected
429	82846	18	15	34	15	36	"high confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	ok

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
430	65150	18	15	35	15	35	The word "downwasting" is not found in the dictionary e.g in Oxford Advanced Learners Dictionary and needs to replaced by some other meaningful word. (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	Downwasting has been replaced by shrinking.
431	66889	18	15	35	15	35	Delete 'is'. (Peter Burt, University of Greenwich)	done
432	77615	18	15	39	15	39	I think the authors should avoid the practice of reporting a confidence range (medium to high in this case). The interpretation could be that there is high confidence in some aspects of this statement, and only medium confidence in others, or it could be that the authors think they can differentiate more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have high confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	Reporting a confidence range has now been avoided.
433	64952	18	15	42	15	42	“impacted glacier lakes”: this needs to be expanded. The impact is literal: when the debris hits the lake water, the resulting wave can breach the dam holding in the water, causing a “GLOF”. (J. Graham Cogley, Trent University)	The statement has been reworded
434	58916	18	15	45	15	45	It would be good to write " ... above mentioned ice-related types of landslides ..." in order to make clear that the relation to ice is essential for adequately interpreting observed trends in frequency. (Wilfried Haeberli, University of Zurich)	This wording has been included
435	84492	18	15	46	15	47	Should this be read as "shallow landslides in regions with a relatively complete event record" or separately for shallow landslides and for regions with a relatively complete event record for all landslides? Please clarify. (Michael Mastrandrea, IPCC WGII TSU)	we had to remove this statement due to space limitations.
436	74108	18	15	47	15	47	Here, "detection of changes" can include changes due to internal climate variability, I assume, so this could be noted. (UNITED STATES OF AMERICA)	We agree, but introducing this note would require further explanation and probably confuse the reader, therefore we have not made this extra note here.
437	74109	18	16	2	16	2	Here, "detection of changes"□can include changes due to internal climate variability, I assume, so this could be noted. (UNITED STATES OF AMERICA)	see response to comment 436
438	78231	18	16	4	16	5	Gully Erosion The Nanka erosion gullies in Anambra State are the most complex single gully erosion site in the whole world (Akpojide et al., 2010), with those of Imo and Anambra States of Nigeria estimated to be causing loss of over 20 tons of fertile soil per annum and amounting to a cost of over 2 million dollars, with gullies extending to depths of over 120m to 2km wide in some places (Jimoh, 2006) The gully is estimated to have a mean advance rate of 150 metres every 3-5 years. The years are often years of exceptionally heavy rainfall (Ajaero, 2010) When compared with available scientific models and information on climate change from around the world, it may be seen how climate change could be attributed to the severe gully erosion and landslide problems happening in south eastern Nigeria, even in the absence of comprehensive local climate data. Hitherto, while some local scientists have attributed the underlying cause of gully erosion to include other human activities (Igokwe et al, 2008), others haves stressed that the soil properties (friable and flood-prone) and hydrologic processing (rainfall, surface and sub-surface flooding) are the major culprits. Interestingly though, most of the gully erosion sites including that of the famous Nanka, Agulu, Ekwulobia and Oko communities are located in typical rural areas with minimal presence of such human activities like road construction, intensive agriculture and deforestation, heavy industries’ activities, etc. especially with reference to the period of inception of the gullies around early-to-mid nineties. However, sand excavation activities were noticed in recent times in some of these areas, but only for a while due to government intervention. More so, other surrounding areas within Nigeria with higher degree of industrial activities and un-sustained road construction, sand excavation, intensive farming and deforestation have not witnessed severe gully devastation (Ezenekwe, 2009). With the introduction of the climate change phenomenon, there appears to be better understanding as to why gully erosion and landslides are becoming more rampant. Ezenekwe (2009) compared traditional knowledge and local scientific understanding of the causes of the gully erosion problems with models from the IPCC to investigate for a link. This revealed that while some dedicated and noble scientists working for the IPCC are using sophisticated mathematical and computer simulated models to give examples of possible hotspots at risk from hydro (or a combination of hydro and drought) for a region within Nigeria located thousands of miles away, some humble citizens are, in actual fact and within the same precincts captured by the IPCC simulation, experiencing worsening gully erosion and landslide problems responsible for the widespread degradation of arable land and biodiversity, destruction of homes, transportation,	We appreciate the detailed information provided by the reviewer. We checked all the references indicated, at least those which we could identify and made additional investigations on the subject (in collaboration with authors from the Africa chapter). However, we could not identify any sufficient evidence to would allow us to include this subject in the chapter text (also in view of very limited space).

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
438.2	78231	18	16	4	16	5	electricity and communication systems, contamination of water supply, isolation of settlements, migration of communities etc. (Akpokodje et al., 2010). Research efforts in the tropics show that the most important factor that is of direct relevance to erosion studies is rainfall (Jimoh, 2006), and according to (Aaron, 2011), recorded volumes of torrential rains increased 20 percent across various southern states in Nigeria over the past forty years, some of which already see up to 160 inches of rainfall a year, with wet seasons lasting eight to ten months. Ezenekwe (2009) attributes gully erosion to flood activities with a 68 per cent confidence level. Low bulk density, high hydraulic conductivity, low organic matter content and hence friability of soil (Onwuka and Okoye, 2012) are soil properties that contribute to the vulnerability of these landscapes to hydro or flood activities. References [Enuvie G. Akpokodje, Akaha C. Tse, Nnamdi Ekeocha. GULLY EROSION GEOHAZARDS IN SOUTHEASTERN NIGERIA AND MANAGEMENT IMPLICATIONS Scientia Africana, Vol. 9 (No.1), March, 2010, pp 20-36 © Faculty of Science, University of Port Harcourt. Printed in Nigeria. ISSN 1118 – 1931] [Isah H. Jimoh. THE ECOLOGICAL PROBLEMS OF SOIL EROSION IN NIGERIA. Faculty of Business and Social Sciences, University of Ilorin, Ilorin, Nigeria. 2006 And Vantage Publishers Ltd. ISBN 978-071-973-3] Chukwuedozie Kelechukwu AJAERO, Arinze Tagbo MOZIE. The Agulu-Nanka gully erosion menace in Nigeria: what does the future hold for population at risk? Department of Geography, University of Nigeria, Nsukka. Email:ajaerock@yahoo.co,mTel: +234(0)803-7511-422 [Igbokwe J. I., Akinyede B. Dang, Alaga T., Ono M. N., Nnodu V. C., Anike L. O. 2008 Mapping and Monitoring of the Impact of Gully Erosion in South eastern Nigeria with Satellite Remote Sensing and Geographic Information System. The International Archives of the Photgrammetry, Remote Sensing and Spatial Information Sciences Vol. XXXVII. Part B8 Beijing] [Ezenekwe Elochukwu. Investigation into Climate Change Contribution to the worsening gully/landslide activities in Anambra state of south eastern Nigeria (case study: Nanka community). Report for the Zeeler Campaign Initiative of Peace Advocacy and Sustainable Development Outreach, PASDO, 2009] Onwuka, S.U.; Okoye, C. O.; Nwogbo, N. The Place of Soil Characteristics on Soil Erosion in Nanka and Ekwulobia Communities in Anambra State. Journal of Environmental Management and Safety, 2012 (Elochukwu Ezenekwe, Nnamdi Azikiwe University)	
439	82847	18	16	10	16	10	"high agreement" and "robust evidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	done
440	74110	18	16	11	16	11	The use of the term "outside of their natural variation" is confusing, because one can think of natural variation as including changes due to natural (non-anthropogenic) changes in climate such as internal climate variability. But under the definitions of detection and climate change proposed in this chapter, the internal climate variability can be a form of "climate change" so you can have detection without the changes being different from internal climate variability. Is a stronger definition of detection being used here or are we misinterpreting? (UNITED STATES OF AMERICA)	We recognise the confusion but we think that the clarification occurs now in our revised methods section. There, we emphasise that climatic fluctuations beyond a few decades may appear as climate change. The "natural variation" in ecosystems referred to here is mostly that of endogenous fluctuations in ecosystems (e.g., succession or natural disturbance). We hope that this is clear even if we do not overload this introductory sentence with technical detail.
441	79969	18	16	11	16	14	This statement is contrary to statement in TS (p. 9, l. 21-24), to statements in chapter 4 and statements later in chapter 18.3.2. Please check for consistency. (NORWAY)	We trust that the TS author team continues to carefully cross-reference to our completed FGD.
442	77616	18	16	14	16	14	Replace "review" with "assessment" (presumably that authors have performed an assessment, and have not just provided a review). (Francis Zwiers, Pacific Climate Impacts Consortium)	change made as proposed
443	64777	18	16	14	16	15	The science presented in IPCC AR5 WG2 Chapter 4 is a vast improvement over the analysis presented in IPCC AR4 WGII in 2007. However referring the reader the "statements of confidence for detection and attribution are given without references, as detailed traceability is provided in chapter 4." is a bit misleading since as noted in Chapter 4, page 20, lines 7-, "Note that a slightly different definition than Chapter 18 for detection is used, because detection here is based solely on the presence of a temporal trend and does not attempt to distinguish natural from climate related variation. Referring the reader to Chapter 4 only makes sense if Chapter 18 adopts and implements the same definitions for detection and attribution that are used in Chapter 4. (Robert Webb, NOAA OAR ESRL)	We understand the concern, however we think that there is no inconsistency nevertheless. In the SOD, we made our assessment on the basis of information given in chapter 4, but following our own definition and methodology. In the FGD, this stays the same, but we now refer more directly to the references given in chapter 4 (rather than to chapter 4 itself).
444	76838	18	16	14	16	15	See my general comments about traceability but I do not think it acceptable to provide statements without references. There has to be a thread the reader can follow from the SPM to the chapter assessment by subsection and it shouldn't lose the thread in the additional layer of complexity imposed on the WGII structure by having an attribution synthesis chapter. (Peter Stott, UK Met Office)	We agree and therefore now cite the key references from the original literature directly in chapter 18.
445	82848	18	16	14	16	15	But in some cases citations are provided, which could be clarified. (Katharine Mach, IPCC WGII TSU)	? - "but"?

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
446	66890	18	16	15	16	15	Capital 'C' required for 'chapter' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
447	77617	18	16	15	16	15	Detailed cross-links to chapter 4, providing traceability, should be included here. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have maintained the relevant cross-links but now also cite the most important literature sources.
448	57450	18	16	17	0	0	Consider using 'the timing of recurring developmental (life-cycle) events in plants and animals, such as , bud burst in trees, migration of birds and appearance of insects' as a definition of phenology. (Alison Donnelly, Trinity College Dublin)	We think this would overload the definition - two examples should be sufficient in our opinion.
449	78642	18	16	18	0	0	include: timing of algal blooms (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	see response to comment 448
450	84493	18	16	22	16	24	these changes "can be assumed" to be due to recent climate change/CO2 increase. Is this because other drivers have limited importance or is this more of a hypothesis to be tested? (Michael Mastrandrea, IPCC WGII TSU)	Typically, the "assumption" that there could be a climate effect comes from some sort of process knowledge.
451	82849	18	16	23	16	23	Would it be more accurate to say "are hypothesized to be due to..."? (Katharine Mach, IPCC WGII TSU)	We think this would reduce readability without necessarily adding precision.
452	74111	18	16	23	16	24	Confusing here. The changes referenced - said to apply to this entire chapter - are said to be "beyond natural variability" but due to "recent climate change". But under the definitions being used in the chapter, the recent climate changes can be due to natural climate variability. Unless different definitions are being used here. Please clarify. (UNITED STATES OF AMERICA)	see response to comment 440
453	64953	18	16	23	16	25	“assumed” and “assumptions” are rather disturbing. I trust that what is meant is “shown” and “observations of natural variability”. (J. Graham Cogley, Trent University)	At this point, we cannot see what would be disturbing about any assumption of possible impacts of climate change. Detection refers just to that: something has changed and it could be due to climate change. It is the attribution which implies the actual assessment.
454	64778	18	16	26	16	26	replace 'the assessment' with 'the rigorour quantitative assessment' (Robert Webb, NOAA OAR ESRL)	In the interest of brevity and readability, we prefer the existing text.
455	77618	18	16	31	16	31	I think it would be good to replace "significant" with a synonym such as "substantial", unless the intent is to refer to statistical significance, in which case, it would be good to be specific and say "statistically significant". The word significant is used so heavily in statistical contexts that I worry that readers may confound "statistical significance" with other interpretations. (Francis Zwiers, Pacific Climate Impacts Consortium)	changed as suggested
456	82850	18	16	33	16	33	"medium agreement" should be used instead of "moderate agreement." Additionally, "robust evidence" and "medium agreement" should be italicized. (Katharine Mach, IPCC WGII TSU)	changed as suggested
457	84494	18	16	33	16	33	"Moderate" should be "medium" here. (Michael Mastrandrea, IPCC WGII TSU)	changed as suggested
458	79010	18	16	35	16	35	It would be good to provide spatial ranges and error bars around the "5.4" and "6.6" days. (Richard Jones, Met Office Hadley Centre)	this information is unfortunately not provided by the cited paper
459	66891	18	16	35	16	48	There is inconsistency with capitalsition. Here, we have 'northern hemisphere', on line 48 it is 'Northern hemisphere'. Elsewhere in the chapter/document it is Northern Hemsiphere. I recommend 'Northern (and Southern) Hemisphere throughout, as it is a proper noun, as used on page 23, line 35. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
460	66187	18	16	36	0	0	The global level analysis of temperature seasonality (ST) and vegetation seasonality (SV) using satellite and ground based data over 30 years indicated both temperature and vegetation seasonality diminishment over northern lands (Xu et al,2013). (L. Xu, R. B. Myneni, F. S. Chapin III, T. V. Callaghan, J. E. Pinzon, C. J. Tucker, Z. Zhu, J. Bi, P. Ciais, H. Tømmervik, E. S. Euskirchen, B. C. Forbes, S. L. Piao, B. T. Anderson, S. Ganguly, R. R. Nemani, S. J. Goet, P.S. A. Beck, A. G. Bunn, C. Cao and J. C. Stroeve, 2013. Temperature and vegetation seasonality diminishment over northern lands. Nature Climate Change 2013, NCLIMATE 1836 / doi: 10.1038) (International Centre for Integrated Mountain Development (ICIMOD))	This is a useful paper that has only been published very recently. It does not add knowledge to the observed trends discussed here, although it strengthens the cause for attribution. The reference has therefore been added to the sentence following this one.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
461	78643	18	16	37	0	0	The timing of the spring algal bloom occurred about a month earlier from the year 1988 as compared with the preceding decade in a north temperate lake (Huber et al. 2008). Reference: Huber V., R. Adrian, D. Gerten. 2008. Phytoplankton response to climate warming modified by trophic state. Limnology and Oceanography, 53 (1): 1-13. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	reference has been added
462	66188	18	16	38	0	0	Abundant winter injury to the foliage and shoots of Rhododendron arboreum and Quercus semecar-pifolia became apparent in winters of 2010-2011 in Subalpine-timber line regions of western Himalayas of India due to unusual climatic conditions such as low winter temperature and heavy snow fall (Ishwari et al,2012). (Ishwari Datt Rai, Bhupendra Singh Adhikari, Gopal Singh Rawat, 2012. Mass Foliar Damage at Subalpine-Timberline Ecotone in Western Himalaya Due to Extreme Climatic Events. American Journal of Climate Change, 2012, 1, 104-107) (International Centre for Integrated Mountain Development (ICIMOD))	Thank you for the reference which unfortunately cannot be cited here since the work concerns the responses of vegetation to an extreme event not attributable to climate change. The paper itself states this clearly and notes that the damages illustrate the sensitivity of plants to such changes.
463	77619	18	16	48	16	48	I suggest deleting "now" or replacing it with some other word. Using "now" suggests that terrestrial ecosystems were not net carbon sinks in the past (i.e., that this is a change that has recently occurred). Perhaps a better sense of the situation could be given by saying "... ecosystems currently remain net sinks ...". That gives a sense of their status over recent decades, and at the same time suggests a concern for the future. (Francis Zwiers, Pacific Climate Impacts Consortium)	The literature about this point is quite clear in stating that the present net sink has not been present for a very long time - it is indeed a consequence of warming and probably CO2 fertilization. We have therefore retained the word "now" in this sentence. The reviewers' reflections are precisely the ones we intend to provoke in the reader.
464	82851	18	16	53	16	53	It would be preferable to provide specific reference to the relevant sections of chapter 6 in the working group 1 contribution. (Katharine Mach, IPCC WGII TSU)	This would perhaps be desirable, but conversely, WG1 should have been crossreferencing to WG2 chapters 4 and 18 about these matters as well. It is a frequent misconception in IPCC procedures that atmospheric physicists "own" the primary knowledge about the biosphere and the carbon cycle.
465	79970	18	16	54	17	3	Please also add "rising atmospheric CO2 concentration" due to the fact that an increased CO2 level also will affect growth. (NORWAY)	We are surprised by this comment since the following sentence clearly explains why such an attribution cannot currently be made.
466	82852	18	17	6	0	0	Section 18.3.2.3. For all statements supported by assessment in chapter 4, specific cross-reference to relevant sections of chapter 4 should be further clarified. Additionally, the chapter team should strongly consider providing examples of core citations in support of more findings. (Katharine Mach, IPCC WGII TSU)	This has been done to the degree possible, given space limitations.
467	69440	18	17	12	17	13	The statement regarding an 'increase in the number of species studies has incresed considerably since AR4' would be strengthened if a selection of key exemplar references were provided. (NETHERLANDS)	We did not find a meaningful way to select references for this particular statement as there are far too many of them.
468	60094	18	17	13	17	16	The sentence starting 'overall, many terrestrial species have recently moved' doesn't appear to reflect the variability and uncertainty in the movement of species reflected in chapter 4. (AUSTRALIA)	No, it does not, since it is a summary statement. If summary statement always had to "reflect the variability and uncertainty" in everything, then no summary statements could ever be made.
469	77620	18	17	13	17	16	This is rather awkwardly constructed - breaking it into a couple of separate sentences would probably help, one stating what has been observed, and another stating precisely what is being assessed to have high confidence. Also, the statement does not give a good sense of how many species are represented in the averages that are reported, or whether there is confidence that these measured movements are representative of a broader group of species, and how that broader group is constituted. (Francis Zwiers, Pacific Climate Impacts Consortium)	It has been extremely hard to summarize the huge body of findings provided by chapter 4 and the underlying literature and we have been unable to find a better way to phrase this in a limited amount of space.
470	66892	18	17	14	17	14	'per' should be in italics. (Peter Burt, University of Greenwich)	we are not sure about that and leave it to the scientific editors going through the text after us.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
471	78644	18	17	22	0	0	something on zooplankton diversity: In a study on the association between zooplankton species richness in lakes spanning Canada, USA Germany and Switzerland it was found that temporal fluctuations in the chemical environment tend to exclude zooplankton species while temperature variability promotes greater zooplankton species richness (Shurin et al. 2010). Reference: Shurin, J. B., M. Winder, R. Adrian, W. (Bill) Keller, B.Matthews, A. M. Paterson, M. Paterson, B.Pinel-Alloul, J. A. Rusak, N.Yan. 2010. Environmental stability and lake plankton diversity- contrasting effects of chemical and thermal variability. Ecology Letters 13: 453-463. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	We have considered this comment, as well as the greatly enhanced treatment of freshwater ecosystems in chapter 4 and have included some selected references where these clearly contained information about detection and attribution.
472	65151	18	17	23	17	23	In the sentence: " Across the world, ……fossil record", the word species appears twice, the word species appearing the second time, better be replaced by the word "their". (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	We disagree and think that following the reviewer would make the statement more ambigous
473	64779	18	17	23	17	30	I think the authors need to provide a number of peer-reviewed publications that support the statement throughout the paragraph. It is surprising that there are no citations supporting the assessments being presented. (Robert Webb, NOAA OAR ESRL)	see response to comment 466
474	82853	18	17	23	17	30	Specific cross-reference to relevant sections of chapter 4 should be provided. (Katharine Mach, IPCC WGII TSU)	see response to comment 466
475	79971	18	17	24	17	26	Important to point out that these are, although serious threats, also (undoubtedly) antropogenic drivers - i.e. possible for humankind to affect with decisions and behaviours and thus reduce their impact and hopefully increase resilience and robustness of (NORWAY)	No, discussing these things would be outside the task given to IPCC.
476	78033	18	17	26	0	0	This is one of the cases where I worry that 'very low confidence' to me suggests you think its due to human influence but cant prove it while the text clarifies that it is quite likely (likelyhood language??) due to other factors. Maybe this would be clearer if phrased differently (Gabi Hegerl, University of Edinburgh)	We are not sure what the reviewer's point is here more exactly. Our statement leaves no doubts about the human influence on extinctions, as we see it - but nearly all of that influence is independent of anthropogenic climate change. Since the task of this report is not to assess OVERALL human influence, but rather the influence of climate change, we are actually unable to conclude in any way different from what is done here.
477	74112	18	17	29	17	29	"Anthropogenic forcing" is a better term than "global warming" in this context. (UNITED STATES OF AMERICA)	We recognise the confusion but have now changed "global warming" to "climate change", as this is the only objective of this report.
478	79011	18	17	29	17	29	Linked to the general point made about low confidence statements, perhaps insert "suggested" before "attribution". (Richard Jones, Met Office Hadley Centre)	agreed and done
479	77621	18	17	36	17	37	Does the traceback apply to this whole subsection? In general, I think the traceability of evidence that is assessed in other chapters should be more detailed. (Francis Zwiers, Pacific Climate Impacts Consortium)	all crosslinks and tracable accounts have been checked and revised throughout the chapter
480	79777	18	17	40	0	0	this section states 'high confidence' but has very few references. Why? (Jessica Gutknecht, Helmholtz Centre for Environmental Research-UFZ)	see response to comment 466
481	82854	18	17	40	0	0	Section 18.3.2.4. For all statements supported by assessment in chapter 4, specific cross-reference to relevant sections of chapter 4 should be further provided. Additionally, the chapter team should strongly consider further providing examples of key references in support of findings. (Katharine Mach, IPCC WGII TSU)	see response to comment 466
482	66893	18	17	42	17	42	Capital 'B' for 'Boreal' (as used elsewhere in chapter/document). (Peter Burt, University of Greenwich)	This appears to not be common use - we leave it to the final copy editing to change this if necessary.
483	82855	18	17	46	17	52	Specific cross-reference to relevant sections of chapter 4 should be provided. (Katharine Mach, IPCC WGII TSU)	see response to comment 466
484	74113	18	17	50	18	16	Some additional caveats needed. The authors could consider: "facilitates attribution to climate change in general, including possible natural climate variability." The reader should be reminded that the attribution to climate change referred to in this section includes climate change due to natural variations as well as anthropogenic forcing, not just anthropogenic climate change. (UNITED STATES OF AMERICA)	We are unsure about the number of times that the reader needs to be reminded of this, over and over. It cannot be reasonable to make the same statement in every single paragraph of the chapter. We have nevertheless sought to reduce possible understandings even further.
485	66894	18	18	1	18	1	Capital 'B' for 'Boreal' (as used elsewhere in chapter/document). (Peter Burt, University of Greenwich)	see response to comment 482

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
486	82856	18	18	1	18	12	Specific cross-reference to relevant sections of chapter 4 should be provided. (Katharine Mach, IPCC WGII TSU)	see response to comment 466
487	66895	18	18	4	18	4	Small 's' for 'southern'. (Peter Burt, University of Greenwich)	agreed and done
488	82857	18	18	4	18	4	Is "perceived" the clearest word here? (Katharine Mach, IPCC WGII TSU)	no, it is not - we have now changed "perceived overall" to "broad-scale", as that reflects better what we wanted to say here.
489	59035	18	18	9	18	12	Here, and elsewhere in this chapter, references should be cited. (Guoyu Ren, National Climate Center)	see response to comment 466
490	63429	18	18	9	18	12	What about a reference about this statement? (Jose Marengo, CCST INPE)	Section has been revised, Davidson 2012 has been given as a reference for this particular point
491	77622	18	18	16	18	17	Does the traceback apply to this whole subsection? In general, I think the traceability of evidence that is assessed in other chapters should be more detailed. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 479
492	78645	18	18	18	0	0	include invarion of the tropical Cycindrospermopsis raciborskii into european lakes -see comment on chapter 4 page 28, line11 (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	see response to comment 471
493	64489	18	18	20	18	20	18.3. The title is somehow misleading. Most of this section is about changes in physicochemical parameters and sea level rise, thereby covering WGI issues only (except 18.3.4.). This is fine if this sets the stage for a treatmant of impacts on biological and human systems but the title should reflect this. What about "Detection and Attribution of Observed Climate Changes in Natural Systems" Alternatively, 18.3.4. is a nice model how to change 18.3.1. to 3. if needed. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	There is some confusion arising from this comment. The suggested heading is indeed the one of 18.3, but this cannot be the point of the comment. Rather, we understand that the reviewer argues for a different way of introducing section 18.3.3 - but we cannot follow the advice since we think that our introductory paragraphs set the stage for the section quite appropriately.
494	66896	18	18	23	18	23	Temperatures don't warm, they increase, replace 'warmed' with 'increased', and quantify. (Peter Burt, University of Greenwich)	ok
495	64487	18	18	24	18	24	18.3.3. WG1 Ch3, p3 L 4 reads „high confidence" for ocean warming. Where does „very high confidence" come from? This chapter is about impact, not the physical change. Ch6 reads in 6.6 p51 L4 „very high confidence" for Temperature effects. This tells us that increasing temperature will have an effect on specimens/species (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	As this chapter is about detection and attribution, we need to consider the change in the physical climate system that causes the impacts. The statement refers to coastal waters only, and is based on the paper cited along with it. We have, however, decided to eliminate this confidence statement in order to avoid confusion.
496	77623	18	18	25	18	25	Is this statement about temperature extremes about water temperature in coastal regions, or air temperature? (Francis Zwiers, Pacific Climate Impacts Consortium)	reference is to water temperatures. We inserted a specifier to make this clear.
497	64488	18	18	29	18	29	18.3.3. Tab 5-1 cited should be Tab 5-2 now (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	tables have all been renumbered and crosslinks been checked
498	64490	18	18	31	18	31	18.3.3. IPCC guidance note from 2010 defines in ascending order of probability in percent „likely", „very likely", „virtually certain", but not „extremely likely" (WGI AR5 Chapter 10.4.3 p 34 L 42-46 reads „extremely certain". Is this the same as „extremely likely"?) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	checked against FGD of Chapter 10 and changed accordingly to "very likely"
499	84495	18	18	31	18	54	These two paragraphs are somewhat overlapping and could be shortened/combined. (Michael Mastrandrea, IPCC WGII TSU)	the first paragraph discusses the attribution of local sea level rise to global mean sea level rise, while the other discusses the difficulties to detect and attribute shoreline erosion to local sea level rise. While there is some overlap, these two things are different. we have therefore left them separate, but tried to make improve the rationale of the second statement.
500	77624	18	18	32	18	34	Isostatic rebound (which continues after the last glaciation) is an important confounder in some places as well - and depending upon location, can contribute to or offset relative sea level rise. (Francis Zwiers, Pacific Climate Impacts Consortium)	isostatic adjustment has been added to the list of important confounders.
501	77304	18	18	32	18	40	Isn't it also very relevant that many of the expected impacts of sea-level rise are by worsening rare catastrophic events, for which statistical sampling is inevitably problematic? (William Ingram, Met Office)	While we agree with observation, our chapter is concerned with past observations, therefore we are not including this perspective here. Section 18.4.4 has relevant discussion on extreme events

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
502	64491	18	18	37	18	40	18.3.3. not sure whether teleconnection issues have been considered in this treatment. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	the message here is that due to complexity, no detection has been possible to date. As teleconnection would add yet another layer of complexity, without changing that statement, we consider it not relevant in this context.
503	77625	18	18	45	18	46	This statement would appear to at least partially contradict the statement on lines 34 and 35 of this page "Thus far, it has not been possible to isolate an anthropogenic climate signal in local sea level changes from the contributions of these confounding factors". (Francis Zwiers, Pacific Climate Impacts Consortium)	rephrased the statement in order to remove the apparent contradiction by removing the "are eroding due to climate change..." part.
504	58535	18	18	49	18	49	Bongaerts et al (2010) is not the correct reference for this statement about mangroves respodning to warming and OA. (Janice Lough, Australian Institute of Marine Science)	We agree that the reference is not appropriate for the statement, however, this section of the text has been deleted during editing.
505	64492	18	18	53	18	54	18.3.3.1. The treatment of polar regions then deserves more room. What about the confidence levels for those? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Coastal erosion in the Arctic is treated in Chapter 28 of the report, and also summarized in table 18-8 of this chapter, including confidence statements. Due to space limitations, we were unable to extend our treatment in this section that is considering global effects.
506	80448	18	19	8	0	9	Coastal aquifers are crucial for Small Island environments but also in any coastal environments that depends of the groundwaters because of their dry climate. (Velasco López, 2013) (Jonathan Gómez Cantero, Universidad de Alicante)	"..and dry climates" has been added to the statement to incorporate this point.
507	66897	18	19	8	19	8	I don’t know why 'Small Island' is capitalised (elsehwere, eg, page 38, line 45, it is given as 'small island(s))'. (Peter Burt, University of Greenwich)	we have removed capitalisation of small islands throughout the chapter
508	77626	18	19	13	19	14	I think the wording of this statement could be a bit more subtly nuanced. Perhaps replace "Attribution to climate change, in particular incremental sea level rise, is not supported …" with "Attribution of a contribution from climate change to coastal aquifer degradation, particularly from coastal sea level rise, is not currently supported ...". This makes it clearer what is being attributed, and leaves open the possibility that further research might alter this assessment at some point. (Francis Zwiers, Pacific Climate Impacts Consortium)	sentence has been rephrased to clarify, however the statement is still strong - there is hardly any evidence in the literature, so detection can not be done.
509	64493	18	19	23	19	23	18.3.3.2. see comment above, confidence said to be very high in Executive summary (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have iterated the confidence assessment for Coral Reefs across chapters, it is now consistent across and within the chapter
510	82858	18	19	23	19	24	Over what time frame have such impacts been detected? (Katharine Mach, IPCC WGII TSU)	time frame has been inserted
511	64494	18	19	24	19	24	18.3.3.2. Another way to say this is as in Ch5 where p 20 L 4 reads: „... climate-related drivers are the primary cause of mass coral bleaching and mortality (very high confidence)...“ So the first statement would be on climate as before and then your could disentable and say it is mostly temperature until now. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we see no reason to change current our formulation, as it is not in contradiction with Ch5 or any of the other chapters. Besides, our main discussion on that issue is in Box 18-2, therefore the statement here should be as short and clear as possible
512	82859	18	19	28	19	28	It should also be acknowledged that hypoxia is a natural phenomenon within the oceans. (Katharine Mach, IPCC WGII TSU)	we discuss hypoxia in the context of coastal systems, whereas the naturally occurring hypoxia is rather an open ocean Phenomenon. We have decided to omit further discussion for the merit of brevity. Details on this can be found in Ch 6 and 30, both are crossreferenced via our table 18-1
513	64495	18	19	32	19	32	18.3.3.2. Fig S1 in Diaz and Rosenberg 2008 does not show doubling from 1990 to 2000.... (they write „doubled since the 1960s“, but the figure shows different results?) Maybe write something like: increased in number from below 50 to over 400 since 1960? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	this statement has been rephrased and does not include those numbers any more
514	64496	18	19	34	19	50	in ch 5 p 15 to 16, all these paragraphs are on „rocky shores“. Each paragraph should mention rocky shore to make this clear (e.g. rocky shore intertidal...). In fact, this part is actually the same as ch5 5.4.2.2. , although the wording is a bit different. Maybe refer to chapter 5 and provide a brief summary here? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have inserted the specification to rocky shore species where appropriate, and further aggregated this section.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
515	82860	18	19	39	19	40	What is the role of human-introduced invasives, beyond climate-induced shifts? (Katharine Mach, IPCC WGII TSU)	human introduced invasives are summarized under anthropogenic confounders. Due to space limitations, it is not possible to include a specific discussion on all drivers for each observation/species
516	77627	18	19	42	19	42	Insert "the" before "overriding". Also, insert "the" before "timing". (Francis Zwiers, Pacific Climate Impacts Consortium)	done
517	77628	18	19	44	19	45	This last sentence seems disconnected from the rest of the paragraph - it's not clear to me (as a non-expert) how I should use this information. (Francis Zwiers, Pacific Climate Impacts Consortium)	this sentence was indeed out of context and has been removed.
518	74114	18	19	47	19	47	"Changes in musselbeds in response to higher temperatures induced by climate change" A confidence level is needed for the link between temperatures and the mussel bed changes. As to the climate change link to temperatures, the reader should be reminded that the climate change referred to here can include contributions from natural variability (e.g., internal climate variations). (UNITED STATES OF AMERICA)	This statement has been moved to table 18-8, North America section. we added confidence statement and climate drivers, and clarify "observed climate change" in the caption
519	82861	18	19	47	19	50	It would be helpful to specify the relevant time frames for these impacts. (Katharine Mach, IPCC WGII TSU)	added "over the course of the last century", as coastal modification is an ongoing and longstanding process that actually started even before the 20th century.
520	66898	18	19	48	19	48	Change 'West coasts' to 'west coast'. (Peter Burt, University of Greenwich)	done
521	82862	18	20	4	20	38	As appropriate, the relevant time frames for these impacts should be specified. (Katharine Mach, IPCC WGII TSU)	at this aggregation level, the specification of the exact duration of the study, or time frame of the impact, is not deemed appropriate by the author team. The relevant timeframe spans decades in order to be able to detect a climate trend (and therefore, and impact), which is clearly stated in several places of the chapter
522	74115	18	20	6	20	6	Confidence level needed for temperature/sea grass link (UNITED STATES OF AMERICA)	we do not attach confidence levels to every single finding, but deliver an aggregate assessment based on all available evidence at the end of the section
523	66899	18	20	11	20	11	Change 'North' to 'north'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
524	74116	18	20	11	20	11	Confidence level needed for kelp population-ocean warming link (UNITED STATES OF AMERICA)	see response to comment 522
525	64497	18	20	19	20	19	ch 5 p 30 L 31 reads "very high confidence"for global decline salt marshes and mangroves. Maybe include this here? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	the very high confidence statement in Ch5 relates to the overall observed degradation of those system, which is different from what our chapter reports. Therefore it would be inconsistent to include this statement here.
526	66900	18	20	35	20	35	I don't know why 'Small Island' is capitalsied (elsewhere it is given as 'small island(s)'). (Peter Burt, University of Greenwich)	we have removed capitalisation of small islands throughout the chapter
527	74117	18	20	36	20	36	"Both climate variability and change impact fishermen livelihoods" - To be consistent with the definition of climate change used in the chapter, you could say, "Both short term climate variations (e.g., El Nino) and climate change (due to anthropogenic or natural factors) impact fishermen livelihoods." (UNITED STATES OF AMERICA)	we have rephrased the statement to read "vulnerability to climate fluctuations and change". Your suggestion is valid, but due to space constraints, we can not spell this out for every single statement
528	66901	18	20	41	20	41	Insert space after 'see'. (Peter Burt, University of Greenwich)	done
529	64499	18	20	46	20	46	Box 18.3. The statements in this box or the box overall needs a reference to the underlying chapters 5, 6, 30. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	now Box 18-2 has crossreferences to CC-CR, CC-OA, Chs 5, 6 and 30
530	66902	18	21	2	21	2	Use of 'ibid' confusing, as there are two previous references cited. (Peter Burt, University of Greenwich)	rearranged the sentence to avoid use of ibid

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
531	77629	18	21	3	21	3	Is this number (16%) known to wthin 1% accuracy? (That is the level of accuracy that is implied by reporting 16% - i.e., not 15%, or 17%, but 16%). If the state of knowledge is not judged to support that level of precision, would it be more appropriate to say that there was a loss of 1/6th? (which would imply that you know this number to within about +/-8% (+/-1/12th) rather than +/-0.5%). Note that I think there are many opportunities in the chapter where the authors can ask themselves these kinds of questions (and thus perform subtle, but very useful, forms of assessment). (Francis Zwiers, Pacific Climate Impacts Consortium)	Box 18-2 has been shortened considerably and this statement is no longer included
532	64954	18	21	6	21	7	“seawater temperature”. But “small” and “> 1°C” seem to conflict. Is the sentence trying to say “increases of as little as 1°C”? Further, I do not understand “above the summer maxima”; does this mean “above mean summer maxima”? Italicize “very high confidence”. (J. Graham Cogley, Trent University)	see response to comment 531
533	82863	18	21	6	21	7	This description of temperature exceeded could be further clarified. Also, "very high confidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	see response to comment 531
534	64498	18	21	9	21	9	Box 18.3. can you present a level of confidence? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	now Box 18-2: we do not think it is helpful to include confidence levels on every single statement within this box. We have included a confidence statement on the summary
535	64955	18	21	9	21	9	What does “Symbiodinium” mean? (J. Graham Cogley, Trent University)	rephrased to avoid the term Symbiodinium. they are the symbionts of Corals involved in the heat stress reaction called bleaching-
536	82864	18	21	9	21	9	In place of "broad agreement" it would be preferable to specify a summary term for agreement. (Katharine Mach, IPCC WGII TSU)	see response to comment 531
537	77630	18	21	15	21	15	There seems to be a grammatical problem - maybe something is missing? (Francis Zwiers, Pacific Climate Impacts Consortium)	this language has been dropped from the box
538	64956	18	21	15	21	16	This sentence is garbled. Should it be “… have evolved substantially greater thermal tolerance …, nor can they be expected to do so”? (J. Graham Cogley, Trent University)	this language has been dropped from the box
539	71560	18	21	15	21	16	This sentence is not easy to understand. Please clatrify. (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	this language has been dropped from the box
540	78885	18	21	16	0	0	This statement strikes me as too strong; cf assessment in chapters 6, 25, 30 amongst others. We have little reason to hold high hopes about adaptation occurring, but I don't think we can make a positive statement that adaptation cannot be expected at all. Rephrase. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	see response to comment 531
541	69441	18	21	27	21	30	The authors are correlating the mass corals bleaching to elevated temperature in the sections above the statement in question. In this statement, authors conclude that mass coral bleaching is attributed to the anthropogenic effect of climate change, by implicitly assuming that the rise in temperature of the ocean is largely caused by anthropogenic influences on the climate. Strictly seen they should also provide some references substantiating this assumption. Please add some citation. (NETHERLANDS)	Box 18-2 has been shortened considerably and this statement is no longer included. We have deleted the link to anthropogenic forcing, our assessment now speaks to the well-established relation of ocean temperatures and bleaching
542	78034	18	21	29	0	30	this seems a very confident attribution to anthropogenic climate change given that we don’t have attribution of ssts to anthropogenic factors at the spatial scale of coral regions - lthough its probably a large part of the tropics but it still seems very indirect for such a strong assessment. It also would be good to link to the WG1 assessment of SST changes in relevnt regions (Gabi Hegerl, University of Edinburgh)	see response to comment 541
543	62683	18	21	35	21	35	Suggestions as the above mentioned general comments. (RONGSHUO CAI, Third Institute of Oceanography)	We have opted to merge ocean statements here into one section to avoid redundancy, and also because reviewers suggested it earlier
544	60095	18	21	37	21	38	This statement should be supported with a confidence statement. (AUSTRALIA)	statements in the first para of 18.3.4 have been revised in coordination with Ch30, and in line with the corresponding chapters of WG1AR5. we have added confidence language where appropriate.
545	63430	18	21	37	21	38	What about a reference about this statement? (Jose Marengo, CCST INPE)	statements in the first para of 18.3.4 have been revised in coordination with Ch30, and in line with the corresponding chapters of WG1AR5. we have added confidence language where appropriate.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
546	69442	18	21	37	21	38	No reference cited for the statement. Please do so. To connect to the statement in line no. 27 - 30, it would moreover be interesting if the authors could also provide information (e.g. an adequate references) on how anthropogenic warming effects the risk of exceeding threshold (mentioned at line no. 6 on page no. 21) of 1 degree for the summer maximum sea temperature that would effect corals. A rise in temperature of 0.1 degree per decade (as mentioned in line no. 37), would result in a 0.5 degree rise (of the average termperature) after 5 decades. The question now is what can be stated on the summer maximum sea temperature trend under these conditions. (NETHERLANDS)	we agree that this is an interesting field to explore. We have, however, decided to streamline the chapter with a focus on observed climate change, and therefore eradicated the discussion on anthropogenic forcing from Box 18-3 (ln 27 referred to here). Discussion of anthropogenic influence on changes in physical parameters like Ocean mean and extreme temperature can be found in WG1AR5 Chapters (e.g. 10, 3 and in parts in Chapter 30)
547	77631	18	21	37	21	38	Need a traceable account of where these numbers come from - perhaps a cross-link back to the WG1 oceans chapter? (Francis Zwiers, Pacific Climate Impacts Consortium)	statements in the first para of 18.3.4 have been revised in coordination with Ch30, and in line with the corresponding chapters of WG1AR5. we have added confidence language where appropriate, and references to underlying chapters.
548	84496	18	21	37	21	38	Please provide references or cross-references to WGI to support these statements. (Michael Mastrandrea, IPCC WGII TSU)	statements in the first para of 18.3.4 have been revised in coordination with Ch30, and in line with the corresponding chapters of WG1AR5. we have added confidence language where appropriate, and references to underlying chapters.
549	64500	18	21	38	21	38	18.3.4. include reference to WGI ch 3 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have added a reference to Ch3 of WG1AR5 at the end of the paragraph, as related information on many statements within this paragraph can be found in Ch3
550	66903	18	21	38	21	38	Insert space between number and unit. (Peter Burt, University of Greenwich)	done
551	65152	18	21	40	21	40	"seawater" to be written as "sea water" (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
552	64501	18	21	41	21	41	18.3.4. This is not explicitly mentioned in the CC Box OA. The box rather contains projections, impacts, Risks, and Mitigation. The decrease by 0.1 pH units and greatest reduction at high latitudes is inWGI and in WGII ch6 p7 L 31-35. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	As Box CC-OA is one of the central places within WG2 that discusses Ocean Acidification, we think it is justified to point to the box here, not as a reference, but rather as a point where additional information can be found. Box CC_OA will provide additional references to the Ocean Chapters of WG1 and WG2
553	82865	18	21	41	21	41	It could be helpful to also provide specific cross-reference to the relevant chapter sections in the working group 1 report. (Katharine Mach, IPCC WGII TSU)	we have crossreferenced to WG1 to the extent we deemed useful. Information on this issue can be found in several places across WG1 Chapter 3, so we decided to add a generic pointer to that chapter at the end of the paragraph, instead of overloading the introductory paragraph with a whole list of WG1 chapter sections.
554	64502	18	21	43	21	45	18.3.4.can you present confidence levels here? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have included "with at least medium confidence" for these statements. due to space constrains, we can't reference every single item in this introductory paragraph. we are confident that readers interested in details on Ocean property changes will directly visit chapters 6 and 30, or WG1 Ch3 and 10
555	66904	18	21	44	21	44	Delete comma after 'distribution'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
556	74118	18	21	49	21	51	Here you could say just "attribution" and leave out "detection". Under the definition of climate change and detection being used in the chapter, the PDO and AMO would appear to qualify as "climate changes"especially when relatively short records are being analyzed. A clear statement of how the AMO and similar low-frequency variations are viewed (included? Excluded?) with regard to climate change in the chapter is needed. (UNITED STATES OF AMERICA)	We have reprhased this statement to clarify the relative roles of multidecadal oscillations. However, it is not correct that in our chapter, short term changes are considered to be "climate change". We are convinced that our generic definition is clear enough without a separate discussion for long term variability for all phenomena concerned.
557	58536	18	21	49	21	52	ENSO operates on inter-annual time scales whereas the PDO and AMO are interdecadal time scales; i.e. not just "long-term variability". (Janice Lough, Australian Institute of Marine Science)	you are of course right, and we have therefore deleted ENSO from the list of examples
558	62684	18	21	50	21	51	"El Nino-Southern Oscillation" which belongs to short-term variability should be removed, because it is one of inter-annual natural variablities. (RONGSHUO CAI, Third Institute of Oceanography)	you are of course right, and we have therefore deleted ENSO from the list of examples
559	58537	18	21	51	21	53	"fragmentary nature of ocean observations" - presumably of marine organisms and ecosystems? (Janice Lough, Australian Institute of Marine Science)	For the sake of brevity, we have left the language here unaltered, as we think it is clear from context to the reader what is meant.
560	66905	18	21	52	21	52	Delete comma after 'alteration'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
561	82866	18	22	4	22	13	It would be helpful to specify the general time frames for these statements. (Katharine Mach, IPCC WGII TSU)	Tme frames have been specified throughout the chapter wherever the underlying information made this possible. Where they have not been specified, the assessment concerns typically the last few decades.
562	79012	18	22	5	22	5	By "controversial" do you mean this rather than "inconsistent" or "both increasing and decreasing"? Please clarify. (Richard Jones, Met Office Hadley Centre)	we have rephrase this to read " trends...from different methods disagree"
563	82867	18	22	9	22	9	Is this statement referring to net primary production in the ocean? If so, it would be helpful to clarify this. (Katharine Mach, IPCC WGII TSU)	we do not share this impression. We trust that the reader will be able to infer that we are referring to marine primary production from the fact that this statement appears within the Ocean section. However, this statement has been rephrased and now does not mention "global primary prduction" any longer
564	74119	18	22	9	22	10	We assume that detection here leaves open the possibility that the changes have large (perhaps even dominant) contributions from natural variability of ocean temperatures on multidecadal time scales. The reader should be reminded of this. (UNITED STATES OF AMERICA)	see response to comment 556
565	66906	18	22	12	22	12	Change 'invertebrate' to 'invertebrates'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
566	64503	18	22	14	22	14	18.3.4.1. suggested to add the word presently as the future my show otherwise: In many regions, temperature presently exerts the strongest influence... (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have not made this change, as it is clear from the scope of our chapter that we are not talking about future conditions
567	66907	18	22	14	22	14	Small 't' for 'Temperatures' (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
568	82868	18	22	23	22	28	Relevant sections of chapters 6 and 30 should be cross-referenced, and additionally, relevant time frames for these statements should be indicated. (Katharine Mach, IPCC WGII TSU)	this section has been moved to the Coastal section (18.3.3.1). We have crossreferenced to table 18-1, where the reader can find additional references to chapter 6.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
569	64504	18	22	26	22	26	18.3.4.1. ch6 p 158 reads "high confidence" in Figure 6-16 for attribution. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	this statement has been moved to 18.3.3.1. the confidence statement is consistent with Chapter 18 framework and standards. Deviations from other chapters assessment can occur where these framework differ. We have made clear in the heading that we point to Chapter 6 as a source of further detail and information (via table 18-1) only, not as a source for our confidence assessment.
570	74120	18	22	26	22	26	We assume the warming that the changes are attributed to could in turn have large (perhaps even dominant) contributions from natural variability of ocean temperatures on multidecadal time scales. The reader should be reminded of this. (UNITED STATES OF AMERICA)	your assumption is correct. We have, however, refrained from stating the fact that changes can have contributions from natural long term variability every time it shows up in this section, as this is evident from our definitions.
571	64505	18	22	26	22	28	18.3.4.1. maybe cite 6.3.3 here? If you wish to present confidence levels, some are given in ch6 p 34 L 5-10 for different issues. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	statement has been moved to 18.3.3.1, and we cite the relevant sections of Chapter 6 in the references to table 18-1
572	66908	18	22	40	22	40	Replace 'Chapter' with 'Section'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
573	74121	18	22	42	22	42	"Regional climate variation and long-term global trends" is vague/unclear. We suggest rewording to something like "relative contributions of internal or natural climate variability vs. long-term changes due to anthropogenic forcing". (UNITED STATES OF AMERICA)	we have deleted this language from the table heading in order to avoid confusion. We have refrained from repeating the climate change definition used in our chapter (and throughout the report)
574	77632	18	22	44	22	44	I think it would be good to replace "significant" with a synonym such as "substantial", unless the intent is to refer to statistical significance, in which case, it would be good to be specific and say "statistically significant". The word significant is used so heavily in statistical contexts that I worry that readers may confound "statistical significance" with other interpretations. (Francis Zwiers, Pacific Climate Impacts Consortium)	even though we share your concerns, we have not changed language here. we feel that adding "statistically" in front of significant would invite debate rather than clarify for most readers. The studies summarized in the metanalysis mostly show statistically significant changes, so we think the use of the word is justified
575	77633	18	22	48	22	51	Does Chapter 18 have a view? The task is to provide an assessement, so it would be helpful if the chapter could do more than report from the literature. (Francis Zwiers, Pacific Climate Impacts Consortium)	due to considerable controversy about the power of such "metaanalysis" assessments (see e.g. Box 18-1) we feel that the neutral language chosen here is the best we can do
576	64506	18	22	51	22	51	18.3.4.1. maybe add reference to 6.3 here. 6.3 has a broad literature base and goes into detail for different climate-related factors. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we are crossreferencing table 18-2, which is largely based on Chapter 6 and gives the crossreferences in more detail than feasible here within the text.
577	74122	18	22	51	22	51	"climate change (including natural and internal variations)" (UNITED STATES OF AMERICA)	We have refrained from stating the fact that changes can have contributions from natural long term variability every time it shows up in this section, as this is evident from our definitions and the "climate change" definition used throughout the report.
578	64507	18	23	1	23	3	18.3.4.1. is it possible to merge this paragraph with the previous paragraphs? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have deleted this sentence and give reference to table 18-2 in the previous paragraph
579	66909	18	23	7	23	7	Replace 'Chapter' with 'Section'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
580	74123	18	23	9	23	9	"Regional climate variation and long-term global trends" is vague/unclear. We suggest rewording to something like "relative contributions of internal or natural climate variability vs. long-term changes due to anthropogenic forcing". (UNITED STATES OF AMERICA)	we have deleted this language from the table heading in order to avoid confusion. We have refrained from repeating the climate change definition used in our chapter (and throughout the report)
581	62685	18	23	12	24	11	Suggestions as the above mentioned general comments. (RONGSHUO CAI, Third Institute of Oceanography)	We have opted to merge ocean related information here into one section to avoid redundancy, and also because reviewers suggested it earlier
582	60096	18	23	14	23	14	This statement, 'while climate change is evident across the Ocean', is inconsistent with the statement on pg 3, and in the SPM…'in most oceans'. Are the effects of climate change evident across all oceans or most oceans? (AUSTRALIA)	we have rephrased this across the whole chapter to consistently read "across the ocean" (with regional variations).
583	82869	18	23	15	23	15	It would be preferable to specify the specific relevant sections of chapter 3 in the working group 1 contribution. (Katharine Mach, IPCC WGII TSU)	we have referenced Chapter 3 and subsections as appropriate
584	64508	18	23	18	23	18	18.3.4.2. add ocean basins (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have not added this word as we think the language is clear
585	66910	18	23	19	23	19	Where are the EBUEs? (Peter Burt, University of Greenwich)	we do not understand this comment. The reader is referred to the corresponding section/figure of Ch30
586	64509	18	23	20	23	20	18.3.4.2. abbreviation EBUE not needed here because is currently not used anywhere else in ch18 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have deleted the acronym
587	64510	18	23	23	23	23	18.3.4.2. Box 30.8.2 does not seem to exist. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	this paragraph has been rewritten, and the reference has been removed
588	74124	18	23	25	23	25	"attributed to anthropogenic emissions" ? (UNITED STATES OF AMERICA)	in line with our overall chapter focus, we have removed the reference to attribution from this paragraph, and only state detection
589	64511	18	23	27	23	27	18.3.4.2. once again this seems only related to physicochemical issues but should include biological and human systems. Probably this statement and table 18-3 should go across chapter 5,6, and 30 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we do not understand this comment. However, we have deleted the underlying table, and therefore also these lines from the chapter in order to save space.
590	66911	18	23	28	23	28	Change 'Deep Sea' to 'deep sea'. (Peter Burt, University of Greenwich)	this language has been deleted during rewrite
591	74125	18	23	33	23	33	Unclear: is the attribution to anthropogenic emissions (UNITED STATES OF AMERICA)	we have dropped this table from the chapter in order to save space.
592	77634	18	23	35	23	35	What kind of "bloom systems"? Phytoplankton? (Francis Zwiers, Pacific Climate Impacts Consortium)	"spring bloom systems" is standard oceanographic terminology and used throughout Ch30, we have therefore refrained from clarifying the term
593	74126	18	23	35	23	39	The first two sentences read together suggest that the Bering Sea shows strong warming and associated effects, which is not the case (Overland et al. 2012 Deep-Sea Research II 65-70; Lomas et al. 2012 Deep-Sea Research II 65-70, 126-140; Stabeno et al. 2012 Deep-Sea Research II 65-70, 14-30; Stabeno et al. 2012 Deep-Sea Research II 65-70, 31-45). Apparent poleward changes in latitudinal gradients of Bering Sea epibenthic invertebrate megafauna and fishes is associated with short-term (5-yr) fluctuations in position of cold pool, which is under the influence of spring sea ice distribution (Stevenson and Lauth 2012 Deep-Sea Research II 65-70, 251-259; Stabeno et al. 2012 Deep-Sea Research II 65-70, 14-30). Further, although loss of sea ice necessarily leads to the northward retreat of the cold pool in the northeastern eastern Bering Sea, the converse is also true, and there is no clear trend in loss of sea ice between ~60N ‰ÛÒ 66N (Stabeno et al. 2012 Deep-Sea Research II 65-70, 14-30). There is no northward expansion of productivity apparent in the Bering Sea (see for example Lomas et al. 2012 Deep-Sea Research II 65-70, 126-140, and other references in this special edition of DSR II 65-70). (UNITED STATES OF AMERICA)	we do not share the view of the reviewer. The paragraph clearly states that changes are "due to climate variability, change and fishing impacts"., not just warming trends. For the Bering Sea productivity changes, both chapter 30 and we have reassessed the literature and we have found evidence that productivity changes have indeed occurred in PARTS of the Bering Sea. Unfortunately, the corresponding text in chapter 18 was not updated with suitable references at FGD submission - however we wish to amend this during copy-editing, the sentence should now read: "Loss of sea ice has led to the retreat of the cold pool in parts of the Bering Sea, and northward expansion of productivity (30.5.1.1.2; Wang et al., 2006; Mueter and Lizow, 2008; Brown and Arrigo 2012)". We apologize for this editing error.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
594	74127	18	23	37	23	37	"climate variability, climate change" Comment: climate variability is subsumed within climate change under the definition used in this chapte. (UNITED STATES OF AMERICA)	this is not true. Effects of short term climatic variability are not subsumed under climate change, and we state this in several occasions.
595	64512	18	23	41	23	42	18.3.4.2. ch30 p 32 L18 reads "robust evidence and high agreement" for this. According to guidance notes (Mastrandrea et al 2010) this is "very high confidence" (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	We disagree with this interpretation of the guidance document. It is obvious to us that confidence assessment is done case by case, and the borders between "high" and "very high" confidence is blurry and subject of careful consideration based on expert judgment. However, we have omitted the confidence statement here during re-assessment of the underlying information and literature. while we are pointing towards Ch30, this statement is based on our own assessment of the literature, and the author team did not feel it was appropriate to add confidence language here.
596	82870	18	23	41	23	42	"high confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	we have omitted the confidence statement here during re-assessment of the underlying information and literature.
597	77635	18	23	42	23	42	For clarity, it might be helpful to insert "in marginal seas" after "fisheries yields" so that the sentence containing the assessment can stand alone if quoted by a user of the report . (Francis Zwiers, Pacific Climate Impacts Consortium)	thank you. We have rephrased the statement in order to clarify
598	64513	18	23	43	23	44	18.3.4.2. ch30 p 32 L19-20 reads "medium evidence and medium agreement" for this. Policymakers may wish to find this confidence language here? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	while we are pointing towards Ch30, this statement is based on our own assessment of the literature, and the author team did not feel it was appropriate to add confidence language here.
599	66912	18	23	46	23	46	Bad English: change 'like' to 'such as' (Peter Burt, University of Greenwich)	done
600	64646	18	23	47	23	47	ch30 p31 L12 refers to Semi enclosed seas for the statements on hypoxia, not only to the Baltic and Black Sea? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	while we are pointing towards Ch30, this statement is based on our own assessment of the literature, and the author team did not feel it was appropriate to make statements on all semi-enclosed seas.
601	64514	18	23	48	23	48	18.3.4.2. The respective sections in ch. 30 are formulated as a perspective whereas chapter 18 is about detection and attribution in present day oceans. However, expanding hypoxia is not only the case for the Baltic and Black Seas. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	while we are pointing towards Ch30, this statement is based on our own assessment of the literature, and while we acknowledge the fact that hypoxia is occurring in other areas of the Ocean, the author team did not feel it was appropriate to make statements on all semi-enclosed seas.
602	64515	18	23	48	23	48	18.3.4.2. should read „the Red Sea... (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	this typo was unfortunately overlooked during editing up to FGD submission and will be corrected during copy-editing
603	58538	18	23	48	23	49	delete "appear to have" - they did experience bleaching see, for example, Status of Coral Reefs of the World 2000, C Wilkinson (ed), Global Coral Reef Monitoring Network, AIMS, Qld, Australia. (Janice Lough, Australian Institute of Marine Science)	this factual error was unfortunately overlooked during editing up to FGD submission and will be corrected during copy-editing
604	74128	18	23	50	23	50	"long-term variability that has, combined with climate change" But long-term variability is part of the definition of climate change being used in the chapter. Please revise. (UNITED STATES OF AMERICA)	we have rephased this statement, which is now conistent with our chapter's definitions
605	82871	18	23	50	23	50	Given the level of confidence presented with this statement, it would be best to avoid "highly likely," which somewhat ambiguously sounds like a likelihood term. (Katharine Mach, IPCC WGII TSU)	we have rephased this statement, which is now conistent with our chapter's definitions, and deleted "highly likely"
606	82872	18	24	1	24	1	Have these mass mortality effects affected systems other than coral reefs? It could be helpful to specify this. (Katharine Mach, IPCC WGII TSU)	we do not refer to Coral Reefs in that line. We do not see the need to specify species affected in such a generic statement.
607	64516	18	24	2	24	2	18.3.4.2. the section cited is on the Black Sea. The tropicalisation is mentioned in 30.5.3.1.5. ch 30 p 30 L14 presents "high confidence" for this, maybe include it here as well? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have rephrased this statement to state "high confidence" in a major role of Climate Change in the observed tropicalisation.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
608	64517	18	24	4	24	4	18.3.4.2. Is it possible to give the confidence level for mass coral bleaching and mortality? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Confidence levels on a global level are given in Box 18-2, and regionally in table 18-8.
609	64518	18	24	6	24	6	18.3.4.2. please give a reference for high-quality databases (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have rephrased this statement, and data bases are no longer mentioned
610	82873	18	24	7	24	7	Which types of ecological changes? (Katharine Mach, IPCC WGII TSU)	we have not spelled this out for reasons of brevity. We discuss types of ecological changes and give relevant examples in other parts of the chapter, such as 18.3.4.1, table 18-2, and table 18-8
611	74129	18	24	8	24	8	One would assume that the PDO would be part of the definition of climate change used in this chapter. Where is the defining line? If a record is fairly short, a trend could be detected that is just due a fluctuation due to the PDO, but is not that the point of including internal climate variability in the definition of climate change:? it gives a lower threshold to meet for climate change detection. (UNITED STATES OF AMERICA)	we have rephrased this statement in order to make clear that short and long term variability complicate the attribution to anthropogenic forcing, while detection and attribution of an impact driven by a change in climate (including PDO) is more straightforward
612	82874	18	24	17	24	23	It would be preferable to provide more citations for this paragraph. (Katharine Mach, IPCC WGII TSU)	As this paragraph discusses farily generic issues, we do not share the view that many citations are needed to support these statements.
613	77636	18	24	19	24	19	Insert "is" before "ocean mixing". (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 612
614	64519	18	24	21	24	22	Box 18-4: do you mean time series? please clarify. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Yes we think this is indicated by "shorter studies"
615	77637	18	24	29	24	30	Also cite AR5 WG1 Chapter 2, which assess surface temperature changes (land and ocean). (Francis Zwiers, Pacific Climate Impacts Consortium)	We do not cite WG1 here because it is the Burrows paper that makes the direct intercomparison which we report
616	77638	18	24	34	24	35	Presumably this is strongly constrained by light availability … ? (Francis Zwiers, Pacific Climate Impacts Consortium)	Presumably, we refer to Burrows for a deeper discussion of the various factors
617	64520	18	24	40	24	40	"other" not needed here (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Yes, this language error was not corrected at FGD submission but will be rectified during copy edit.
618	64521	18	24	43	24	43	what are confounding effects? could you give a reference here? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Confounding effects are numerous, depending on the species in question and can therefore not be discussed here, given space limitations.
619	64522	18	24	44	24	44	could you give a reference here? should read dependent (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 618
620	74130	18	24	50	34	26	Howe and Cochrane (1993) provide a useful framework for classifying the economic effects of natural hazards, one that is also relevant to the range of effects associated with climate change. Other typologies of economic effects of disasters might also be useful in organizing the content on economic losses and ensuring its completeness, including those by Lindell and Prater 2003, Rose 2004, and Pelling 2002. Howe, Charles W., and Harold C. Cochrane. "Guidelines for the uniform definition, identification, and measurement of economic damages from natural hazard events: With comments on historical assets, human capital, and natural capital." (1993). Lindell, Michael K., and Carla S. Prater. "Assessing community impacts of natural disasters." Natural Hazards Review 4.4: 176-185. 2003. Rose, Adam. "Economic principles, issues, and research priorities in hazard loss estimation." Modeling Spatial and Economic Impacts of Disasters: 13-36. 2004. Pelling, Mark, Alpaslan ÌÐzerdem, and Sultan Barakat. "The macro-economic impact of disasters." Progress in Development Studies 2.4: 283-305. 2002. (UNITED STATES OF AMERICA)	We note your reference to the literature, yet will use the framework set out in 18.2 as they are consistently applied to all systems throughout the chapter.
621	77307	18	24	52	25	1	Is that climate is playing a minor role or is because of sparse literature/evidence or because it is difficult to evaluate the contribution of confunding factors. Changes detected in the human systems have been increasing at an unprecedented pace and therefore one should look for ways by which this incremental change can be measured. (Maggie Opondo, University of Nairobi, Kenya)	The text as we read it makes your point. Climate often plays a minor role and in some settings the literature is sparse.
622	76955	18	24	54	25	2	The "it is therefore…" sentence is overly restrictive. In addition to these reasons, you might want to add the absence of adequate monitoring networks. Some of these things probably could be detected and attributed, in spite of the dynamic nature of the systems and the high number of confounding factors, if we had better monitoring systems. (Marc Levy, Columbia University)	This is a very good point and we have added this to the manuscript.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
623	77639	18	25	3	25	3	Some readers may be a bit confused by this because they will understand "climate sensitivity" to be the sensitivity of the climate to for example, CO2 doubling. In particular, the "equilibrium climate sensitivity" (the eventual warming that would occur if CO2 were doubled and then held constant) is a standard metric of the potential for warming that is extensively used (and abused) in the policy community. Climate sensitivity here refers not to the sensitivity of the climate, but rather, to the sensitivity of a sector to climate change. I don't have a really good suggestion, but it seems to me that "sector sensitivity" [to climate change] would provide a clearer description of what is being discussed. Would it be possible to change the term that is used so that it reflects the thing that is sensitive (e.g., the sector) rather than the agent that produces the sensitivity (climate change in this case). (Francis Zwiers, Pacific Climate Impacts Consortium)	This is an excellent point. We have changed this to "sensitivity to climate" throughout.
624	82875	18	25	6	25	7	Given the findings across chapters, how rigorous is this statement? (Katharine Mach, IPCC WGII TSU)	We have modified this sentence to "clearest signal".
625	66913	18	25	11	25	11	Capital 'C' required for 'chapters' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
626	82876	18	25	18	25	20	It would be preferable to present calibrated uncertainty language for these statements. (Katharine Mach, IPCC WGII TSU)	We have refrained from this in this section, which is consistent with chapter 7.
627	77308	18	25	21	25	26	Indeed this supports the comment above (p. 24-25 Ln 52-1), that the difficulty is in measurement and not necessarily climate playing a minor role. (Maggie Opondo, University of Nairobi, Kenya)	We have noted this in the introduction to this section now.
628	66914	18	25	29	25	29	'et al.' should be in italics. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
629	66915	18	25	30	25	30	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
630	66916	18	25	31	25	31	Replace 'find' with 'found'. (Peter Burt, University of Greenwich)	done
631	76889	18	25	35	0	0	Section 18.4.1.1 needs to cross reference chapter 7. Chapter 7 has extended discussion on attribution of climate change impacts on agricultural crops (Food and Agriculture Organization of the United Nations (FAO))	We have done this now.
632	58302	18	25	37	25	54	Some new results should be cited as ' The wheat phenology at more than 100 national agro-meteorological experiment stations across China spanning the years 1981–2007 was examined (Tao et al., 2012; Xiao et al., 2013). Heading dates and maturity dates advanced significantly at 40% of the investigated stations; Lengths of growing period (from sowing to maturity) and vegetative growing period (from sowing to heading) were significantly reduced at about 30% of the investigated stations, especially for spring wheat in northwestern China, despite thermal accumulation during the periods increased. In contrast, although significantly and negatively related to mean temperature, lengths of reproductive growing period (from heading to maturity) increased at 60% of the investigated stations, owing to increase in crop cultivars thermal requirements or/and decrease in mean temperature. '1)Tao F., Zhang S, Zhang Z. 2012. Spatiotemporal changes of wheat phenology in China under the effects of temperature, day length and cultivar thermal characteristics. European Journal of Agronomy, 43, 201-212.2)Xiao Dengpan, Tao F., Liu Yujie, Shi Wenjiao, et al., 2013. Observed changes in winter wheat phenology in the North China Plain for 1981-2009. International Journal of Biometeorology.57, 275-285. (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	We have summarized this in our regional statement in table 18-9, which refers back to chapter 7.
633	66917	18	25	40	25	40	'via' should be in italics. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
634	82878	18	25	43	25	53	It could be helpful for the reader to clarify further how production and yields are distinct given the differing findings across these paragraphs. (Katharine Mach, IPCC WGII TSU)	We have clarified the difference between output and yield early on in the chapter.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
635	77640	18	25	43	26	5	It would be helpful if greater detail tracing back to the evidence and assessments in chapter 7 could be provided. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have done this now and referenced the relevant sections of chapter 7 throughout.
636	66918	18	25	44	25	44	Replace 'Chapter' with 'Section'. (Peter Burt, University of Greenwich)	we have changed referencing in keeping with the TSU guidance
637	82877	18	25	44	25	50	The chapter team should consider presenting the levels of confidence parenthetically at the end of the respective sentences to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	We have done this consistently with chapter 7's assessment.
638	84497	18	25	48	25	50	Which regions are in mind here? As mentioned in the context of the ES, Table 18-9 talks about positive yield changes in the UK, but associated with low confidence. (Michael Mastrandrea, IPCC WGII TSU)	We have added United Kingdom and China to this statement. Confidence levels have been adjusted in parallel with specification of climate role and baseline
639	82879	18	25	49	25	49	Is it possible to specify further which cold regions are meant? (Katharine Mach, IPCC WGII TSU)	We have added United Kingdom and China to this statement
640	74131	18	25	50	34	26	Many of the economic effects of climate change are impossible to discern in macroeconomic data, like those associated with the reallocation of resources to new uses (e.g., by governments reallocating capital improvement funds to cover increased maintenance costs and households whose time reallocated from leisure, cleaning, food preparation to disaster response and preparation). Benson, Charlotte, and Edward J. Clay. ‰ÛÏUnderstanding the Economic and Financial Impacts of Natural Disasters.‰ÛDisaster Risk Management Series No.4. The World Bank, Washington DC. 2004. Howe, Charles W., and Harold C. Cochrane. "Guidelines for the uniform definition, identification, and measurement of economic damages from natural hazard events: With comments on historical assets, human capital, and natural capital." (1993). (UNITED STATES OF AMERICA)	We noted that this is complex, yet cite the relevant literature. It is not impossible, but challenging.
641	58303	18	25	52	25	54	Some new results should be cited as ' For China, the planting area-weighted average showed that climate trends from 1980−2008 reduced wheat, maize and soybean yields by 1.27, 1.73 and 0.41%, respectively, while increasing rice yields by 0.56%. As a result, climate trends as a whole reduced wheat and maize production by 3.60E5 t and 1.53 E6 t, respectively, and increased rice and soybean production by 7.44 E4 t and 4.16 E3t, respectively (Tao et al., 2008; 2012). '1)Tao, F., Zhang, Z., Zhang, S., Zhu, Z., & Shi, W. 2012. Response of crop yields to climate trends since 1980 in China. Climate Research, 54, 233-247.2)Tao, F., M. Yokozawa, J. Liu, Z. Zhang. 2008. Climate-crop yield relationships at province scale in China and the impacts of recent climate trend. Climate Research, 38, 83–94. (Juqi Duan, National Climate Center, Chinese Meteorological Administration)	We have summarized these effects based on the evidence of chapter 7. we do cite the recommended literature in a more detailed statement in table 18-9
642	77641	18	26	9	26	9	Suggest inserting "Global scale" ahead of "Changes in the patterns of rainfall …" since the supporting paper considered only changes in extremes at the global scale. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have made this change
643	59036	18	26	9	26	10	This is a highly augmented question, and in my knowledge, most of the researchers do not agree with Min et al. (2011). The observed changes in the patterns of precipitation and intense precipitation events on globe and the continents in the past a hundred years are dominantly induced by the inner natural variability on decadal to multi-decadal time scales. (Guoyu Ren) (Guoyu Ren, National Climate Center)	We have changed this language to reflect that this is a statement made at the global scale.
644	77642	18	26	11	26	11	Zwiers et al., 2011, looks at cold temperature extremes (annual minima of daily minimum temperature and daily maximum temperature), but it doesn't look at frost events per se. You might want to cite Donat et al, 2013, JGR, doi:10.1002/2012JD018606, which is an update of the Alexander et al., 2006 paper. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have changed this sentence.
645	66919	18	26	12	26	12	Change 'nighttime' to 'night time'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
646	77643	18	26	16	26	16	You might also want to cite Chritidis et al, 2011, JCLIM, doi:10.1175/2011JCLI4150.1 (Francis Zwiers, Pacific Climate Impacts Consortium)	We have added this.
647	71561	18	26	18	26	19	Is virtually certain IPCC language? (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	Yes.
648	56332	18	26	19	0	0	spelling "concentrations" (Paul WOODS, World Vision)	done
649	56333	18	26	20	0	0	spelling "effects" (Paul WOODS, World Vision)	done

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
650	82880	18	26	23	26	24	"high confidence" could be placed within parentheses at the end of the sentence to maximize the directness of wording. (Katharine Mach, IPCC WGII TSU)	we have reworded this statement, and refrained from adding a confidence statement, given that we can not appropriately expand the discussion due to space limitations.
651	77644	18	26	23	26	27	In this discussion, I suggest inserting "tropospheric" before "ozone" or "O_3", so that it is clear that this is ozone change in the lower part of the atmosphere. Is there any literature on the impacts on crops of stratospheric ozone depletion via changes in downwelling UV radiation? (Francis Zwiers, Pacific Climate Impacts Consortium)	Good point. We have done this.
652	77645	18	26	30	26	31	I think it would be important to included pointers to a traceable account for these statements. I would be a bit sceptical of statements that variability has changed since, in general, variability change is substantially more difficult to detect than change in mean conditions. This would be further exaserbated by the spatial extent of the question (localized, urban scale rather than regional, subcontinental or continental scale). (Francis Zwiers, Pacific Climate Impacts Consortium)	We have dropped the variability statement here, as we did not consistently use it throughout the chapter, and rephrased in order to be clear.
653	64529	18	26	30	27	2	18.4.1.2. The writing should be toned down a bit (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	this section has been largely rewritten. We hope the concerns are addressed, as it is not really clear what (and which parts of the text" the reviewer refers to by "toned down a bit"
654	61966	18	26	32	0	0	The climate impacts on fisheries however do not sufficiently deal with ecosystem level impacts and feedback loops and focus on species of single fishery levels. Worth highlighting the need for a broader view? (Matthew Bunce, Institute of Marine Engineering, Science and Technology)	this is a very valid point, however, we have shortened our discussion here due to space constraints, and therefore opted to not include this additional point.
655	77646	18	26	33	26	36	Make sure that these statements (e.g., increased probability of flooding, drought, etc) are consistent with assessments elsewhere in the chapter. The evidence is not all black and white. (Francis Zwiers, Pacific Climate Impacts Consortium)	unfortunately, we cannot identify the text this comment is referring to. Overall, we have strived to ensure consistency with regard to our assessment of floods and droughts throughout the chapter.
656	82881	18	26	34	26	36	This statement should be coordinated with chapter 6 as well. Should the role of other drivers be acknowledged? (Katharine Mach, IPCC WGII TSU)	we are giving references to those sections of the report that most clearly discuss this issue, namely chapter 7 and 30. 18.3.4 holds a discussion of other drivers and also adds crossreferences to chapter 6
657	64523	18	26	36	26	36	18.4.1.2. you may also cite chapter 5.4.3.3 here (ch5 p 27) as well as chapter 7 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have inserted a crossreference to the fishery discussion of Chapter 7, however, as Chapter 5 has no relevant discussion of observed effects on fisheries, decided to not include a reference to chapter 5
658	64524	18	26	38	25	39	you may also cite here 6.3 (ch6 p 28): a bit more detailed or 6.6.3 (ch6 p 52): chapter conclusions (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have decided that the most helpful crossreferences here are CC-MB, 30.4 and the subsection 18.3.4 (which has many crossreferences to Chapter 6.3)
659	64780	18	26	38	26	39	There are more recent studies than Perry 2005 that should be cited such as: William W. L. Cheung, Reg Watson, Daniel Pauly 16 May 2013), Signature of ocean warming in global fisheries catch Nature, Vol. 497, No. 7449. 365-368, doi:10.1038/nature12156 (Robert Webb, NOAA OAR ESRL)	thank you. We do cite Cheung et al 2013 in the following sentence where we discuss his particular findings, which relate to harvest composition.
660	69443	18	26	38	26	44	On one hand authors said that there is high level of confidence in detection and attribution and in line no. 42 authors said that the ability to attribute changes in fisheries to climate change is confounded by host of other factors. This seems to indicate a contradiction. Please reformulate or spend some attention to this (NETHERLANDS)	we have rephrased this statement in order to clarify that, while climate change has a major role in detected shifts in distribution of fish, detection and attribution of changes in fishery yields and fisheries is confounded by a host of other factors.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
661	71562	18	26	40	26	41	Ocean acidification is out of context here. As far as I know OA does not affect fisheries directly, and if it does it has to be stated how this happens. (Grete Hovelsrud, Center for International Climate and Environmental Research - Oslo)	we think it is appropriate to mention the effects of Ocean Acidification evne if theirimpacts may be indirect, given that they combine and interact with temperature and other climate change effects. As this is a very generic statement, we do not think it is appropriate to spell pathways out in detail. the discussion can be found in 18.3.4, and Chapters 6 and 30.
662	64525	18	26	42	26	44	this is an important statement, and should not be hidden in the middle of a section. Chapter 6.?.?. discusses this in detail. May be move it to the end of 18.4.1.2? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have shortened and revised this whole section, and a similar statement is now the closing statement of the paragraph.
663	66920	18	26	43	26	43	Delete comma after 'pollution' (Peter Burt, University of Greenwich)	no longer applicable due to rephrasing
664	74132	18	26	43	26	43	One would assume that "decadal climate variability" would be part of the definition of climate change used in this chapter. Where is the defining line? If a record is fairly short, a trend could be detected that is just due a fluctuation due to decadal variability. (UNITED STATES OF AMERICA)	we have rephrased this paragraph in order to be consistent with out definitions, and improve clarity. Decadal climate variability therefore is no longer part of this statement.
665	64526	18	26	48	26	49	This does not read like a sentence suitable in a chapter strictly on DaA as it summarizes both the present and future perspectives. Above it reads, that attribution of detected changes to climate change is confounded???? it seems to be possible for coastal fisheries. Please clarify. (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we share the view that this is not appropriate for our chapter, and have therefore deleted this part of the discussion from the section.
666	82882	18	26	49	26	49	The use of "strong traceable account" is not fully clear here--a strong basis for attributing the impacts? (Katharine Mach, IPCC WGII TSU)	we have come to the conclusion that this discussion is not in line with our definitions, and not appropriate for our chapter, and have therefore deleted this part of the discussion from the section.
667	64527	18	26	52	26	52	same comment (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we share the view that this is not appropriate for our chapter, and have therefore deleted this part of the discussion from the section.
668	64528	18	27	1	27	1	important for what? foodweb, economics? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have come to the conclusion that this discussion is not in line with our definitions, and not appropriate for our chapter, and have therefore deleted this part of the discussion from the section.
669	64530	18	27	2	27	2	maybe include 6.6.2 (ch6 p 14) here. This section deals with the thermal biology of species (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we have come to the conclusion that this discussion is not in line with our definitions, and not appropriate for our chapter, and have therefore deleted this part of the discussion from the section.
670	76956	18	27	5	0	0	Section 18.4.1.3 Food Security. This section focuses only on production and price, but food security also depends on things like natural disasters, incomes, migration, and political conflict, all of which have their own set of connections to climate change. Production is already covered in another section. I would consider moving the price discussion to a the earlier production section and just dropping this food security section. If you want a stand-alone food security section it needs to touch on all the relevant drivers of food security that have a plausible connection to climate change. (Marc Levy, Columbia University)	We followed the structure given in chapter 7. But we moved this up to follow the production discussion and provided a traceable account to chapter 7 throughout.
671	79778	18	27	5	0	0	There are a series of papers by R. Lal that could be interesting to cite here: Lal R., Follett F., Stewart B.A., Kimble J.M. (2007) Soil carbon sequestration to mitigate climate change and advance food security. Soil Science 172:943-956. DOI: 10.1097/ss.0b013e31815cc498.; Lal R. Managing soils for a warming earth in a food-insecure and energy-starved world. Journal of Plant Nutrition and Soil Science 173:4-15. DOI: 10.1002/jpln.200900290; Lal R. (2009) Soils and food sufficiency. A review. Agronomy for Sustainable Development 29:113-133. DOI: 10.1051/agro:2008044. (Jessica Gutknecht, Helmholtz Centre for Environmental Research-UFZ)	The chapter is looking at detected and attributed impacts. These papers do not directly speak to D&A, so we have not included them

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
672	77647	18	27	6	27	13	Overall, I think the message from this paragraph comes across ok (high income countries seem to be resilient in the face of a 1 C change, but low income countries are not). However, it would be useful if you could assign a confidence level to this assessment. A minor comment is that 15-year normals (lines 6-7) would generally be considered short; the WMO standard is to define climate in terms of 30-year normals. Another minor comment is that it is not clear, from the sentence that spans lines 6 and 7, what the circumstances are under which impacts become large; do they become large whent there is a 1 C change in these 15-year means? (Francis Zwiers, Pacific Climate Impacts Consortium)	We decided not to attach a confidence statement to this paragraph as it is an emerging issue.
673	66921	18	27	9	27	9	'per capita' should be in italics. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
674	76890	18	27	16	0	18	Sentence "Increased demand…": what is the confidence level do the authors assign to this statement? Needs to cross reference Chapter 7 which discusses this topic extensively. (Food and Agriculture Organization of the United Nations (FAO))	We have cross referenced chapter 7's figure 7-3.
675	77648	18	27	16	27	16	Perhaps I'm getting to be a bit saturated at this point, but I don't see a detection aspect discussed in this sub-section. Presumably there should be. (Francis Zwiers, Pacific Climate Impacts Consortium)	We modified this paragraph to stress the the supply side detetcion in the Lobell et al. 2011 Paper
676	66922	18	27	19	27	19	Capital 'F' required for 'figure' (Peter Burt, University of Greenwich)	done
677	77649	18	27	20	27	20	I think it would be good to replace "significant" with a synonym such as "substantial", unless the intent is to refer to statistical significance, in which case, it would be good to be specific and say "statistically significant". The word significant is used so heavily in statistical contexts that I worry that readers may confound "statistical significance" with other interpretations. (Francis Zwiers, Pacific Climate Impacts Consortium)	we agree, however, we have dropped this entire section
678	82883	18	27	22	27	24	What is the timeframe for this statement? (Katharine Mach, IPCC WGII TSU)	We have inserted the timeframe.
679	74133	18	27	23	27	23	Consider clarifying: "temperature and precipitation trends (natural or anthropogenic in origin)"(UNITED STATES OF AMERICA)	We have clarified this throughout the document. Unless it says anthopogenic, it is not.
680	76957	18	27	27	0	0	Section 18.4.2. Cities and Urbanization. Drop the "and urbanization," because it gives the impression that you are looking at how climate change affects the process of urbanization. Either call the section "cities" or "urban areas." (Marc Levy, Columbia University)	Agreed. We have dropped urbanization from the title.
681	59037	18	27	27	27	45	This section could be greatly improved. Actually, urban climate change is overlapped to global and regional climate changes, making big cities the most rapid warming areas of the planet, and probably the most discernible places where increased precipitation and intense precipitation frequency have been caused by local human activities. In recent years, studies of urban climate change including those examining urbanization effect on changes in surface air temperature and precipitation over the regions like mainland China, U.S.A., Europe and Japan, have witnessed a big progress (e.g. Chung U, Choi J, Yun J I. (2004) Urbanization effect on observed change in mean monthly temperature between 1951-1980 and 1971-2000 in Korea. Climate change, 66(1-2): 127-136; Fujibe, F. (2009), Detection of urban warming in recent temperature trends in Japan, Int. J. Climatol., 29, 1811–1822, doi:10.1002/joc.1822; Ren GY. Zhou YQ. Chu ZY, et al. (2008) Urbanization effect on observed surface air temperature trend in North China, J Clim, 21(6): 1333-1348; Zhang AY, Ren GY, Zhou JX, et al. (2010) On the urbanization effect on surface air temperature trends over China. Acta Meteorol Sin 68:957-966 (in Chinese); Zhou L M, Dickinson R E, Tian Y H, et al. (2004) Evidence for a significant urbanization effect on climate in China, Proc. Natl. Acad. Sci. 101(26): 9540-9544; Zhou YQ, Ren GY (2009) The effect of urbanization on maximum, minimum temperature and daily temperature range in North China. Plateau Meteorol 28(5): 1158-1166 (in Chinese); 103. Yang, P., G. Y. Ren, W. Hou and W.D. Liu, 2012, Spatial and diurnal characteristics of summer rainfall over Beijing Municipality based on a high-density AWS dataset, Int. J. Climatol. (2012) Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/joc.3622). (Guoyu Ren) (Guoyu Ren, National Climate Center)	Your comment deals with the reverse causation we are after. We are looking for impacts of climate change on an outcome/system (here cities), not the impact of the system on climate change. We have therefore not addressed your comment in the manuscript.
682	77650	18	27	29	27	29	Suggest deleting "standard" (who determines what is a "standard" design criterion - these are presumably site/plant specific). (Francis Zwiers, Pacific Climate Impacts Consortium)	We deleted the word.
683	82884	18	27	30	27	30	"robust evidence" should be italicized. (Katharine Mach, IPCC WGII TSU)	done
684	82885	18	27	31	27	31	It should be clarified what is meant by "consistent with climate change projections." Is reference to mechanistic understanding more appropriate? (Katharine Mach, IPCC WGII TSU)	We deleted this wording.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
685	82886	18	27	33	27	36	The key findings of working group 1 should be cross-referenced here. (Katharine Mach, IPCC WGII TSU)	This subsection has been removed
686	61453	18	27	38	27	44	Is it clear that the D+A problem is inherently difficult or just that no studies have been done - it would be good if this were clarified with an assessment of available references. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	This subsection has been removed
687	79013	18	27	38	27	44	Is it clear that the D+A problem is inherently difficult or just that no studies have been done - it would be good if this were clarified with an assessment of available references. (Richard Jones, Met Office Hadley Centre)	This subsection has been removed
688	76959	18	27	49	0	0	Section 18.4.3.1. Economic Growth. Is it possible to assign a confidence statement to the income effect? This would be a very important finding if its confidence could be characterized. (Marc Levy, Columbia University)	Due to the single author team this evidence relies on we have not assigned a confidence statement.
689	66923	18	27	51	27	51	'per capita' should be in italics. (Peter Burt, University of Greenwich)	We have done this.
690	82887	18	27	51	27	54	Cross-reference to chapter 10 could be considered. (Katharine Mach, IPCC WGII TSU)	We have done this.
691	76958	18	27	53	0	0	Complexity is not an excuse for not understanding causality. We understand causality in all kinds of complex systems. You need to say something about the data or the theories not being adequate relative to the complexity. (Marc Levy, Columbia University)	Thank you. In this setting the system is so complex that causal inference is extremely difficult. No theoretical model would solve this issue. We have noted that the system is not well understood to address your comment.
692	77651	18	28	1	28	1	I think it would be important to included pointers to a traceable account for the statement concerning increased precipitation variability. I would be a bit sceptical of statements that variability has changed since, in general, variability change is substantially more difficult to detect than change in mean conditions. This would be further exaserbated by the spatial extent of the question (localized to winter tourist destinations rather than regional, subcontinental or continental scale). Was the intent was to say something about snowfall rather than precipitation in general? (Francis Zwiers, Pacific Climate Impacts Consortium)	The statement is study sepcific and we have dropped the word "increased" which better captures the study's approach.
693	66924	18	28	2	28	3	'per capita' should be in italics. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
694	66925	18	28	5	28	5	Replace 'degree' with degree symbol, for consistency. (Peter Burt, University of Greenwich)	done
695	82888	18	28	5	28	5	An increase in temperature over space or time?? (Katharine Mach, IPCC WGII TSU)	We have replaced this with "uniform".
696	66926	18	28	6	28	6	Insert hyphen between '15' and 'year'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
697	61454	18	28	6	28	7	Climate is more than just "averages of weather" but also statistics of variability of the weather. Please rephrase (and reinterpret the results if required) accordingly. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	We do understand this point very well. But the study we speak about here only looks at these averages. The text is correct but we have clarified that averages are just one possible measure of climate.
698	79014	18	28	6	28	7	Climate is more than just "averages of weather" but also statistics of variability of the weather. Please rephrase (and reinterpret the results if required) accordingly. (Richard Jones, Met Office Hadley Centre)	see response to comment 697
699	74134	18	28	10	28	10	Suggest Dunne et al. Nature, 2013 as another reference here. (UNITED STATES OF AMERICA)	We have added this citation.
700	66927	18	28	11	28	11	Replace 'degree' with degree symbol, for consistency. (Peter Burt, University of Greenwich)	done
701	59038	18	28	16	28	43	This section should also be rewritten, and it should focus on energy consumption. Many studies in China and other countries were conducted to investigate into the impacts of climate change and variability on national and regional energy consumptions, and found that although the increasing temperature raised the energy consumption in summer, it also led to a decline of energy consumption in winter, and the decrease in winter significantly overpasses the increase in summer in mainland China, U.S.A. and probably other countries in mid-latitude continents. The impacts can be attributed to the anthropogenic climate change. (Guoyu Ren) (Guoyu Ren, National Climate Center)	We have surveyed the literature extensively and only found studies looking at either sensitivities or projections of future demand. Since we cannot detect any of these studies in your comment, we cannot address this point.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
702	82889	18	28	18	28	43	The key findings of chapter 10 could potentially be further cross-reference in these paragraphs. (Katharine Mach, IPCC WGII TSU)	Chapter 10 does not report detected and attributed impacts on energy systems- we have howevere crossreferenced the related sections discussion sensitivity and available literature on past trends.
703	66928	18	28	37	28	37	Change 'regions' to 'region'. (Peter Burt, University of Greenwich)	we have dropped this section from FGD
704	66929	18	28	38	28	38	Delete comma after 'storms'. (Peter Burt, University of Greenwich)	we have dropped this section from FGD
705	78886	18	28	39	28	34	This para seems to have nothing to do with observed impacts and hence should be deleted. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	We have deleted this portion of the text, as we agree it is not relevant D&A information
706	82890	18	28	46	0	0	Section 18.4.3.3. Further cross-reference to the key findings of chapter 10 should ideally be provided. (Katharine Mach, IPCC WGII TSU)	There is nothing on D&A in chapter 10 on this subject as far as we can tell from our interactions, the FOD and SOD. However we inserted a crossreference for the appropriate subsection
707	65153	18	28	51	28	51	The word "lower" needs to replaced by "low" as the sentence does not show any comparison of two areas. (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	done
708	66930	18	28	53	28	53	Change '1980's' to '1980s' (it is not possessive). (Peter Burt, University of Greenwich)	done
709	66931	18	29	1	29	1	This is physically meaningless, replace 'warm' with 'higher' or 'increased'. (Peter Burt, University of Greenwich)	We have used higher.
710	64240	18	29	3	29	4	The sentence 'Eijgelaar et al. (2010) argue that so-called “last chance tourism” is a strong pull for tourists to visit Antarctica to admire the glaciers while they still can' is not suitable for an IPCC report. Especially, considering that the Antarctic ice sheet will under any conceivable circumstances last for thousands of years. (ICELAND)	We have rewritten this sentence. But we do not see reasons to dispute the validity of this particular study.
711	60097	18	29	5	29	6	The sentence reads 'In contrast, Zeppel (2012) states a low level of concern for coral bleaching by tourists visiting the GBR'. The author of the paper quoted advised that the paper does not mention levels of concern about coral bleaching. It is suggested that this sentence and the reference be deleted. Alternative references for tourism and commercial fishing in the Great Barrier Reef include: Marshall, N., Tobin, R., Marshall, P., Gooch, M., and Hobday, A. (2013) Vulnerability of marine resource users to extreme weather events. Ecosystems DOI 10.1007/s10021-013-9651-6 Gooch, M., Vella, K., Marshall, N., Tobin, R., and Pears, R. (2012) A rapid assessment of the effects of extreme weather on two Great Barrier Reef industries. Australian Planner DOI:10.1080/07293682.2012.727841 Marshall, N.A., Tobin, R.C. (2012). More Than What Meets the Eye: The Social and Economic Impacts of Recent Natural Disasters on Marine Resource Dependent Industries of the Great Barrier Reef Region. Great Barrier Reef Marine Park Authority, Townsville, pp. 1-82. (ISBN 978-1-921682-98-8) Moon, K. and Gooch, M. (unpublished) Rapid Impact Assessment of Great Barrier Reef commercial fishing and tourism sectors affected by floods and cyclones during 2010/2011. Internal Report prepared for the Great Barrier Reef Marine Park Authority. (AUSTRALIA)	We have deleted the sentence, as we have not been able to find literature that supports detection of observed effects on tourism.
712	77309	18	29	20	30	2	Section 18.4.4.1 appears misplaced or should be summarised. Why focus only on the economic impacts of extreme events and not other impacts like fatalities? Perhaps could be summarised by cross referencing to Ch.10 (Maggie Opondo, University of Nairobi, Kenya)	We have made clear what the limitations of this approach are by specifically mentioning non-market damages in the opening paragraph.
713	66932	18	29	25	29	25	This should be 'Section' rather than 'chapter'. (Peter Burt, University of Greenwich)	we have changed referencing in keeping with the TSU guidance
714	82891	18	29	28	29	29	"high confidence" could be placed within parentheses at the end of the statement. (Katharine Mach, IPCC WGII TSU)	Done
715	66933	18	29	29	29	29	This should be 'Section' rather than 'chapter'. (Peter Burt, University of Greenwich)	we have changed referencing in keeping with the TSU guidance
716	82892	18	29	33	29	35	"high confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	Done
717	59039	18	29	33	29	36	How is the contribution from the anthropogenic climate change? Is it a small positive or a negative contribution? (Guoyu Ren, National Climate Center)	We generally do not consider the role of anthropogenic climate change in this chapter or in this section, in part because the literature is currently insufficient for a comprehensive assessment. However we do discuss the detectability of a role of climate change in the following paragraph.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
718	66046	18	29	36	29	36	Besides the growing value of assets it would be necessary to consider the increasing number of premiums paid by customers (a major number of insurances). It is well explained in the reference of Barredo et al, 20012, about losses due to floods in Spain, that is already cited in line 44. This work shows the great influence of the value of insured losses considering the premiums paid by customers and the total value of dwellings. Reference: Barredo, J.I., D. Saurí, and M. C. Llasat, 2012. Assessing trends in insured losses from floods in Spain 1971–2008. Nat. Hazards Earth Syst. Sci., 12, 1723–1729, 2012. www.nat-hazards-earth-syst-sci.net/12/1723/2012/ doi:10.5194/nhess-12-1723-2012 (Maria-Carmen Llasat, University of Barcelona)	We have studied this paper and we agree that it is an valuable case study. However, for the sake of clarity (simplicity) in communication, we prefer not to mention analyses of premiums (or surcharges) since such studies are rare and the conclusions are the same as reached by the great majority of studies that analyze insured losses.
719	66934	18	29	36	29	36	This should be 'Section' rather than 'chapter'. (Peter Burt, University of Greenwich)	The report is currently inconsistent on a standard for this but will be dealt with during copy editing.
720	60835	18	29	38	30	2	Re lack of signal in normalised inusred losses and extreme wether events: my understanding is that another potentially confounding factor in detecting such a signal is that as the patterns of extremes are changing, adapation actions (eg better hazard reducton for wildfires, more rigorous building standards in cylone-prone areas etc) may have contributed to teh lack of signal but is very difficult to account for statistically.This is later refered to on p30 line 44 but perhaps the role of adapation needs to be made more strongly here as well. (Lesley Hughes, Macquarie University)	This is now discussed.
721	77513	18	29	39	29	54	The statement in lines 53-54 is incompatible with statements in lines 39-48; the statement of 53-54 can better be skipped. Indeed so far no convincing evidence can be shown (based on statistical analysis) that growth in extreme weather related losses can be partly attributed to climate change (next to factors such as growth in wealth). (Adriaan Perrels, Finnish Meteorological Institute FMI)	These lines have now been removed
722	66047	18	29	46	29	46	About the trend of tornadoes in Europe, you can find, in English language, the paper of Gayà et al (2011), where it si showed that a positive and significative trend in the annual number of tornadoes have been found since 1950, but that could be more related to the reporting improvement by population and proffesional people (plus a major exposure), than to climate change. Reference: Gayà, M., M.C. Llasat and J. Arús: Tornadoes and waterspouts in Catalonia (1950-2009). Nat. Hazards Earth Syst. Sci., 11, 1875–1883, 2011 (Maria-Carmen Llasat, University of Barcelona)	We appreciate this additional reference but the statement is about normalized losses in tornadoes and not frequency changes.
723	74135	18	29	49	29	49	What is century scale damage and loss of life? (UNITED STATES OF AMERICA)	The "century-scale" was inappropriate there and has been removed.
724	66935	18	29	53	29	53	Change 'are' to 'is' to avoid mismatch of singular and plural. (Peter Burt, University of Greenwich)	This sentence has been removed.
725	84498	18	29	53	30	2	The point being made here is not clear. Does this mean that there is some evidence of a trend consistent with anthropogenic climate change? Such evidence has not been presented in the section. Or is the discussion in the next section meant? Please clarify. (Michael Mastrandrea, IPCC WGII TSU)	We have written this sentence to try to clarify that while the evidence for detection of a climate change signal is only limited, there is much uncertainty and thus the conclusion that climate change has not played any role is not supported.
726	65154	18	30	7	30	7	The word "of" needs to be replaced by "on". (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	done
727	64781	18	30	9	30	11	There is value in understanding the role and contribution of anthropogenic climate change in extreme weather and climate events that is missed in the current form of that sentence. Thus suggest modifying the the sentence to read: "While useful as predictability assessments to advance early warning and risk management on seasonal and shorter climate timescales, assessing the contribution of climate change to a specific event poses particular challenges, both in terms of methodology and communication of results." (Robert Webb, NOAA OAR ESRL)	This sentence concerns challenges in event attribution rather than uses of event attribution study, so we have retained the original sentence.
728	66936	18	30	12	30	12	Insert 'of' after 'question'. (Peter Burt, University of Greenwich)	language has been changed
729	66937	18	30	13	30	14	'et al.' should be in italics. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
730	82893	18	30	21	30	23	"high confidence" could be placed within parentheses at the end of the sentence to maximize directness of wording. (Katharine Mach, IPCC WGII TSU)	Done.
731	77310	18	30	21	30	28	Given that there is not much evidence/literature on Detection and Attribution in human systems is it possible for Ch. 18 to look at the evidence of Detection and Attribution in the physical systems and link this to the human systems? As done in Line 21-28 on page 30? (Maggie Opondo, University of Nairobi, Kenya)	We now do this in a number of cases studies in the highly modified table (previously Table 18-4, now 18-3).

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
732	66938	18	30	22	30	22	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
733	64957	18	30	35	30	35	“increasingly vulnerable infrastructure” needs to be clarified. The infrastructure itself is becoming mechanically less vulnerable all the time. The point is that there is more and more of it, including more and more in vulnerable locations. (J. Graham Cogley, Trent University)	We now refer just to "vulnerable infrastructure".
734	64782	18	30	39	30	40	Change to read ""The storm surge hazard is expected to increase with additional contributions to rising local sea level as a result of anthropogenic emissions," (Robert Webb, NOAA OAR ESRL)	Thanks, but we have removed this paragraph because of redundancy with the new Table 18-3.
735	74136	18	31	8	31	8	Is "climate change" as referred to in this sentence the same as used in the WG2 report now? If not, this needs to be clarified. (UNITED STATES OF AMERICA)	Yes, this is now clarified
736	82894	18	31	12	31	13	The relevant time frame for these changes could be specified. (Katharine Mach, IPCC WGII TSU)	We now indicate that it is for these studies cover "past few decades".
737	65351	18	31	12	31	16	Research shows in Korea that temperature rise in spring is highly related to increase in patients who visit hospital with tree pollen allergy. (Source: Impact of meteorological variation on hospital visits of patients with tree pollen allergy. BMC Public Health. 2011 Nov 24;11:890) (REPUBLIC OF KOREA)	Thanks for the reference, but in this chapter we are restricting ourselves to detection and attribution evidence of observed trends.
738	77311	18	31	28	31	29	Although not peer reviewed - there is increasing evidence of the link between climate and health in this reference: ' World Health Organization (WHO) and World Meteorological Organization (WMO) (2012), Atlas of Health and Climate. WHO Press: Geneva'. Perhaps reference/assessment could be made to it in this section. (Maggie Opondo, University of Nairobi, Kenya)	see response to comment 737
739	82895	18	31	30	31	30	Within the parentheses, it would be helpful to specify that all of these lists are examples. (Katharine Mach, IPCC WGII TSU)	Done
740	84499	18	31	42	31	43	Does this mean there is some evidence regarding the role of observed warming or none? This is not clear from the paragraph, unless the last sentence is meant--this could be clearer, if so. (Michael Mastrandrea, IPCC WGII TSU)	We have heavily edited this paragraph, including the addition of new material, and we hope it is clearer now.
741	65352	18	31	42	31	49	Research shows in Korea that Scrub typhus carried by mites are highly correlated with high temperature and humidity in summer. (Source: Correlations between climate change-related infectious diseases and meteorological factors in Korea, J of Preventive Medicine and public health 2010;43(5); 436-444) (REPUBLIC OF KOREA)	see response to comment 737
742	77652	18	31	48	31	49	Is there any literature on Lyme disease in North America related to the expansion of the range of the tick vector? (Francis Zwiers, Pacific Climate Impacts Consortium)	There does not seem to be any effect on Lyme disease reported. We have merged the North American sentence with the European one to make this parallel (impacts on ticks but nothing noted for disease) clear.
743	77312	18	32	2	32	4	There are other studies indicating this trend of increasing incidence of malaria in the Kenyan highlands e.g. 'Wandiga, S., et. al., (2010) Vulnerability to epidemic malaria in the highlands of Lake Victoria basin: the role of climate change/variability, hydrology and socio-economic factors, Climatic Change, Volume 99, Issue 3-4,473-497.' (Maggie Opondo, University of Nairobi, Kenya)	Thanks for the reference, but we have elected to remain with a restricted key reference list due to space limitations. More details are discussed in Chapters 11 and 22.
744	77653	18	32	2	32	13	Is there any literature that links the spread of the West Nile Virus to climate change, and if so, should it be assessed here? (Francis Zwiers, Pacific Climate Impacts Consortium)	Considering space limitations and the nature of West Nile virus in North America as a recent invasive species, we have decided not to consider it here.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
745	84500	18	32	16	0	0	Section 18.4.6: It is important that this section cross-references and coordinates with Chapters 12 and 19. In addition, low confidence should not be equated with no confidence. (Michael Mastrandrea, IPCC WGII TSU)	These comments (745, 746, 748, 749, 751, 758) ask for harmonization with the relevant sections of Chapters 12 and 19. There is some disagreement between Chapters 12 and 19. In general, Chapter 19 expresses higher confidence in a link between weather and violence than Chapter 12. While Chapter 12 is careful to cite literature challenging such a link, Chapter 19 does not. A second issue is that work in this area has typically focused on an association between weather and violence and not climate change and violence. For these reasons, our assessments are closer to, but more conservative than, those in Chapter 12.
746	77313	18	32	16	33	16	Section 18.4.6.1. - more cross referencing to Ch. 12 necessary (Maggie Opondo, University of Nairobi, Kenya)	see response to comment 745
747	76963	18	32	18	0	0	18.4.6.1 Violent Conflict and Social Disruptions. The flow of the argument from research results based on variability to confidence statements based on climate change needs to be spelled out. The logic is not spelled out so the argument as it is transcribed is incorrect. My own undertanding of the logic is something like this: 1) we know with medium confidence or better that climate stress elevates violent conflict risk; 2) we know with high confidence that some of the observed climate stress is attributable to climate change; 3) therefore there is some basis for believing that some of the observed elevation in conflict risk in the recent past is attributable to climate change, though we cannot say either a) which specific climate stresses are attributabe to climate change, or b) which specific conflicts are attributable to climate change. (Marc Levy, Columbia University)	This comment asks us to spell out the argument by which a relationship between violence and interannual climate variability also implies a link between violence and climate change. We have done so.
748	82896	18	32	18	0	0	Section 18.4.6.1. The chapter team should ensure consistent, harmonized assessment with the key findings of chapter 12 and also Chapter 19 in this section. (Katharine Mach, IPCC WGII TSU)	see response to comment 745
749	79080	18	32	18	32	45	Please make sure that your valuation is in line with section 19.4.2.2 - currently, the two texts show deviating valuations. It may be advisable to reference the other sub-chapter and explicitly show differing points of view. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	see response to comment 745
750	82897	18	32	20	32	21	It would be helpful to specify the timeframe for this statement. (Katharine Mach, IPCC WGII TSU)	This comment asks for a time-frame to be attached to statements concerning the role of historical climate change in the collapse of civilizations. In fact, the time scale of these collapses is itself uncertain and almost certainly varies from case to case.
751	77654	18	32	20	32	45	The assessment here seems to be at least somewhat inconsistent with that in Chapter 19 (see 19.4.2.2 and 19.6.1.3.3), where the view seems to be that there is evidence that climatic events have been contributing factors to conflict. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 745
752	66939	18	32	21	32	21	Bad English: change 'like' to 'such as' (Peter Burt, University of Greenwich)	A minor wording change has been made.
753	82898	18	32	25	32	26	Where "climate" is mentioned on these lines, is "climate change" meant? (Katharine Mach, IPCC WGII TSU)	A minor wording change has been made.
754	76960	18	32	32	32	33	The paragraph is about climate variability and civil conflict, but it ends with sentence about climate change and civil conflict, which is a complete non-sequitor. I don't see anything in the section to support any statement at all about detection of observed climate change impacts in the form of civil conflict. (Marc Levy, Columbia University)	These comments (754, 755, 756) suggest that three statements to which we have assigned low confidence to the detection of a climate change impact should instead receive zero confidence. The basis for this suggestion is that, in each case, at best a connection can be claimed between violence and weather with the connection between weather and climate change unexplored. Upon reflection, we have accepted this argument and made the suggested changes.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
755	76961	18	32	35	32	38	This is another case where the text summarizes literature on variability and draws inferences about climate change. The implication is that if there is no evidence of something we can speak of there being low confidence about it, but that doesn't make sense. In the absence of any positive research results, the assumption should be zero confidence, not low confidence. (Marc Levy, Columbia University)	see response to comment 754
756	76962	18	32	40	32	45	This is another case where the text summarizes literature on variability and draws inferences about climate change. The implication is that if there is no evidence of something we can speak of there being low confidence about it, but that doesn't make sense. In the absence of any positive research results, the assumption should be zero confidence, not low confidence. (Marc Levy, Columbia University)	see response to comment 754
757	76964	18	32	48	0	0	18.4.6.2 Migration. The text doesn't say anything about detection and attribution of climate change impacts in the form of migration. I would drop the section and if you want add a sentence elsewhere in the chapter that migration is a phenomenon for which there is no d&a. A link to chapter 12, section 4 would enable people who are curious about the available evidence more broadly to read more. (Marc Levy, Columbia University)	we have followed your advice and dropped the section on migration. We have included a paragraph with a short generic discussion, and point to Ch12 for more detail.
758	82899	18	32	48	0	0	Section 18.4.6.2. The chapter team should ensure consistent, harmonized assessment with the key findings of chapter 12 throughout this section. (Katharine Mach, IPCC WGII TSU)	see response to comment 745
759	77314	18	32	50	32	54	There are an increasing number of studies on pastoral systems showing that migration/mobility as an age old coping mechanism to climate variability and change. For example, 'Little, P.D., McPeak, J., Barrett, C.B., and Kristjanson, P., (2008) Challenging Orthodoxies: Understanding Poverty in Pastoral Areas of East Africa, Development and Change, 39 (4): 587–611' and 'Burke, W.J. and Jayne, T.S. (2010) Spatial disadvantages or spatial poverty traps Household evidence from rural Kenya, Overseas Development Institute (ODI) Working Paper 327 and Chronic Poverty Research Centre (CPRC) Working Paper 167'. (Maggie Opondo, University of Nairobi, Kenya)	thank you. While we agree that migration is an important response and coping mechanism to environmental stress, including climate varibility, we do not see how the suggested literature could support a detection and attribution assessment. We have eliminated the subsection on migration, and point to ch12 for a more extensive discussion of vulnerability to climatic change, and migration as a coping mechanism.
760	82900	18	33	4	33	7	It would be helpful to specify the relevant time frames for these statements. (Katharine Mach, IPCC WGII TSU)	this section has been deleted, and some aspects of the discussion have been included in a seperate paragraph. As the remaining studies are merely examples, we have not included detailed information on time frames.
761	66940	18	33	9	33	9	'per' should be in italics. (Peter Burt, University of Greenwich)	we have deleted this sentence
762	77655	18	33	11	33	11	Define short- and long-distance. (Francis Zwiers, Pacific Climate Impacts Consortium)	we have deleted this section, and this sentence has been omitted from the short paragraph on migration included in 18.4.5
763	66189	18	33	16	0	0	Banerjee et al. (2012) report from an empirical study on labour migration in the flood affected settlements of the Hindu Kush Himalayan region that majority of migrant households perceived economic reasons as the most important determinant of migration for work. Other non-environmental factors included inadequate income, unemployment, and insufficient land for faming or grazing. Many of these non-environmental determinants of labour migration are sensitive to the impacts of rapid or slow water hazards. Also, nearly 80% of the sampled migrant households considered water hazards (viz. flood, flash flood and drought) to have important influence on the decision to migrate. [(Banerjee, Soumyadeep, Jean-Yves Gerlitz and Dominic Kniveton, 2012. A methodology for assessing patterns of labour migration in mountain communities exposed to water hazards. In Faist, Thomas and Jeanette Schade (Eds.) Disentangling Migration and Climate Change, Chapter 4. Heidelberg/London: Springer International. (Forthcoming)] (International Centre for Integrated Mountain Development (ICIMOD))	thank you for providing these most interesting references. However, as there is little to no evidence supporting detection and attribution of observed climate change impacts on migration, we have decided to delete this entire section, and point to Ch12 for a more extensive discussion of migration in the context of climate change.
764	82901	18	33	19	0	0	Section 18.4.7. The chapter team should consider substantially further cross-referencing the key findings and relevant sections of chapters 9 and 13. (Katharine Mach, IPCC WGII TSU)	We included cross-references to Chapter 13 at several points.
765	84501	18	33	19	0	0	Section 18.54.7: It is important that this section cross-references and coordinates with Chapters 9 and 13. In addition, given the widespread usage of "climate sensitivity" as shorthand for "equilibrium climate sensitivity" in a specific physical science sense, I would recommend using "sensitivity to climate change" or another alternative to avoid confusion. (Michael Mastrandrea, IPCC WGII TSU)	See reponse to comment 764. We avoided the term climate sensitivity.
766	77315	18	33	19	35	27	Section 18.4.7 - more cross referencing to Ch. 9, 12 & 13 necessary (Maggie Opondo, University of Nairobi, Kenya)	See reponse to comment 764.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
767	77656	18	33	22	33	22	Some readers may be a bit confused by this because they will understand "climate sensitivity" to be the sensitivity of the climate to for example, CO2 doubling. In particular, the "equilibrium climate sensitivity" (the eventual warming that would occur if CO2 were doubled and then held constant) is a standard metric of the potential for warming that is extensively used (and abused) in the policy community. Climate sensitivity here refers not to the sensitivity of the climate, but rather, to the sensitivity of a sector to climate change. I don't have a really good suggestion, but it seems to me that "sector sensitivity" [to climate change] would provide a clearer description of what is being discussed. Would it be possible to change the term that is used so that it reflects the thing that is sensitive (e.g., the sector) rather than the agent that produces the sensitivity (climate change in this case). (Francis Zwiers, Pacific Climate Impacts Consortium)	See reponse to comment 765.
768	82902	18	33	22	33	23	Wording here could be adjusted to ensure that "climate sensitivity" does not sound like "equilibrium climate sensitivity." (Katharine Mach, IPCC WGII TSU)	See reponse to comment 765.
769	66941	18	33	44	33	44	Change to '1990s' and '2000s' (the dates are not possessive). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
770	74137	18	33	48	33	49	Could add Held et al. PNAS (2005) reference here. (UNITED STATES OF AMERICA)	Thanks, this reference has been added now.
771	77657	18	33	49	33	50	Does this reflect an assessment of the impact of climate change, or an assessment of the metrics that are used to evaluate changes in poverty, or perhaps just the nature of the question? If the metric indicated that most small-holders and subsistence farmers were already empoverished, then the effects of factors that would exaserbate their condition might not result in a discernable change in the metric. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have included a reference to Chapter 13 where more details can be found.
772	74138	18	34	15	34	17	This first sentence, which seems highly-political in nature, should be considered for deletion. Does the IPCC want to imply that it has a position on indigenous rights? Why only discuss the rights of indigenous people and not the rights of others? The paragraph does not lose its impact if the first sentence is deleted and the rest of the paragraph, which focuses on observed impacts, remains. (UNITED STATES OF AMERICA)	Sentence has been deleted
773	64921	18	34	15	34	28	Suggest linking in case study from Chapter 20 to give amore regionally rounded analysis, specifically:Ziervogel, G and Opere (eds) 2010. Climate Change Adaptation in Africa Learning Paper. In Integrating Meteorological and Indigenous-Knowledge based seasonal climate forecasts in the Agricultural Sector. International Development Research Center, Ottawa, Canada (Ameyali Ramos Castillo, United Nations University - Institute of Advanced Studies)	We have included the link to the Africa TEK study in the TEK box where it fits better than in the main text.
774	66942	18	34	49	34	49	Capital 'C' required for 'century' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
775	64958	18	35	27	35	27	Delete “western”. The perspective in question is the same as that which prevailed for decades in the former Soviet bloc and now prevails in the explosively growing contributions of colleagues in China, India and elsewhere. (J. Graham Cogley, Trent University)	We have replaced the word "western" with "natural" - this changes somewhat the meaning of the statement, but it is still correct and noncontroversial
776	77658	18	35	29	35	29	I found the box on TEK to be very helpful. However, one thing I'm wondering about is whether you would also be willing to hazzard a discussion on the reliability/homogeneity (in space and time) of TEK. Also, a further question would be whether this source of information is being affected by confounders (such as the loss of the oral traditions that presumably have maintained TEK across generations) that are in addition to the myriad of other confounders that might affect the interpretation of climate impacts data? (Francis Zwiers, Pacific Climate Impacts Consortium)	The last paragraph of the TEK box discusses these issues, including about the lack of homogeneity and the difficulty of comparisons across time and space due to the specific cultural context of TEK. We can not expamd further due to space constraints

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
777	84502	18	35	32	0	0	Section 18.5: As mentioned in my general comments, I would recommend a reformulation of section 18.5. While short synopses with detailed summary tables is a good idea, the tables succeed more than the synopses, which are so abbreviated that they read as overgeneralizing without direct citations or cross-references, nor calibrated uncertainty language (all of which do appear in the tables). In a few cases, the information in tables provides a different impression than the section text. Given this, options include adding citation/cross-reference support to sections 18.5.1-8, or condensing the synopses in these sections further to summaries that explicitly link to the table entries (perhaps even as individual paragraphs in the current 18.5.9). The main information in these sections that is not captured in the tables is on changes in climate, which could be retained in close to its current form. (Michael Mastrandrea, IPCC WGII TSU)	Impact statements in section 18.5 now are all deferred to the tables, references and confidence assessments are provided there.
778	74139	18	35	32	39	45	Statements in regional sections are poorly supported. (UNITED STATES OF AMERICA)	see response to comment 777
779	66295	18	35	34	35	38	Same comment as for P11 (thematic chapters). If I understand correctly, this paragraph shifts much of the burden of literature review and analysis to the regional chapters minus chapter 30. While this is a reasonable and pragmatic approach, it does place quite some reliance on the quality of the assessment in these other chapters, some of which may not include detection/attribution experts on their author teams. How has this been cross-checked? Furthermore, should reviewers understand to look for details on D/A literature in the core chapters or in this chapter? (Timothy Carter, Finnish Environment Institute)	see response to comment 11
780	66943	18	35	35	35	35	Capital 'C' required for 'chapters' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
781	66944	18	35	35	35	35	Small 'o' for 'Ocean'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
782	66945	18	35	39	35	39	Delete comma after 'managed'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
783	82903	18	35	42	0	0	Section 18.5.1. Clearer cross-reference should be made to tables 18-6 through 18-9. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
784	77659	18	35	45	35	45	There is a missing "that" (insert before "continue to exist"). (Francis Zwiers, Pacific Climate Impacts Consortium)	done
785	74140	18	35	45	35	46	Suggest "apparently low natural temperature variability" since this is presumably based on some estimate, typically from models. Also this discussion seems to imply that the term detection in line 46 means detection relative to natural variability levels, which is different from the default definition used in the chapter. (UNITED STATES OF AMERICA)	Temperature variability is much lower on the African continent than in most other areas of the world in the observed record, as well as in climate model simulations, for well-understood dynamical reasons. The detection discussion concerns detectability of a signal against a no-trend baseline (the default when not specified), which means that the difference between the observed trend and zero-trend must exceed an amount considered improbable due to naturally generated variability.
786	77660	18	35	46	35	47	I think the authors should avoid the practice of reporting a confidence range (medium to high and low to high in these cases). The interpretation could be that there is high confidence in some aspects of a statement, and only low or medium confidence in others. Alternatively, it could be that the authors think they can different more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document (medium to high being somewhere between medium and high), or that they simply can't differentiate based on the evidence (and just suggest somewhere between low and high). The message is simply that the assessments should be as informative as possible, and should not leave readers guessing about which aspects of the assessment have high confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	This statement refers to the assessments of regional warming made in Chapter 22, which range from medium to high, depending on the region.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
787	69444	18	35	50	36	3	References are missing for these statements. (NETHERLANDS)	see response to comment 777
788	82904	18	36	3	36	5	It is somewhat ambiguous to use "domain" on both of these lines of text. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
789	77661	18	36	5	36	8	What results did the research produce, and what is the ultimate assessment by the chapter? (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 777
790	84503	18	36	5	36	8	What has resulted from these research focuses? The tables provide such details, which should be cross-referenced/summarized here. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 777
791	61967	18	36	5	36	9	Has there not been also a research focus on African inland rural systems at the expense of more populous coastal and urban areas? (Matthew Bunce, Institute of Marine Engineering, Science and Technology)	see response to comment 777
792	82905	18	36	11	0	0	Section 18.5.2. Clearer cross-reference should be made to tables 18-6 through 18-9. Additionally, the timeframe relevant to statements in these paragraphs should be clarified, and further provision of relevant citations and also calibrated uncertainty language should be considered. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
793	66946	18	36	15	36	15	Small 's' for 'Southern'. (Peter Burt, University of Greenwich)	done
794	61455	18	36	17	36	17	"Everywhere" - even in southern Europe? Advise checking this result. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	For heavy precipitation trends there is no clear spatial pattern of changes, with the continental trend being toward an increasing frequency.
795	79015	18	36	17	36	17	"Everywhere" - even in southern Europe? Advise checking this result. (Richard Jones, Met Office Hadley Centre)	see response to comment 794
796	64241	18	36	20	36	20	This sentence is too narrow in scope. The authors should change: “substantial loss of Alpine glaciers” --> “substantial loss of Alpine, Scandinavian and Icelandic glaciers”. It is easy to justify adding these regions in. Chapter 4 in the upcoming WGI IPCC report documents this evidence in detail. Figure 4.9 in the report shows the retreat of glaciers world wide, including Iceland and Scandinavia. For Scandinavia one can also point to the study by Andreassen et al (2012) who note that since 2000 most Norwegian glaciers “have experienced mass deficit, although years with positive balances still occur as in 2005 and 2007 for many of the maritime glaciers”. For Iceland the extensive retreat of glaciers is also described in the review article by Bjornsson and Palsson (2008) who report that “Since 1985, the once more warmer climate has steadily led to more widespread retreat, and every non-surging outlet glacier in Iceland has been retreating since 1995”. The relevant references are: Andreassen, L. M.;B. Kjøllmoen, A. Rasmussen, K. Melvold, Ø. Nordli, (2012) Langfjordjøkelen, a rapidly shrinking glacier in northern Norway, Journal of Glaciology, vol. 58, issue 209, pp. 581-593 and Bjornsson H. and Palsson F. (2008) Icelandic Glaciers, JÖKULL No. 58, 2008 p. 365 – 383. (ICELAND)	see response to comment 777
797	82906	18	36	22	36	22	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
798	66947	18	36	23	36	23	Insert comma after 'Mediterranean'. (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
799	77662	18	36	27	36	27	In general, it would be helpful to include assessments of the chapter's confidence in the evidence presented, and cross-links to the places where the evidence is evaluated. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 777
800	82907	18	36	27	36	27	Section 18.5.3. Clearer cross-reference should be made to tables 18-6 through 18-9. Additionally, the timeframe relevant to statements in these paragraphs should be clarified, and further provision of relevant citations and also calibrated uncertainty language should be prioritized. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
801	79779	18	36	29	0	0	In the Asia and Australasia summaries, as with the other summaries, it would be interesting to have sentence stating the overall state or history of research regarding observed responses of climate change. In the Aisia summary there is no reference to the confidence level or certainty of the statements. (Jessica Gutknecht, Helmholtz Centre for Environmental Research-UFZ)	see response to comment 777
802	59040	18	36	29	36	32	Change "with a more frequent ....., and contracting increasing and drying trends over coastal and inland China" to "with a more frequent ....., and contracting increasing precipitation in the south and drying trends in the north over eastern China". (Guoyu Ren, National Climate Center)	see response to comment 777
803	79016	18	36	31	36	31	"More frequent" would imply more than once a year! Please check and reword accordingly. (Richard Jones, Met Office Hadley Centre)	statement has been revised

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
804	77663	18	36	31	36	32	What aspect of the Indian monsoon occurs more frequently, but more weakly? On the face of it, suggesting that there has been a change in frequency of an annual phenomenon is confusing. Is there an assessment of the confidence in the estimates of trends that are mentioned (e.g, are the observations up to the job, are trends statistically significant relative to internal variability, etc)? (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 803
805	79017	18	36	34	39	2	There are very few references in this section. At least references to the relevant regional chapter sections should be included. (Richard Jones, Met Office Hadley Centre)	see response to comment 777
806	66190	18	36	36	0	0	The cascading effects of rising temperatures and loss of ice and snow in the Himalayan region are affecting, for example, water availability (amounts, seasonality), biodiversity (endemic species, predator–prey relations),ecosystem boundary shifts (tree-line movements, high-elevation ecosystem changes), and global feedbacks (monsoonal shifts, loss of soil carbon). (Jianchu et al,2009). (Jianchu Xu, R. Edward Grumbine, Arun Shrestha, Mats Eriksson, Xuefei Yang, Yun Wang, And Andreas Wilkes, 2009. The Melting Himalayas: Cascading Effects of Climate Change on Water, Biodiversity, and Livelihoods. Conservation Biology, Volume 23, No. 3, 520–530) (International Centre for Integrated Mountain Development (ICIMOD))	see response to comment 777
807	59041	18	36	37	36	39	Replace "Across most.....except from some....In some rivers (e.g. in China)....." with "Across most.....except for some....In some rivers (e.g. in northwestern China).....". (Guoyu Ren, National Climate Center)	see response to comment 777
808	66191	18	36	38	0	0	Decreases of 20% in summer runoff in the rivers Hunza and Shyok of Upper Indus Basin of Himalayas were estimated to have resulted from the observed 1°C fall in mean summer temperature since 1961, with even greater reductions in spring months. The observed downward trend in summer temperature and runoff is consistent with the observed thickening and expansion of Karakoram glaciers, in contrast to widespread decay and retreat in the eastern Himalayas.(Fowler and Archer,2006). (H.J. FOWLER and D. R. ARCHER, 2006. Conflicting Signals of Climatic Change in the Upper Indus Basin. Journal of Climate, Vol. 19, 1 Sep 2006) (International Centre for Integrated Mountain Development (ICIMOD))	see response to comment 777
809	66192	18	36	42	0	0	Changes in the timberline ecotone vegetation of Nanda Devi National Park (NDNP), Western Himalayas, India studied over a period of 30 years (1980–2010) using Landsat MSS and TM images reported no geographical shift in the upper limit of timberline, while the subalpine forest's canopy has increased substantially (Rupesh et al, 2012). (Rupesh R. Bharti, Bhupendra S. Adhikari and Gopal S. Rawat, 2012. Assessing Vegetation Changes in Timberline Ecotone of Nanda Devi National Park, Uttarakhand. International Journal of Applied Earth Observation and Geoinformation 18: 472–479) (International Centre for Integrated Mountain Development (ICIMOD))	see response to comment 777
810	66193	18	36	42	0	0	The improved process based equilibrium terrestrial biosphere model (BIOME3China)simulations on climate change impacts revealed large reduction in the temperate desert, alpine steppe, desert, and ice/polar desert, a large increase in the cold-temperate conifer forest, temperate shrubland / meadow, and temperate steppe, and a general northwestward shift of all vegetation zones of Tibetan Plateau (Jian 2000). (Jian Ni, 2000. A Simulation of Biomes on the Tibetan Plateau and Their Responses to Global Climate Change. Mountain Research and Development, 20(1):80-89. 2000). (International Centre for Integrated Mountain Development (ICIMOD))	This is not a study of detection and attribution
811	82908	18	36	46	0	0	Section 18.5.4. Clearer cross-reference should be made to tables 18-6 through 18-9. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
812	77664	18	36	48	36	49	The wording here seems a bit award. A suggestion would be "There is very high confidence that Australia and New Zealand have warmed during the past century, and high confidence that hot extremes have become more frequent, and cold extremes less frequent….". (Francis Zwiers, Pacific Climate Impacts Consortium)	Wording has been modified
813	78887	18	37	1	0	0	insert "at" before "several sites" (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	done
814	82909	18	37	1	37	17	Specific line-of-sight references to supporting chapter sections in Chapter 25 should be provided. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
815	64531	18	37	10	37	14	18.5.4. reference/s needed, very important for the numbers (chapter 25, or original publication?) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 777
816	82910	18	37	10	37	17	The relevant time frames for these statements should be specified. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
817	58539	18	37	13	37	14	"tropical cyclones" (Janice Lough, Australian Institute of Marine Science)	see response to comment 777
818	66948	18	37	14	37	14	Reference required. (Peter Burt, University of Greenwich)	see response to comment 777

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
819	82911	18	37	20	0	0	Section 18.5.5. Clearer cross-reference should be made to tables 18-6 through 18-9. Additionally, the timeframe relevant to statements should be clarified, and further provision of relevant citations and also calibrated uncertainty language should be prioritized. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
820	64783	18	37	28	37	29	The statement from WG1 AR5 is "However over the satellite era, increases in the intensity of the strongest storms in the Atlantic appear robust (Elsner et al., 2008; Kossin et al., 2007). To accurately represent this finding, suggest this sentence to read: ""There is robust evidence of an increase in intense tropical storms in the North Atlantic over the satellite era of the past several decades" (Robert Webb, NOAA OAR ESRL)	Satellites are among the data sources used in making this assessment and we have elected not to highlight them.
821	74141	18	37	28	37	29	The robust evidence of an increase in intense tropical storms in the North Atlantic over the past several decades presumably meets the requirements of this chapter to be a detectable climate change, since climate change includes internal climate variability, which is one of the hypothesized causes of this increase. So you could either identify this as such or explain that tropical cyclone D&A is being treated differently from the default D&A terminology in the chapter. (UNITED STATES OF AMERICA)	This is not a detection and attribution statement, but rather a statement of confidence in the direction of a trend over the period, no matter the cause.
822	77665	18	37	28	37	29	Even though this is the North American bit, it would nevertheless be useful to make a short note indicating that this is not the case in other basins. (Francis Zwiers, Pacific Climate Impacts Consortium)	We discuss tropical cyclones more generally in 18.4.4.
823	84504	18	37	28	37	29	This is the opposite of what WGI section 2.6.3 says, and must be changed to reflect the discussion there. (Michael Mastrandrea, IPCC WGII TSU)	WGI 2.6.3 states that it is virtually certain that there has been an increase in frequency and intensity since the 1970s.
824	77666	18	37	31	37	36	Need to provide links back to places where the evidence is presented and evaluated. Key confidence assessments could be repeated here. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 777
825	64784	18	37	34	37	35	Change to read ""Agricultural production is affected by increased temperature amplification of drought impacts in the Southern US and Mexico". That being said, is there evidence in the literature for any of the statements on regional impact of agriculture productivity in the Southern US and Mexico or are these inferred. Assessment statements not supported by peer-review literature do not meet the rigor of the IPCC assessment. Need to include citations documenting impacts for each region or suggest deleting regions that are not substantiated or entire sentence. (Robert Webb, NOAA OAR ESRL)	see response to comment 777
826	64785	18	37	35	37	36	Assessment statements not supported by peer-review literature do not meet the rigor of the IPCC assessment. Need to include citations documenting evidence for infrastructural damage due to more frequent extremes. (Robert Webb, NOAA OAR ESRL)	see response to comment 777
827	82912	18	37	39	0	0	Section 18.5.6. Clearer cross-reference should be made to tables 18-6 through 18-9. Additionally, the timeframe relevant to statements should be clarified throughout, and further provision of relevant citations should be made. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
828	77667	18	37	41	38	6	It would be good if a native English speaker could go over this bit of text (please don't take offense …). Also, I think it is necessary to provide links back to places where the evidence is presented and evaluated. (Francis Zwiers, Pacific Climate Impacts Consortium)	Native speaker has gone over what is left of this text.
829	66949	18	37	43	37	43	Either there is text missing, or repace 'in' with 'a'. (Peter Burt, University of Greenwich)	text has been revised
830	60836	18	37	46	0	0	Section 18.5.4: overall, a good summary for Australasia (Lesley Hughes, Macquarie University)	thanks!
831	66950	18	37	48	37	50	References required. (Peter Burt, University of Greenwich)	see response to comment 777
832	82913	18	38	9	0	0	Section 18.5.7. Clearer cross-reference should be made to tables 18-6 through 18-9. Additionally, the timeframe relevant to statements should be clarified throughout, and further provision of relevant citations and calibrated uncertainty language should be made. The line-of-sight cross-references or citations supporting each statement must be clear to the reader. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
833	64532	18	38	11	38	40	18.5.7. please give references (other sections of ch18, chapter 28, other chapters or original publications) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 777
834	77668	18	38	11	38	40	Need to provide additional links back to places where the evidence is presented and evaluated. Key confidence assessments on detected impacts could be repeated here. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 777
835	66951	18	38	24	38	28	References required. (Peter Burt, University of Greenwich)	see response to comment 777
836	79018	18	38	26	38	26	Please use more common/clearer words than "provisioning" and "phenological mismatch". (Richard Jones, Met Office Hadley Centre)	see response to comment 777

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
837	60423	18	38	28	0	0	The Antarctic sea ice extent has not declined overall (page 14 lines 37-38). (David Parker, Met Office Hadley Centre)	see response to comment 777
838	74142	18	38	28	38	28	Mention of decrease in Antarctic krill, in turn affected by sea ice loss brings to mind the fact that Antarctic sea ice in general has had a slight upward trend. So some further elaboration seems to be needed. (UNITED STATES OF AMERICA)	see response to comment 777
839	66952	18	38	30	38	30	Capital 'A' for 'arctic'. (Peter Burt, University of Greenwich)	see response to comment 777
840	82914	18	38	43	0	0	Section 18.5.8. Specific citations and line-of-sight cross-references to supporting chapter sections should be made as much as possible in support of all statements in this section. (Katharine Mach, IPCC WGII TSU)	see response to comment 777
841	61968	18	38	43	38	49	There are of course possible secondary impacts in terms of diversions of resources, food and consumer goods to countries that can afford to address their own local impacts of climate change with imports at the expense of more remote global markets such as islands with long supply chains and where rising prices mean goods move out of reach of the poor. (Matthew Bunce, Institute of Marine Engineering, Science and Technology)	see response to comment 777
842	64533	18	38	45	39	2	18.5.8. please give references (other sections of ch18, other chapters or original publications) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 777
843	66953	18	38	46	38	46	Change 'Coral reefs' to 'coral reefs'. (Peter Burt, University of Greenwich)	done
844	58540	18	39	4	39	8	Probably not "persistant La Nina like conditions" but decadal timescale variability affecting trade winds. See, for example, Merrifield MA (2011) A shift in western tropical Pacific sea level trends during the 1990s. Journal of Climate 24: 4126-4138. Merrifield MA and Maltrud ME (2011) Regional sea level trends due to a Pacific trade wind intensification. Geophysical Research Letters 38, doi:10.1029/2011GL049576. Merrifield MA, Thompson PR and Lander M (2012) Multidecadal sea level anomalies and trends in the western tropical Pacific. Geophysical Research Letters 39, doi:10.1029/2012GL052032. (Janice Lough, Australian Institute of Marine Science)	Statement has been removed
845	74143	18	39	7	39	8	The strong and persistent La Nina like conditions seems to be referring to low frequency variations, which if we understand the definition of climate change used in this chapter, would be included under climate change. (UNITED STATES OF AMERICA)	see response to comment 844
846	66954	18	39	14	39	14	Change 'is' to 'are' to avoid mismatch of singular and plural. (Peter Burt, University of Greenwich)	Statement has been removed
847	82915	18	39	21	39	21	Would it be preferable to present a level of confidence here? (Katharine Mach, IPCC WGII TSU)	Statement has been removed
848	66955	18	39	33	39	33	Change 'Drought' to 'drought' and 'Wildfire' to 'wildfire'. (Peter Burt, University of Greenwich)	the title of this table has been changed
849	66956	18	39	38	39	38	Change 'Marine' to 'marine', 'Ecosystems' to 'ecosystems' and 'Coastal' to 'coastal'. (Peter Burt, University of Greenwich)	done
850	66957	18	39	43	39	43	Change 'Human Systems' to 'human systems'. (Peter Burt, University of Greenwich)	done
851	84505	18	39	48	0	0	Section 18.6: As mentioned in my general comments, I would recommend further consideration of options for section 18.6, ideally in consultation with Chapter 19. I expected this section to present new information on observed impacts relevant to each reason for concern, and to provide assessment based on this evidence of whether current temperature increase is already associated with a transition away from white (e.g., to yellow) in terms of the RFC color gradient or not. I found the current explanation for each category (sometimes couched as "confirming" a reason for concern, sometimes couched in other terms) somewhat confusing, and have made further specific comments related to the section text where clarification would be useful. The section text should also reference other sections of Chapter 18 to ensure clear line of sight. Again, this section should also be coordinated with Chapter 19 to ensure consistency and a smooth handoff from assessment of changes to date (realized risks) to assessment of future risks. Please specifically consider the described scope of aggregate impacts in 19.6.3.5 compared to that here. Chapter 19's discussion focuses on nonmonetary aggregations, while here the focus is on monetary aggregations. (Michael Mastrandrea, IPCC WGII TSU)	The synthesis has been revised, following this and other comments, by, 1) re-arranging the discussion on Reasons for Concern with chapters 1 and 19, thereby avoiding redundancy and contradictions, 2) revising the detection and attribution elements for the RfCs along the lines indicated further below, and 3) by adding two new synthesis elements, on regional impacts and on cascading impacts.
852	59042	18	39	48	39	48	I suggest that the subtitle be changed to "Synthesis: Detected Major Negative Impacts of Climate Change and Reasons for Concern". The reason is that only some of the impacts from climate change are discussed here. I would also suggest to add a parallel sub-section entitled "Synthesis: Detected Major Negative and Positive Impacts of Climate Change and Their Implications for Adaptation". (Guoyu Ren, National Climate Center)	We have strived to achieve a full synthesis of observed impacts such as this has been possible from the literature. The "negative and positive" would have been possible if a sufficient number of studies had been available to demonstrate the positive impacts that this reviewer is hinting at.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
853	61456	18	39	48	45	9	Have the authors considered the current section 18.6 appearing at the beginning of the chapter? It synthesises important and policy-relevant results and so could appear earlier with the subsequent sections providing the more detailed evidence for this synthetic material. (European Union DG Research, Directorate Environment Climate Change & Environmental Risks Unit)	We have considered this but believe the synthesis is in the right place here. The Executive Summary presents key elements of the synthesis at the beginning of the chapter.
854	79019	18	39	48	45	9	Have the authors considered the current section 18.6 appearing at the beginning of the chapter? It synthesises important and policy-relevant results and so could appear earlier with the subsequent sections providing the more detailed evidence for this synthetic material. (Richard Jones, Met Office Hadley Centre)	We are surprised that this reviewer would use the exact same words as the one who made comment 853 and refer to our response there.
855	74144	18	39	52	40	5	This paragraph discussing the importance of D&A generally in the overall assessment even of projected future impacts, could receive more attention if it were moved up earlier in the chapter, perhaps in the introduction. (UNITED STATES OF AMERICA)	The paragraph has indeed been moved to the introduction, following this comment.
856	77669	18	39	52	40	37	The RFCs are also discussed extensively in Chapter 19; it would be good to establish cross-linkages in this introduction and to ensure that the descriptions of the RFCs and accounts of their history are fully consistent. I wonder if both chapters really need to provide detailed background, as well as an introduction in Chapter 1. Perhaps this would be a good option for a cross-cutting box? (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 851
857	64959	18	39	53	39	54	“Observed losses … lend additional plausibility”: this is out of focus. It is certain (not “virtually certain” in calibrated language) that if the temperature goes up more ice will melt. A more useful point to make here is that we are committed to continued loss of glacier ice because of past warming. (See comment at P3 L20.) (J. Graham Cogley, Trent University)	We do not follow this argument since the linkage between climate change and ice loss also involves changes in snow accumulation which could compensate for melting-caused losses. To make this clearer, we have replaced "warming" with the more appropriate "climate change".
858	82916	18	40	9	40	10	It may be clearest indicate why this approach was not taken. (Katharine Mach, IPCC WGII TSU)	We feel that this discussion would lead to far away from the synthesis (it would have to argue about the effort that would have been necessary, and why resources for this would have been insufficient), we have rephrased the sentence to make even more clear the distributed approach we have taken here.
859	74145	18	40	10	40	11	The use here of the word "fully" is questionable. (UNITED STATES OF AMERICA)	We have deleted the word "fully".
860	74146	18	40	11	40	22	While the reasons for concern may have been developed in response to requests from countries that the IPCC assess the science with respect to the UNFCCC's commitment to stabilize GHG concentrations to prevent DAI, it should be clearly stated that the five reasons for concern were developed by authors as THEIR idea of what might be useful measures and NOT what the UNFCCC determined as measures for dangerous. This subtle but important distinction could be incorporated into the sentence starting on line 13 as follows: "The RFC concept was developed as a paradigm by authors in IPCC-TAR...." and in the sentence beginning on line 14; "Through development of the RFCs, the authors were providing a construct to respond directly to requests from countries..." (UNITED STATES OF AMERICA)	We have removed the discussion of the UNFCCC here - all relevant information about it is handled by chapter 1 now.
861	84507	18	40	18	40	22	Here, it is not clear why this section could not present whether current temperature increase is already associated with a transition away from white (e.g., to yellow) in terms of the RFC color gradient or not, based on the assessment in Chapter 18. (Michael Mastrandrea, IPCC WGII TSU)	We think this is actually what our text says and therefore do not understand the comment.
862	82917	18	40	19	40	26	It seems that the assessment here should focus on warming to date within each reason for concern, rather than make assertions about future risks. (Katharine Mach, IPCC WGII TSU)	The main discussion about future risks has been moved to chapter 19 where it belongs.
863	66958	18	40	26	40	26	Capital 'C' required for 'chapter' (in this context it is a proper noun and is also in keeping with other usage in the document). (Peter Burt, University of Greenwich)	we have generally incorporated advice on technical edits (such as spelling, commata etc.), however, language has changed in many places, and technical editing will be done consistently during production to remove any remaining errors.
864	82918	18	40	27	40	29	Should the yellow to red scale used to characterize risks be acknowledged here? (Katharine Mach, IPCC WGII TSU)	See response to comment 862
865	84508	18	40	28	40	29	It is not clear what expressing the degree of concern in qualitative terms means exactly. Again, could not this be the RFC color gradient and where we are at current temperatures based on available evidence? (Michael Mastrandrea, IPCC WGII TSU)	See response to comment 862

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
866	84506	18	40	33	40	33	This should be Chapter 19 rather than 1. (Michael Mastrandrea, IPCC WGII TSU)	At this time, the reorganization between chapters 1, 18 and 19 makes us expect that the correct reference is indeed to chapter 1.
867	82919	18	40	40	0	0	Section 18.6.2. All statements made within this section should fully have their traceable account within Chapter 18. This means that the focus should be on warming that has occurred to date and impacts observed to date. Future-oriented assessment of risks should be left to Chapter 19 for this framework. This section should be very carefully coordinated with the chapter 19 author team. (Katharine Mach, IPCC WGII TSU)	We could not find a more manageable way to portray the tracable accounts than through our current set of tables. The future risk assessment is indeed now handled exclusively by chapter 19.
868	74147	18	40	40	45	9	Section 18.6.2: The treatment of Reasons for Concern is not in keeping with the level of scientific rigor displayed in the rest of the chapter. Definitions for three of the five reasons of concern (risks from extreme weather events, aggregate impacts and risks of large-scale discontinuities) have changed from previous IPCC Assessments and notably from the key literature source cited (Smith 2009). As such it appears that the authors are using the same examples of warm water corals and the Arctic to show 'high-confidence' progress on most fronts. This comes across as the authors reaching to show progress, while ignoring the low and medium levels of confidence in attribution for droughts, floods, aggregate impacts as previously defined, and large-scale singularities (thermohaline circulation and Greenland and West Antarctic ice sheets). See relevant topics in Tables 18-11a & b and 18-12. (UNITED STATES OF AMERICA)	As mentioned before, the treatment of RFCs has been reduced to what is needed in support of chapter 19s risk analysis. Besides this, we do not see a problem that significantly affected large systems are mentioned in more than one RFC - the arguments for doing so have now been made more clear.
869	74148	18	40	40	45	9	Section 18.6.2: This section is not well referenced and overly reliant on citations from the same, small set of authors. This likely stems from the RFCs being a construct by these authors and not broadly representative of a topic found in the literature. But literature on detection and attribution of observed impacts to unique systems, observed impacts of floods, droughts and cyclones, observed changes to large scale singularities must be present in the literature and should be assessed if this section is to be included. (UNITED STATES OF AMERICA)	The now shortened treatment of material related to the RFCs is an analysis of the material assembled throughout this chapter. We do not see how this section could reference other sources than the conceptual works on RFCs.
870	82920	18	40	48	40	48	It would be preferable to indicate specifically which physical systems are meant. (Katharine Mach, IPCC WGII TSU)	The shorter treatment has not provided space to be more specific on this point.
871	82921	18	40	49	40	49	Where "tending" is mentioned, variability should perhaps be more explicitly acknowledged. (Katharine Mach, IPCC WGII TSU)	see response to comment 870
872	82922	18	40	50	40	51	It would be helpful to specify which systems are meant. Also, do the reasons for concern here pertain to observed temperature increase to date? (Katharine Mach, IPCC WGII TSU)	see response to comment 870
873	84509	18	40	50	40	52	Based on this, does this mean that, e.g., that current temperatures are already associated with a transition to yellow on the color scale? (Michael Mastrandrea, IPCC WGII TSU)	We do not address this point
874	66959	18	41	8	41	8	Capital 'B' for 'Boreal' (as used elsewhere in chapter/document). (Peter Burt, University of Greenwich)	done
875	59043	18	41	15	41	18	"Evidence for detection and attribution of shrinkage and recession of glacial comes from all continents". Attributed to what? There is evidence for the influence of aerosols on melting of sea ice, glacial and snow, and a recent paper (in Science or Nature?) attributed the accelerated melting of Arctic sea ice to the direct influence of CO2 itself on crystal structure of ice. What is the contribution from aerosols and CO2? (Guoyu Ren, National Climate Center)	This is condensed language - attribution refers to climate change as is done everywhere else in the chapter.
876	82923	18	41	17	41	18	It seems this assertion should pertain only to the portion of this reason for concern for temperature increase observed to date. (Katharine Mach, IPCC WGII TSU)	We do not understand this comment
877	84510	18	41	17	41	18	Again, it appears that "confirming" the reason for concern could imply a statement about future risks as well as changes to date, but that extends beyond the scope of this chapter. I would suggest clarifying (and constraining) the conclusion presented here to inform the "observed" part of each RFC, linking to what is presented in Chapter 19 (which should build on the information presented here as well). (Michael Mastrandrea, IPCC WGII TSU)	Wording has been modified
878	64960	18	41	28	41	30	I would delete this unnecessary quotation and also that at L42-46, perhaps retaining the first sentence of the latter. (J. Graham Cogley, Trent University)	We have not deleted the quotation but shortened it to the part we find essential for understanding the definition.
879	78646	18	41	30	0	0	possible references of the effects of heat waves on phyto- and zooplankton: Huber V, Wagner C, Gerten D, Adrian R. 2012. To bloom or not to bloom: contrasting responses of cyanobacteria to different heat waves explained by critical thresholds of abiotic drivers. Oecologia: 169:245-256. Huber V., R. Adrian, D. Gerten. 2010. A matter of timing: heat wave impact on crustacean zooplankton. Freshwater Biology 55: 1769-1779. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	At this point of the summary, we do not introduce additional evidence.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
880	82924	18	41	38	41	46	Care in distinguishing trends in weather and climate extremes versus trends in impacts of weather and climate extremes should be ensured here. (Katharine Mach, IPCC WGII TSU)	We have re-written this paragraph to reflect this point.
881	82925	18	41	44	41	44	Would "impacts" be more accurate than "responses"? (Katharine Mach, IPCC WGII TSU)	This text has been re-written and the responses bit not longer appears.
882	77670	18	41	48	41	48	Continuing on with the narrative in the previous paragraph (lines 38-46) it would also be useful to briefly mention SREX (IPCC, 2012) findings on extremes, and to review the current WG1 AR5 assessments on extremes - some of which are somewhat different from those of the AR4 (notably on tropical cyclones and drought). Mention of drought at some point in this discussion would probably also be useful. (Francis Zwiers, Pacific Climate Impacts Consortium)	We now do this at this location of the text, rather than several paragraphs further down.
883	60098	18	41	51	41	51	This statement currently reads, 'it is generally accepted that climate change has not been a major driver of that change in risk'. Should these statement read 'it is generally accepted that climate change has not been proven to be a major driver of that change in risk'? (AUSTRALIA)	While the original text was accurate, for conciseness we have now removed this text.
884	82926	18	42	13	42	14	It seems this assertion should be limited to reasons for concern pertaining to already observed temperature increase. (Katharine Mach, IPCC WGII TSU)	Yes, so this has been removed.
885	77671	18	42	14	42	14	I think it would be good to replace "significant" with a synonym such as "substantial", unless the intent is to refer to statistical significance, in which case, it would be good to be specific and say "statistically significant". The word significant is used so heavily in statistical contexts that I worry that readers may confound "statistical significance" with other interpretations. (Francis Zwiers, Pacific Climate Impacts Consortium)	This text has been removed in response to another comment.
886	84511	18	42	15	42	17	This statement needs unpacking a bit, as coastal impacts were presented as not easily attributable outside the Arctic. (Michael Mastrandrea, IPCC WGII TSU)	This section has been re-written and the mention of sea level rise has been removed.
887	64961	18	42	22	42	23	I would delete the repetitive “but …” clause. (J. Graham Cogley, Trent University)	This text has been re-written and this clause no longer appears.
888	82927	18	42	23	42	24	This assertion should be limited to reasons for concern pertaining to already observed temperature increase. (Katharine Mach, IPCC WGII TSU)	Yes, so this has been removed.
889	84512	18	42	23	42	24	Again, it appears that "confirming" the reason for concern could imply a statement about future risks as well as changes to date, but that extends beyond the scope of this chapter. I would suggest clarifying (and constraining) the conclusion presented here to inform the "observed" part of each RFC, linking to what is presented in Chapter 19 (which should build on the information presented here as well). (Michael Mastrandrea, IPCC WGII TSU)	Yes, so this has been removed.
890	66296	18	42	26	42	26	Figure 18-5 addresses the issue of detection and attribution of extreme weather events, using the same format as for impacts in Figures 18-3 to 18-7. However, this is really a WG I issue, though I don't find this portrayed similarly in Ch 10 or Ch 14, WG I SOD. Or perhaps discussion of this belongs in Ch 21, so is it covered sufficiently? In any case, how was Figure 18-5a constructed and has there been some interaction with WG I? More broadly, is the left hand figure necessary unless the extremes described there are also analysed for their associated impacts in Figure 18-5b? My sense is that these two figures are too different for it to be meaningful to place them side by side. Furthermore, (a) is an anthropogenic climate change attribution exercise, whereas (b) is a climate extreme attribution exercise, where the climate determinant of a given impact (extreme event of some kind) is not specified. So joint attribution would be well nigh impossible across these two figures - or am I missing something? (Timothy Carter, Finnish Environment Institute)	These two tables did not match each other as well as planned, so the content of the climate extremes table has been mostly dropped, with relevant bits transferred to support a modified impact extremes table.
891	82928	18	42	47	42	48	The key findings of chapter 1 could be cross-referenced here. (Katharine Mach, IPCC WGII TSU)	not done in order to save space
892	66960	18	42	49	42	49	Small Islands' in this context is not a proper noun, so should be 'small islands'. (Peter Burt, University of Greenwich)	done
893	77672	18	42	49	42	52	The description of the synthesis doesn't seem very transparent to me. One thing that is obscure for me is that I am not sure what is meant by "middle-to-high range" for detection or for detection and attribution. Also, the subsequent sentence, which indicates that metrics can be combined or decomposed in various ways could lead to some readers having concern that there is room in the assessment, or the presentation of assessment findings, for cherry picking. I'm not sure how to alleviate that - but the current description leaves me vaguely uneasy. (Francis Zwiers, Pacific Climate Impacts Consortium)	text has been revised

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
894	59044	18	42	52	42	54	It was recognized many years ago that the impacts of anthropogenic climate change are unevenly distributed among countries and regions, with some suffering and the others benefiting from the change. There are indeed fewer publications on the disparities of impacts. This may represent another bias in studies or publications in the field of climate change science. (Guoyu Ren, National Climate Center)	Yes, but efforts are made to reduce this disparity - our conclusion is that the efforts have been insufficient so far.
895	82929	18	43	7	43	9	It could be helpful to more explicitly indicate the assessment underpinning these trends. (Katharine Mach, IPCC WGII TSU)	This short statement is a summary of the full set of regional tables
896	82930	18	43	26	43	27	It could be helpful to cross-reference the original chapter here. (Katharine Mach, IPCC WGII TSU)	not done in order to save space
897	62396	18	43	33	43	33	The text in line 33 reads as Table 18-2, however the correct numbering is 'Table 18-12'. (INDIA)	reference has been corrected, it is not table 18-11
898	82931	18	43	40	43	45	These assertions should be limited to reasons for concern pertaining to already observed temperature increase. (Katharine Mach, IPCC WGII TSU)	We do not understand this comment
899	64962	18	43	44	43	45	Delete “Overall,”. But I cannot work out what if anything the rest of the sentence means. Perhaps “This assessment reinforces concern about globally aggregated impacts of recent climate change, because impacts have been detected across several systems with a variety of metrics.” (The globally aggregated impacts are the sum of the impacts on systems.) (J. Graham Cogley, Trent University)	Statement has been fully revised.
900	80414	18	44	8	44	8	Please provide a specific reference to WGI. (Gian-Kasper Plattner, IPCC WGI TSU)	For space reasons, we have not expanded but removed the reference to WGI
901	82932	18	44	19	44	19	Can use of "irreversible" here be fully supported? (Katharine Mach, IPCC WGII TSU)	Clearly, irreversible is a matter of time-scale. All available evidence points to these processes being irreversible at the time scale of decades to millennia.
902	84513	18	44	19	44	19	The relevant executive summary text discusses evidence of early warning signals of large-scale regime shifts, rather than that irreversible regime shifts are already occurring. (Michael Mastrandrea, IPCC WGII TSU)	text has been revised
903	82933	18	44	21	44	21	Would the phrase "biophysical threshold" more nearly reflect general usage? (Katharine Mach, IPCC WGII TSU)	"regime shift" is appropriate and also in agreement with chapter 4
904	58541	18	44	31	44	31	"lost at a large scale……." Although there has been loss of some coral reefs and some corals on some reefs due to thermal stress, many reefs have recovered from thermal (and other) stress events. I think a better term would be degradation of reefs. Coral reef communities are changing rather than disapearing. (Janice Lough, Australian Institute of Marine Science)	text has been revised
905	82934	18	44	35	44	36	Given the lack of confidence to-date in attributing extinction to climate change, this statement could be reconsidered. (Katharine Mach, IPCC WGII TSU)	The statement is about biodiversity loss and not about extinction and therefore remains valid.
906	58542	18	44	38	44	39	"irreversible loss of an entire biome" - again, I think the evidence to date is that tropical coral reef communities will change rather than totally disappear. (Janice Lough, Australian Institute of Marine Science)	Our exchanges with expert authors from other chapters have led us to conclude that our wording here is in agreement with available evidence.
907	66961	18	44	43	44	43	Capital 'B' for 'Boreal' (as used elsewhere in chapter/document). (Peter Burt, University of Greenwich)	done
908	63431	18	44	43	44	48	Please indicate that the projected die back is still subject to large uncertainities. It is almost impossible to affirm now that the die back has been reched in some portions of Amazon in the present climate. (Jose Marengo, CCST INPE)	In this statement, we refer to the dieback scenario calculations that gain considerable attention, and we conclude that no current evidence exists for this dieback to take place at large scale.
909	82935	18	44	47	44	47	Casual usage of "likely" should be avoided, as it is a reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	text has been revised
910	84514	18	45	4	45	6	For both the description of the TAR and Smith et al versions, it would be useful to be as specific as possible regarding these transitions. Smith et al, states that red shading in the TAR begins at 4 to 5C increase, and revises the transition to red to around a 2.5C increase. (Michael Mastrandrea, IPCC WGII TSU)	this paragraph has been removed
911	77673	18	45	6	45	9	Chapter 19, in its updating of the flaming embers diagram (Figure 19.5), identifies some current risks (yellow regions in the vertical bars that correspond to the time of zero temperature change - approximately 1990). How would the early warning indicators that are discussed here play into the evaluation of present day risks that is presented in Chapter 19? I think there is an opportunity to link the two chapters in an important way here. (Francis Zwiers, Pacific Climate Impacts Consortium)	To the degree feasible, we have attempted to do just that.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
912	84515	18	45	9	45	9	Again, it appears that "confirming" the reason for concern could imply a statement about future risks as well as changes to date, but that extends beyond the scope of this chapter. I would suggest clarifying (and constraining) the conclusion presented here to inform the "observed" part of each RFC, linking to what is presented in Chapter 19 (which should build on the information presented here as well). (Michael Mastrandrea, IPCC WGII TSU)	language for this particular type of statement has been revised throughout
913	64963	18	45	14	45	14	Delete “rigorous”. Much of the WGII assessment is in fact qualitative, which is OK but does not suffice to justify “rigorous”. (J. Graham Cogley, Trent University)	"rigorous" deleted
914	82936	18	45	15	45	16	It would be helpful to distinguish that assessment here pertains to reasons for concern for observed warming. (Katharine Mach, IPCC WGII TSU)	We are not sure to understand the comment, but the concerns are of course about future warming - what this chapter does is presenting the evidence that shows the extent to which expected conditions have already been reached.
915	66962	18	45	34	45	34	Change 'geographic' to 'geographical'. (Peter Burt, University of Greenwich)	done
916	82937	18	45	36	45	47	Uncertainty language used here should be harmonized with that within the executive summary. (Katharine Mach, IPCC WGII TSU)	done
917	66963	18	45	40	45	40	Insert 'the' before 'exception' (Peter Burt, University of Greenwich)	done
918	66964	18	45	41	45	41	Insert 'the' before 'exception' (Peter Burt, University of Greenwich)	this has been rephrased
919	77674	18	45	42	45	42	Please use the evidence terms described in the guidance note on uncertainties language. Did you intend to say "medium evidence" rather than "good evidence"? (Francis Zwiers, Pacific Climate Impacts Consortium)	"good" has been replaced by "robust"
920	60099	18	45	42	45	43	Good evidence' - this seems very subjective, and instead should be assigned one of the qualifiers for the statements on evidence (i.e. robust?). (AUSTRALIA)	see response to comment 919
921	77316	18	45	50	46	33	Section 18.7 - Given the complexity of detecting and attributing change in human systems. This section could recommend the use/exploration of innovative qualitative methodology such as life histories, case studies to contribute to the literature. Further as identified in section 18.4.7 traditional ecological knowledge is already being used in detection and attribution and this should be encouraged to beef up the literature in human systems. (Maggie Opondo, University of Nairobi, Kenya)	We have revised and reduced this section due to space reasons and therefore do not explore these interesting perspectives further
922	79972	18	46	2	46	4	Please consider reflecting this finding also in the TS and possibly in SPM.. (NORWAY)	We trust that all our statements are taken into account during the finalization of the TS and possibly the SPM
923	74149	18	46	7	46	8	But climate variability (particularly low-frequency, multidecadal internal or natural variability) is a component of climate change according to the framework being used in this chapter. So the distinction being mentioned does not make sense. (UNITED STATES OF AMERICA)	We have removed this language.
924	76965	18	46	10	46	18	This paragraph arbitrarily omits poor monitoring as a cause for weak understanding of climate change impacts on human systems. It runs the risk of reinforcing a defeatist attitude toward the question ("we'll never figure it out") when the opposite is the case. We could understand these things much better if we devoted more effort to monitoring. (Marc Levy, Columbia University)	We have now made the lack of monitoring more prominent throughout the chapter as well as in the gaps section.
925	77675	18	46	25	46	26	I think this half sentence "and precipitation trends … are not as clearly understood as temperature trends" is trying to say too much in too short a space, with the result that the messages are not completely clear. There are three issues that are intertwined here, and they are not all clearly linked to anthropogenic climate change. First, our observations of precipitation are not nearly as complete as those for temperature (and those that are available are perhaps not as reliable either). Second, the signal-to-noise ratio for the response to anthropogenic forcing is weaker in precipitation than in temperature - making detection more difficult. And finally, we have less consensus between models and, I think, less consensus that models represent precipitation well. So we both don't have as much confidence in estimates of precipitation trends from observations, and we are substantially less confident in attributing the contribution to those trends that comes from anthropogenic forcing. The half sentence that is offered here doesn't capture these two aspects particularly well by saying "precipitation change under anthropogenic climate change". One problem with this formulation is that as soon as I see the word "under", I think of a projection of future change, rather than an explanation of historical change. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have completely rewritten this section and removed this language.
926	84516	18	46	29	46	29	Please clarify what "special events" means in this context. (Michael Mastrandrea, IPCC WGII TSU)	indeed, the intention was to speak about "extreme event in impact systems" - this has now been corrected

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
927	71392	18	46	35	0	0	Suggest that FAQs 18.1 and 18.3 could be integrated into one FAQ (e.g., How and why are the impacts of climate change detected?) (CANADA)	The intention of separating the two FAQ's was to reduce the frequent confusion about this point, hence we have chosen to keep the two separate.
928	81263	18	46	37	0	0	FAQ 18-1 FAQs need to be accessible to a wider audience. External factors, natural variability may be too technical. Using an example to illustrate the challenge may be more effective. (Monalisa Chatterjee, IPCC WGII TSU)	We feel that the FAQ's have been very widely reviewed and discussed now and are therefore reluctant to introduce new material here. Besides, we do not think that the terms used are too technical.
929	84517	18	46	37	46	49	In this FAQ, it would be useful to incorporate more of a focus on examples, perhaps one natural, one human, to illustrate the general points. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 928
930	85153	18	46	37	46	49	The FAQ 18.1 overlaps with FAQ 18.2. It should rephrased as "What are the main challenges in dtecting systematic changes ?" and accordingly the lines 45 to 49 transferred into FAQ 18.2, with appropriate redactionnal changes. (Michel Petit, CGIET rue de Bercy)	see response to comment 927
931	65155	18	46	45	46	45	The word "between" appears twice and one needs to be deleted. (Muhammad Munir Sheikh, Global Change Imapct Studies Centre (GCISC))	this has been rephrased
932	66965	18	46	45	46	45	Delete one 'between'. (Peter Burt, University of Greenwich)	done
933	64964	18	46	45	46	49	The second challenge is actually a challenge for attribution, not for detection. Detection happens once natural variability has been eliminated as an explanation. Attribution begins at that point, and may or may not go through the stages of attribution to climatic change and attribution to anthropogenic climatic change. It is confusing to use “attribution” in the sense “attribution to anthropogenic climatic change”. E.g., at L52 say “in a system are due to climate change or to other causes”. (J. Graham Cogley, Trent University)	thank you. We have rephrased our FAQs in order to more clearly differentiate between detection and attribution challenges
934	60424	18	46	49	0	0	FAQ1: Underlying each of these two high-profile challenges is the need to acquire, document, make available and preserve – in perpetuity – long, homogeneous records of supporting multivariate data. You imply this in sections 18.2.2 and 18.7 but it’s worth reiterating here.. (David Parker, Met Office Hadley Centre)	thank you. We agree in principle, however, in order to make these FAQs more easily accessible we have refrained from highlighting data needs specifically. We do so in section 18.7, and also in the ES
935	81264	18	46	51	0	0	FAQ 18-2 Authors may wish to use another example that is about detected trend rather than individual events. (Monalisa Chatterjee, IPCC WGII TSU)	we have rephrased this (now FAQ 18-4) in a more generic manner, and deleted the example
936	84518	18	46	51	47	3	It would be worth considering merging this FAQ with the previous one, so that the examples mentioned in my previous comment could address both topics. (Michael Mastrandrea, IPCC WGII TSU)	we have opted to keep these separate, in order to clarify how detection and attribution exercises are different according to Chapter 18 definitions.
937	64965	18	46	53	46	54	Here, as at L45-49, detection and attribution seem to be confused. The exclusion of natural variability is part of detection, and attribution is the identification and ranking of the actual drivers. (J. Graham Cogley, Trent University)	thank you, We have rephrased our FAQs in order to more clearly differentiate between detection and attribution challenges.
938	60100	18	47	2	47	3	This statement is very definitive in that the flooding was not at all attributable to climate change. It would be more accurate to state that it has not been conclusively proven that this event is attibutable to climate change, but it could have been exacerbated by climate change. (AUSTRALIA)	thanks you. we have rephrased this (now FAQ 18-4) in a more generic manner, and deleted the example. We agree it was not the best choice to clarify principles.
939	77676	18	47	3	47	3	I suggest inserting a word like "immediately" ahead of "attributable". I think the question is still open, but at the moment, it remains unknown whether there is an underlying signal because of the presence of large natural variations. (Francis Zwiers, Pacific Climate Impacts Consortium)	thanks you. we have rephrased this (now FAQ 18-4) in a more generic manner, and deleted the example. We agree it was not the best choice to clarify principles.
940	81265	18	47	5	0	0	FAQ 18-3 Authors may wish to mention the limitation of detection and attribution approach. (Monalisa Chatterjee, IPCC WGII TSU)	we are not sure we understand the suggestion correctly, however, as TSU guidance for FAQs stressed brevity and clarity, we opted not to address limitations in this FAQ (which is now FAQ 18-3)
941	60101	18	47	12	47	20	This FAQ is very good. One suggestion however is that it would be better if the use of examples is consistent. E.g. in the question, the examples of one off events are disease outbreak, and the extinction of a species, however in the answer the example is heat wave. (AUSTRALIA)	Thank you for this very valid suggestion. We have rephrased this FAQ and hope it is more clear now.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
942	84519	18	47	12	47	20	It would be useful to focus this FAQ further on material discussed in section 18.4.4.2 on attribution of the contribution of climate change to the magnitude of specific events. In addition, I find the last sentence somewhat problematic, as it implies that one should expect to be able to prove that a specific heat wave would not have occurred without climate change if only scientific capabilities were sufficient. But both variability and changes in long-term averages contribute to the magnitude of specific events, so this framing of an either/or does not really make sense. (Michael Mastrandrea, IPCC WGII TSU)	Thank you for this very valid thoughts. We have rephrased this FAQ, thereby deleting the last sentence, and hope it is more clear now.
943	82938	18	47	14	47	14	Is it possible to indicate further why scientists are usually reluctant? (Katharine Mach, IPCC WGII TSU)	we have rephrased this, and no longer use this expression
944	77677	18	47	14	47	20	I think it would be useful to add a paragraph describing the event attribution approaches that are increasingly being used to understand individual events. I think the sense of the last sentence (that we have not seen extreme events that would be outside the realm of an unperturbed climate) is correct, but we also have a growing number of studies that demonstrate that anthropogenic influence on the climate has acted to increase the probability of many of the events that have been studied. The current FAQ does not give a good sense of where our capabilities lie, in my view. (Francis Zwiers, Pacific Climate Impacts Consortium)	Thank you for this very valid thoughts. We have rephrased this FAQ, and hope this is more clear now.
945	64966	18	47	18	47	20	This assessment is too gloomy. For example it does not take account of the work of Otto et al. (2012) (which is in the References but is cited only in Table 18-4), nor of the work of Pall et al. (2011) which is cited in more than one section. (J. Graham Cogley, Trent University)	Thank you for this very valid thoughts. We have rephrased this FAQ, and hope this is more clear now.
946	82939	18	47	18	47	20	But isn't it possible in some cases to indicate that a particular heat wave would have been exceedingly unlikely in the absence of climate change? Should this be acknowledged? (Katharine Mach, IPCC WGII TSU)	Thank you for this very valid thoughts. We have rephrased this FAQ, and hope this is more clear now.
947	60425	18	47	20	0	0	FAQ4: However the change in likelihood of an extreme event can now be estimated – “Fractional Attributable Risk” (e.g. Lott, F. C., N. Christidis, and P. A. Stott (2013), Can the 2011 East African drought be attributed to human-induced climate change?, Geophys. Res. Lett., 40, 1177–1181, doi:10.1002/grl.50235.) (David Parker, Met Office Hadley Centre)	We have re-written this FAQ to focus on impact events, with discussion of weather events in the WGI observational and attribution chapters.
948	60426	18	54	27	0	0	Volume number should be 65. (David Parker, Met Office Hadley Centre)	Has been corrected, thanks.
949	74150	18	58	12	0	0	Replace Georgakakis with: Bales, J., D. Raff, C. McNutt, M. Brewer, T. Johnson, and T. Brown, 2012: Water Resources Sector Technical Input Report in Support of the U.S. Global Change Research Program, National Climate Assessment, 2013. N.B. this report is expected to appear as a USGS technical report in ~July 2013. (UNITED STATES OF AMERICA)	This reference was not available online at the USGS website at time of FGD finalization. Due to the US government shutdown, we could not find out whether or not it has been published. We therefore still cite the public NCA draft.
950	63432	18	66	34	66	36	This paper Marengo et al (2013) have been accepted. There are some others that are listed in the references on Chapter 21, that could also be referred o this chapter 18 (or cross-referred). (Jose Marengo, CCST INPE)	we are citing this as online with DOI now
951	66966	18	66	48	67	3	References out of alphabetical order (in Scottish surnames 'Mac' and 'Mc' are treated the same, therefore this block should appear on line 1 of page 66). (Peter Burt, University of Greenwich)	thanks for advice. We have forwarded this information to the TSU who will take care of this in final technical editing process.
952	74151	18	67	53	0	0	Burkett, .R. and Davidson, M.A. [Eds.]. (2012). Coastal Impacts, Adaptation and Vulnerability: A Technical Input to the 2012 National Climate Assessment. Cooperative Report to the 2013 National Climate Assessment. Washington, DC: Island Press. http://www.islandpress.org/ip/books/book/distributed/C/bo9117766.html (UNITED STATES OF AMERICA)	thank you for the correction. However, the according text in the chapter has been deleted, therefore this reference is no longer included
953	58917	18	80	20	80	20	This reference (Zemp et al.) should better be cited as: WGMS (2008): Global Glacier Changes: Facts and Figures (Zemp, M., Roer, I., Kääb, A., Hoelzle, M., Paul, F. and Haeberli, W. eds.), UNEP, World Glacier Monitoring Service, University of Zurich, Switzerland. (Wilfried Haeberli, University of Zurich)	we have changed the citation accordingly, thank you.
954	78647	18	81	0	0	0	as for an additional table of high/low/medium confident lakes responses toward climate change globally: In Adrian et al. 2009 there is a list of response variables towards climate change with high confidence- that they can be used as sentinels of climate change - along with confounding factors, and advantages and disadvantages of using these response variable as a sentinel. Reference: Adrian R, O’Reilly CM, Zagarese H, Baines SB, Hessen DO, Keller W, Livingstone DM, Sommaruga R, Straile D, Van Donk E, Weyhenmeyer GA, Winder M (2009). Lakes as sentinels of current climate change. Limnol. Oceanogr. 54 (6):2283-2297. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	This literature goes way beyond detection and attribution and is therefore not cited here.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
955	80755	18	81	0	0	0	Impacts of ocean acidification on pelagic marine biota: decreased rate of calcification in pteropods. I believe that it is covered in Ch. 6 and 19. Some references that you may find useful (I am not suggesting that they shoul all be cited): Comeau S., Gorsky G., Jeffree R., Teyssié J.-L. & Gattuso J.-P., 2009. Impact of ocean acidification on a key Arctic pelagic mollusc (Limacina helicina). Biogeosciences 6:1877-1882. Comeau S., Jeffree R., Teyssié J.-L. & Gattuso J.-P., 2010. Response of the Arctic pteropod Limacina helicina to projected future environmental conditions. PLoS ONE 5: e11362. Comeau S., Gattuso J.-P., Nisumaa A.-M. & Orr J., 2011. Impact of aragonite saturation state changes on migratory pteropods. Proceedings of the Royal Society of London. Series B: Biological Sciences 279:732-738. (Jean-Pierre Gattuso, Centre National de la Recherche Scientifique)	Our assessment is based on observational evidence. there is very limited evidence for observed impacts on polar pteropods, notwithstanding their sensitivity and expected future impacts. we therefore regard this as an emerging issue rather than a high-confidence fact. The recommended literature is largely based on experimental work and has not been judged adequate for the assessment of detection and attribution from observations.
956	77678	18	81	0	0	0	In the third row of this table, I think the authors should avoid the practice of reporting a confidence range (low to medium in this case). The interpretation could be that there is medium confidence in some aspects of this statement, and only low confidence in others, or it could be that the authors think they can differentiate more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have medium confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have reduced the use of confidence ranges wherever possible. In some aggregated statements these have nonetheless been necessary.
957	82940	18	81	0	0	0	Table 18-1. Where NPP is discussed in this table, is it confined to ocean net primary production? It would be helpful to clarify this. (Katharine Mach, IPCC WGII TSU)	Since the table is about oceans, we find it unnecessary to be more specific here.
958	77679	18	81	0	82	0	I like the level of detailing beneath these two tables that points to the traceable accounts for the statements that are given. (Francis Zwiers, Pacific Climate Impacts Consortium)	Thanks
959	80756	18	82	0	0	0	Delete “warm-water” because all coral reefs are in the tropics. The 3-D structures built by deep/cold water corals are not reef (ie not navigational hazards) and are called bioherms or coral communities. (Jean-Pierre Gattuso, Centre National de la Recherche Scientifique)	deleted "warm water" as suggested
960	77680	18	82	0	0	0	In row 6 of this table - would readers understand what is meant by "increments in fish species richness"? Does this mean an increase in the diversity of species present in these zones? If so, why not say that? (Francis Zwiers, Pacific Climate Impacts Consortium)	species richness is a common term used within the underlying assessment of Chapter 6, so we opted to keep it
961	65472	18	82	0	0	0	Replace the word "on" with "in" in the first line of the caption of Table 18-2 (Observed changes on marine---) (Naeem Manzoor, Global Change Impact Studies Centre (GCISC))	change has been made
962	74152	18	83	0	0	0	Figure 18-3: Clarify here whether the detection and attribution of observed climate change effects refers to climate change broadly defined (including internal climate variability) or only to anthropogenic climate change. (UNITED STATES OF AMERICA)	this has now been made clear throughout the entire chapter
963	77682	18	83	0	0	0	It would be useful to add pointers to the traceable accounts that lead to the assessments that are summarized in this table, as was done in Tables 18-1 and 18-2. (Francis Zwiers, Pacific Climate Impacts Consortium)	this table has been deleted due to space constraints
964	64535	18	83	0	0	0	now 30.5.2 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
965	64536	18	83	0	0	0	now 30.5.3 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
966	64537	18	83	0	0	0	now 30.5.4 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
967	64538	18	83	0	0	0	now 30.5.5 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
968	64539	18	83	0	0	0	now 30.5.6 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
969	64541	18	83	0	0	0	pp may increase or decrease, depending on various factors 30.5.1. High latitude spring bloom systems 30.5.2 Eastern boundary upwelling systems (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
970	82941	18	83	0	0	0	Table 18-3. Within the caption, it would be helpful to clarify why no assessment is given in some cases--because of lack of literature? It would be also preferable to give some supporting citations here in addition to the chapter references, as done in tables 18-1 and 18-2. Where "declining oxygen" is mentioned, are hypoxic zones being referred to? It could be helpful to clarify this. (Katharine Mach, IPCC WGII TSU)	see response to comment 963
971	84520	18	83	0	0	0	Table 18-3: Increases in primary productivity in some regions are also discussed in the text. It is not clear why the third entry of this table then focuses only on declining productivity. Please reconcile. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 963
972	64534	18	83	0	0	0	Table 18-3: this is based on 30.5. maybe adopt exact header for regions from the corresponding sections (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
973	77681	18	83	0	0	0	This table has many instances in which a range of confidence assessments is report. I think the authors should avoid the practice of reporting a confidence range (e.g., low to medium). The interpretation could be that there is medium confidence in some aspects of this statement, and only low confidence in others, or it could be that the authors think they can differentiate more finely between levels of confidence than indicated by the 5-level scale that is laid out in the uncertainties guidance document. I very much doubt that the latter is possible, and the former leaves readers guessing about which aspects of the assessment have medium confidence, and which aspects have lower confidence. (Francis Zwiers, Pacific Climate Impacts Consortium)	see response to comment 963
974	64540	18	83	0	0	0	what does n/s mean? not specified? please indicate in the table legend (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 963
975	74153	18	84	0	0	0	Figure 18-4: Can you insert "substantial" before "contribution of anthropogenic emissions"?Without this, couldn't the anthropogenic contribution be just trivial (e.g., like a butterfly flapping its wings)? (UNITED STATES OF AMERICA)	This table has been re-written following a new format that explicitly describes the relative magnitude of the role of climate change.
976	74154	18	84	0	0	0	Figure 18-4: The last column in this table should inform the conclusions for the second of the RFCs: risks from extreme weather events as it measures exactly what the RFC addresses. The absence of any significant ability to attribute an anthropogenic signal to anything but very few high temperature events should indicate that there has not been significant progress in detecting that this RFC is observed to be worsening. (UNITED STATES OF AMERICA)	This table is not intended to directly inform assessment of the RFC, but it has been re-written in a more risk-oriented framework.
977	82942	18	84	0	0	0	Table 18-4. Is "extreme impact event" the clearest phrase? Would "impacts of extreme weather event" be more accurate? (Katharine Mach, IPCC WGII TSU)	While we still use the "impact event" heading in the table, in the caption we now also describe these as disasters related to climate change.
978	78883	18	84	0	0	0	Table 18-4: statement about floods in Queensland: I'm not that the "low confidence" assessment of an anthropogenic contribution is supportable; for discussion with chapter 25 authors please (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	We have modified our assessment of the existence of a trend following further assessment of available literature.
979	64786	18	84	0	84	0	Comment on Table 18-4. Table 18-4 is noted to be partly based on Table 1 in Coumou and Rahmstorf (C&R) 2012 that is a "List of record-breaking meteorological events in the past decade and their impacts". If a multi-week heatwave is not an extreme weather event but rather a climate event within Table 18-4, that might explain why the 2010 western Russian heatwave entry isl isted as low for entry in the column "Confidence in contribution of extreme weather event to observed damage". If this is the case, then I suggest using the C&R 2012 terminology and in Table 18-4 replace 'weather' with 'meteorological' in the column header to read "Confidence in contribution for extreme meteorological event to extreme change ' and then to change the entry in this column to' very high' for the row identified as 2010 & Western Russia. Since every one of the extreme impact events in the table should be listed as very high in the column titled "Confidence in contribution of extreme weather event to observed damage", I wonder if there is any value added information provided by including the column in the table? (Robert Webb, NOAA OAR ESRL)	This table has been re-written in a more risk-oriented framework, in part because of the reasons you specify.
980	77683	18	85	0	0	0	In row 7, it is not clear how rainfall affects this sociological behaviour. (Francis Zwiers, Pacific Climate Impacts Consortium)	We have revised the statement, but a full explanation is not possible within the limits of this table (but reference is given)
981	77684	18	85	0	0	0	In the bottom row, I would be a bit sceptical of the statement that variability has changed since, in general, variability change is substantially more difficult to detect than change in mean conditions. This would be further exaserbated by the spatial extent of the question (small region rather than larger regional, subcontinental or continental scale). Detection and attribution studies on extremes are presently only available on very large scales. (Francis Zwiers, Pacific Climate Impacts Consortium)	Indeed, the statements given only refer to observations and perceptions made by local people, we therefore changed the table entry into: 'Locally perceived changes in temperature means and extremes, and rainfall seasonality"
982	60102	18	85	0	85	0	This table would be much more useful if the date of the event could be included. (AUSTRALIA)	Excellent suggestion. We have identified the respective time periods and included them in all table entries.
983	78889	18	86	0	0	0	Table 18-6: Australasia: I struggle with the confidence rating given to the attribution to climate change. For the widespread reduction in glacier volume in NZ, we have no other explanation at all other than climate. Glaciers don't shrink because they have mood swings, and changes in dust deposition don't even begin to offer an explanation. So the 'low' confidence statement for this strikes me as far too weak; also the 'medium' confidence for the climate cause of the decline in late season snow depth in Australia seems too weak, because there is no other candidate explanation (and the climate one is fully consistent with the observed changes). (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	We have had extensive discussions about this particular case, with LA's from Chapter 3 and the Australasia chapter. Based on careful evaluation of evidence the exact wording (reduction in glacier ice volume, ie not in glacier area) we assigned high confidence for the detection and medium for the attribution.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
984	58918	18	86	0	0	0	Table 6: Where are the references of this table? (Wilfried Haeberli, University of Zurich)	The references are listed within the table.
985	63433	18	87	0	87	0	On table 18.6, on c hanges in extreme flows in Amazon river, there should be a reference to Marengo et al (2013) (Jose Marengo, CCST INPE)	reference is now included
986	62397	18	88	0	0	0	Cell on drought and wildfires in Asia is blank. I am not sure if this is an oversight or if no studies have been carried out for Asia in this area. (INDIA)	we have thoroughly surveyed the literature, and only found limited evidence for regional hydrological drought trends which have now been included. To our knowledge, there is no detected impact of climate change on wildfires across Asia. South East Asian forest fires are discussed in the literature, but no climate signal has been identified
987	74155	18	88	0	0	0	Table 18-7. Caption needs to clarify which definitions of climate change, detection, and attribution are being used here. Or is this mixed in the table, in which case each entry would need to have this information identified somehow. For Africa, is the "increased drought in the Sahel since 1970"□being attributed to anthropogenic forcing, or to climate change broadly defined to include internal climate variability. For North America, is the high confidence in detection of increases of wildfire activity referring to a detection of climate change impact where climate change includes internal variability? This needs to be clarified. (UNITED STATES OF AMERICA)	The attribution statement for the Sahel drought now refers to rainfall changes.
988	71393	18	88	0	89	0	Table 18.7 - For North America there is only one reference provided and this is only valid for the southwest United States. The study by Gillett et al. 2004 reporting that Canadian fire activity trends are related to human-caused climatic change could be cited here . Also see the paper by Girardin et al. 2013 for a critical examination of complex temporal patterns of fire activity in Canada. Notably, if fire activity trends are studied over a period longer than the 40 years covered by fire statistics, then a trend toward decreasing fire activity may be found and this likely in relation to long-term influences of natural climate variability on fire regimes. Girardin, M.P., Ali, A.A., Carcaillet, C., Gauthier, S., Hély, C., Le Goff, H., Terrier, A., Bergeron, Y. . 2013. Fire in managed forests of eastern Canada: Risks and options, Forest Ecology and Management, Special Issues on Mega Fires Vol 294: 238-249. //Gillett, N.P., Weaver, A.J., Zwiers, F.W., Flannigan, M.D., 2004. Detecting the effect of climate change on Canadian forest fires. Geophysical Research Letters 31, L18211. (CANADA)	We have included both references and a cross reference to Chapter 26 Box on Wildfire, where these issues are discussed at length
989	65143	18	89	0	0	0	In the Australasia element of Table 18.7, consider including the point on increased hydrogical drought referrred to the last column of the drought element of table 25.1 in Chapter 25 (p84) (Penny Whetton, Commonwealth Scientific and Industrial Research Organization - Marine and Atmospheric Research)	we have included the increase in hydrological drought in table 18-6, and discuss meteorological drought trends in the preface of 18.5
990	60837	18	89	0	0	0	Table 18.7 Re "expansion of some wetlands' The relevant reference is keith et al 2010. Remove the Banfai and Bowman 2007 and Bowman et al 2010 references because these refer to boundaries between savannas and rainforests in Australia, not wetlands. (Lesley Hughes, Macquarie University)	Thank you, this mistake had been introduced during editing and has now been corrected
991	78888	18	89	0	0	0	Table 18-7: Australasia: it might be worthwhile stating that while there has been no change in frequency of droughts, they have become more intense in Australia, in part due to rising temperatures (see Table 25-1) (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	see response to comment 989
992	74156	18	90	0	0	0	Table 18-8. Caption needs to clarify which definitions of climate change, detection, and attribution are being used here. Or is this mixed in the table, in which case each entry would need to have this information identified somehow. For South/Central America, is the percent contribution of anthropogenically forced climate change to the observed anomalies for coral bleaching estimated? For polar regions, are there any positive impacts of the arctic sea ice loss on marine ecosystems? Why just focus on the negative ones, if there are also positive ones? (UNITED STATES OF AMERICA)	We see no need to repeat this in the caption of the table since the definitions are given in the chapter and are applied throughout with no exception.
993	78648	18	90	0	0	0	the same holds for an additional table on lakes - which could be summarized - but that would need some work- if separted for the different eight major world regions. We did that somehow in table 2 in Adrian et al. 2009. (Rita Adrian, Leibniz-Institute of Freshwater Ecology and Inland Fisheries)	Thanks, but no space was available for an additional table

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
994	62686	18	90	0	91	0	"Table 18-8. The coastal process was missing in Africa region? As for NE Atlantic, it has been mentioned in the genereal comments. However, where the tropical Asian and Japanses waters and the Japanese Sea refer to are easily confusing? How could we understand Japanese anchovies, sardines shift in Japanese Sea? Please check the paper of TAKASUKA (2006; 2007). The seas might refer to the Kuroshio Extension, Kuroshio-Oyashio transition regions, the East China Sea and so on. I don't think that could be called Japanese Sea. Furthermore, as we know, there is only an East/Japan Sea located in the east of Korea Penisula, between Japan islands and Russia mainland. (RONGSHUO CAI, Third Institute of Oceanography)	We have not found detection and attribution analyses concerning African coastal processes. We now refer to the western North Pacific instead of the Japan Sea.
995	62398	18	90	0	91	0	Cells on coastal processes for Europe and Australasia are blank. (INDIA)	We have not found detection and attribution analyses concerning coastal processes for these regions or for Africa.
996	64545	18	90	0	92	0	ch 24.4.3.2 p21 L 4-12 reads, that " The impact of warming is also evident on sparsely populated Arctic coastlines, where erosion appears to be accelerating". "low confidence" in attribution of climate change to this does not seem appropriate? ch 24 Executive summary reads for Arctic Asia ch 24 p4 L 3-5 " in the Asian Arctic there is high agreement and medium evidence that rising sea-levels will interact with projected changes in permafrost and the length of the ice-free season to cause increased rates of coastal erosion." (this would be high confidence according to calibrated uncertainty language?) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	Upon further examination of available literature, we believe the current assessment remains accurate.
997	64546	18	90	0	92	0	high or very high in detection? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	in line with the assessment in Ch25, the confidence in detection is set to high
998	64549	18	90	0	92	0	if you need an original citation: ch6 cites the following paper for this: Impact of declining intermediate-water oxygen on deepwater fishes in the California Current J. Anthony Koslow1,*, Ralf Goericke1, Ana Lara-Lopez1, William Watson Mar Ecol Prog Ser 436: 207–218, 2011 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	this entry has been deleted from the table
999	64550	18	90	0	92	0	mangrove swamps are an ecosystem as well? they are mentioned in "small islands" as marine ecosystems, should be classified as such in "south and central america" as well. Just mentioning mangrove degradation here is not very specific. clarify: what impact has the degradation of mangroves on coastal areas? vulnerability to erosion? wave protection? flood protection? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	the degradation of mangroves has been moved to table 18-8. we consider the degradation of an ecosystem to be an impact without further discussion of cascading effects on humans
1000	64553	18	90	0	92	0	now 28.2.2.1.2 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	thank you. crossreferences have been updated based on the FGD
1001	64552	18	90	0	92	0	now 28.2.2.1.3 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 1000
1002	64551	18	90	0	92	0	now 28.2.2.1.4 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 1000
1003	64543	18	90	0	92	0	now table 6-7 in 6.2.5.1 (ch6 p22-23) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 1000
1004	64554	18	90	0	92	0	only high? chapter text of ch29 p 6-7 rather indicates very high confidence for detection (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	we do not now exactly which statement within the table the reviewer is referring to. however, not all chapters use the same definitions for detection and attribution. As a consequence, our own assessment, based on the chapter 18 definitions, deviates in a number of cases.
1005	64547	18	90	0	92	0	see comment below on table 25-3 (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	unfortunately we cannot identify which statement your comment is referring to
1006	64542	18	90	0	92	0	TAB 18-8 tab 6-7 says there is high confidence that warming is the driver for shift from sardines to anchovies at interdecadal scale, but medium confidence in the attribution to climate change (fig 6-16)? (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	not all chapters use the same definitions for detection and attribution. As a consequence, our own assessment, based on the chapter 18 definitions, deviates in a number of cases.
1007	64548	18	90	0	92	0	table 25-3 indicates medium confidence for attribution to climate change because other environmental factors like fishing etc. may mask climate change (original literature not checked, just took table 25-3 as a basis für this comment) (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	see response to comment 1005
1008	64544	18	90	0	92	0	why is confidence not high in detection? see comment below (Lena Menzel, Alfred Wegener Institute for Polar and Marine Research)	We could not determine which entry in the table was being referred to here.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1009	82943	18	91	0	0	0	Note that within the Australasia box, "retreat of seaweeds" is synonymous with "retreat of macroalgae" and only one phrase should be used. (Katharine Mach, IPCC WGII TSU)	deleted "seaweeds"
1010	80757	18	91	0	0	0	You may want to consider adding the negative impacts on polar pteropods here (refs above). As pointed out in Ch. 19, it could have devastating impact on fisheries. (Jean-Pierre Gattuso, Centre National de la Recherche Scientifique)	Our assessment is based on observational evidence. there is very limited evidence for observed impacts on polar pteropods, notwithstanding their sensitivity and expected future impacts. we therefore regard this as an emerging issue rather than a high-confidence fact.
1011	58543	18	91	0	91	0	Should probably add De'ath et al (2009) reference to declining calcification on GBR: De'ath G, JM Lough & KE Fabricius (2009) Declining coral calcification on the Great Barrier Reef. Science 323: 116-119. (NB a correction to this paper will appear shortly in Science - the correceted recent rate of decline is 11% compared to 14% in orginal paper). (Janice Lough, Australian Institute of Marine Science)	we have added this citation to AUS row in table 18-8
1012	67883	18	91	0	91	0	The name "Japanese Sea" in Table 18-8 should be corrected using "the western North Pacific", in accordance with the referred literature. (JAPAN)	we have changed the wording to "western North Pacific" for one entry
1013	67884	18	92	0	92	0	Table 18-8: The term "foraminifera shells" in the table should be replaced with a formal academic term "foraminiferal shells". (JAPAN)	edited to read foraminiferal
1014	69445	18	93	0	0	0	In Table 18.9. Region: Polar Regions: 'Impact on livelihoods of Arctic indigenous peoples' [18.4.5, Box 18-5] is mentioned. This reference indication is however incorrect and should be [18.4.7, Table 18-5] instead of [18.4.5, Box 18-5], since there is no mention of impact on livelihoods of Arctic indigenous peoples in section 18.4.5 (this should be section 18.4.7) and Box 18-5 discusses how indigenous Arctic peoples perceive climate change impacts and does not specifically address the impacts of climate change on their livelihoods (see Table 18-5 for this, at page 85 of chapter 18). (NETHERLANDS)	thank you, we have ensured correct crossreferencing to what is now section 18.4.6 and table 18--4
1015	74157	18	93	0	0	0	Table 18-11a: Caption needs to clarify which definitions of climate change, detection, and attribution are being used here. Or is this mixed in the table, in which case each entry would need to have this information identified somehow. (UNITED STATES OF AMERICA)	see response to comment 992
1016	84521	18	93	0	0	0	Table 18-9: As commented on the relevant text, section 18.5.6 says high/medium confidence for increase in frequency and extension of dengue in Central and South America. Please reconcile. (Michael Mastrandrea, IPCC WGII TSU)	This statement has been removed from the table, based on a thorough assessment of underlying literature
1017	78890	18	93	0	0	0	Table 18-9: Australasia: the authors may wish to consider including the increase in hot days (including partial anthropogenic attribution), and the increased mortality and morbidity during heat waves. Note that the trend in heat waves is less clear than for hot days, so care must be taken in the formulation to avoid making too strong a statement here. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	thank you, we have included such a statement with appropriate reference in table 18-9
1018	77318	18	93	0	93	0	Table 18-9 - Row 10, column 2 - include other studies indicating the frequency of dengue fever e.g. 'Leary, N. et. al., (2008), A Stitch in Time: General Lesson from Specific Cases, in Leary, N. et. al. (eds.) Climate Change and Adaptation, Earthscan: London and Sterling, VA, pp.1-27.' (Maggie Opondo, University of Nairobi, Kenya)	Thanks for the reference. In the end we have decided to restrict ourselves to the example case of the disease and location with the most detailed detection and attribution research thus far.
1019	77317	18	93	0	93	0	Table 18-9 - Row 2, column 2 - include other studies indicating this trend of increasing incidence of malaria in the Kenyan highlands e.g. 'Wandiga, S., et. al., (2010) Vulnerability to epidemic malaria in the highlands of Lake Victoria basin: the role of climate change/variability, hydrology and socio-economic factors, Climatic Change, Volume 99, Issue 3-4,473-497.' (Maggie Opondo, University of Nairobi, Kenya)	Thanks for the reference, but as much has been written on malaria at this location, we have restricted citations to major results and recent reviews.
1020	77685	18	95	0	0	0	In row 3 of Table 18-11b, coastal erosion is of concern in some other regions as well (e.g, in the Gulf of St. Lawrence, Canada). My understanding (which is not very complete) is that the same mechanism is involved in the Gulf of St. Lawrence. The publication list on the Ouranos website (www.ouranos.ca) may point to appropriate literature. (Francis Zwiers, Pacific Climate Impacts Consortium)	Thanks, but in the end we restricted ourselves to larger-scale generalisations.
1021	82944	18	95	0	0	0	Table 18-11 a. It would be preferable to specify which types of "hot events" and "cold events" are meant--hot days, warm spells, etc. (Katharine Mach, IPCC WGII TSU)	We have deleted this table, but retain some aspects in a new extreme impacts table where the characteristics of the impact dictate this specificity.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1022	64809	18	95	0	0	0	Table 18-11a is highly suggestive. A wide range of readers easily understand the confidence in detection and attribution in the observed changes. (Junichiro Oda, Research Institute of Innovative Technology for the Earth (RITE))	Thank you. While we have deleted this table, we retain some aspects in a modified form of the extreme impacts table.
1023	78891	18	95	0	0	0	Table 18-11a: delete the row with changes in tornadoes or hail. There simply hasn't been a trend detected (double check with WGI chapter 10), so even 'very low' confidence is giving the wrong impression. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	deleted
1024	74158	18	95	0	0	0	Table 18-11a: For tropical cyclone activity, the detection confidence level (low) seems to imply that the standard IPCC Ch. 10 definition of detection is being used. If true, this needs to be stated in the caption as well as in the text where this is discussed. Alternatively, if the definition of detection and climate change discussed in the introduction is used, the authors could claim detection of a change in tropical cyclones due to climate change at a high level of confidence. Some examples are discussed in my other comments on this topic. (UNITED STATES OF AMERICA)	This assessment is now in a merged table and paired with extratropical storms. It is now also a statement of confidence in the existence of a trend, rather than detection of a trend, and so follows from the WGI Ch2 assessment.
1025	74159	18	95	0	0	0	Table 18-11a: The "low" confidence in detection of increases in tropical cyclone activity could be higher if the definition of detection of climate change generally used in the chapter (i.e., including internal variability in climate change) were used here. If that is not what is intended, then the caption of the Table should be modified to explain what is meant by the term "Detection" in the table. (UNITED STATES OF AMERICA)	see response to comment 1024
1026	82945	18	95	0	0	0	Table 18-11b. Given that "damage" is often used in a monetary sense, it could be helpful to use the broader phrase "impacts" within the caption as done in the table heading. (Katharine Mach, IPCC WGII TSU)	done
1027	58919	18	96	0	0	0	Table 12: See remarks on page 3 (permafrost boundary) (NOTE: pasted here for your convenience) With glacier shrinking, numerous lakes have formed and many more are likely to form in the near future (cf. Linsbauer, A., Paul, F. and Haeberli, W. (2012): Modeling glacier thickness distribution and bed topography over entire mountain ranges with GlabTop: Application of a fast and robust approach. Journal of Geophysical Research 117, F03007, doi:10.1029/2011JF002313). Many presently still existing glacier landscapes of cold mountains are, in fact, transforming within decades and for long time periods to come into lake landscapes. This should also be made clear on page 9 (see next comment - pg 9, line 34). (Wilfried Haeberli, University of Zurich)	Thanks, although we are not clear on the "next comment" you are referring to. Any updates in the assessment of the chapter text will have been reflected in the population of this figure (the redundant table has been removed, with only the figure remaining).
1028	82946	18	97	0	0	0	Figure 18-1. Within the description of this graphic, would it be helpful to indicate that these are coupled and overlapping systems that cannot be cleanly divided? Within the graphic itself, would it be worth indicating that working group 1 also studies aspects of natural systems? As a small point, within the table, would it be more accurate to say "shifts in fisheries"? (Katharine Mach, IPCC WGII TSU)	In the text we now emphasise that the system separations are artificial experimental divisions required for detection and attribution analysis.
1029	77686	18	97	0	0	0	I have a few comments on this figure. The general concept, that the systems interact in multiple and complex ways is useful to illustrate and contemplate. Less helpful is the allusion to specific working group "study areas" - I think it is understood implicitly that the two working groups work largely on different aspects of the problem, but there is also a lot of overlap, and I think the complementarity of approaches and interperations is helpful. The overlaps are also broadening, for example, as a consequence of the broad adoption of Earth system models, which include parts of the natural system, and at least inform some aspects of potential changes in the human system (e.g., estimates of emissions that might be compatible with a 2C target). Regarding the drivers and impacts - one could imagine a number of direct impacts of forest fire, of which increased windiness might not be the most obvious (changes in forest hydrology, which is extensively studied, come to mind). A subsequent impact might be changes in water quality downstream of the fire affected area. (Francis Zwiers, Pacific Climate Impacts Consortium)	We now emphasise in the text that the system separations are artificial experimental divisions required for detection and attribution analysis. The Working Group labeling is intended as a guide to the content of the chapter.
1030	82947	18	98	0	0	0	Figure 18-3. As done in chapter 3, the chapter team could consider presenting an accompanying table to introduce some of the detail described within the caption, as a way of making the figure more accessible. (Katharine Mach, IPCC WGII TSU)	we have considered this, but due to redundancy with main text and space limitations have refrained from adding more information onto this graph
1031	74160	18	98	0	0	0	Figure 18-3: Caption should clearly indicate what is meant by "detection"2and "detection and attribution"3in the figure, since multiple definitions are used in the chapter. (UNITED STATES OF AMERICA)	see response to comment 992
1032	84522	18	98	0	0	0	Figure 18-3: Consider clearer ways to present the items appearing in this figure, beyond just a list in the caption. (Michael Mastrandrea, IPCC WGII TSU)	we have considered this, but due to redundancy with main text and space limitations have refrained from adding more information onto this graph

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1033	77687	18	98	0	0	0	I think I have commented on Figure 18-2 previously, and I'll try to do so again. In detection and attribution, the objective is to understand change in observations, so in my view, the observations should be positions in the figure in such a way that it is clear that they are of paramount importance. In the left hand diagram - it is the ecological observations of paramount importance. However, those observations sort of sneak in at the side of the figure at the moment, given them much less prominence than the observations of the drivers, which I think sends the wrong message about what it is that we are really trying to understand. (We are trying to understand change in the ecological observations). Similarly on the right, the multi-step approach simultaneously seeks to interpret change the climate and ecological observations, so these observations should be shown to be paramount - but again, they occupy almost a secondary position in the figure, coming into consideration from the sides. (Francis Zwiers, Pacific Climate Impacts Consortium)	We had modified this figure to address your comments, but in the end removed the figure entirely as it was not directly relevent to the assessments now being made in the chapter.
1034	63434	18	98	0	98	0	Figure 18-3, is it for one particular region?. Or is a worldwide vision?. Same comment for Fig 18-4 (Jose Marengo, CCST INPE)	We now specify in the caption that these are global assessments.
1035	64787	18	98	0	98	0	Figure 18-3. The figure (and subsequent figures 18-4 to 18-7) is unreasonable to be showing such a strong linear one-to-one relationship since there is a much higher standard for attribution given the influence of confounding factors as discussed in Pamesan et al 2011. Does including the left-most category of 'very low' on the degree of confidence in detection (X) axis really provide value-added information to inform policy makers. I suspect that the lowest left sector in the figure (very low/very low) could be the most densely populated given the fact there is very low confidence in detection and attribution of most observed climate change impact since the detection and attribution remains very difficult or impossible to demonstrate since the signal has yet to emerge from the background noise of natural variability existing within the various components of the earth system and difficult standard to achieve of system understanding that is required for high-quality detection and attribution studies. (Robert Webb, NOAA OAR ESRL)	In the detection concept followed in this report, confounding factors play a large role for detection too. Attribution is somewhat more sensitive to the role of other drivers because it is more specific about the nature of the climate change role than is detection.
1036	60103	18	98	0	100	0	Please explain what both attribution and detection are referred to on the y access. (AUSTRALIA)	We have now changed the vertical axis label to "Confidence in attribution" for clarity.
1037	66297	18	98	0	102	0	Figures 18-3 to 18-7. these tables each have confidence in detection along the x-axis and confidence in detection and attribution along the y-axis. However, this construction is not explained in detail anywhere that I could find in a quick read. My understanding is that it would be possible to undertake a climate attribution study without doing a detection study first, as this would simply involve attributing causal association between a given climatic determinant and the target system or process. So even without a detected trend in the impact, there can still be a relationship between climate and impact. So does the y-axis labelling include both detection and attribution in recognition of this? If so then it would only address attribution cases where a trend in impacts has first been detected with some level of confidence? However, if that is the case is there a minimum level of confidence in detection that would be needed before a statement on attribution would be allowable using the formulation here? I find the detection/attribution term on the vertical scale to be confusing, because it seems to conflate information already present on the x-axis with new information on attribution of climate. Couldn't "detection" be dropped from the vertical, but the caption make it clear that an entry for attribution is conditional on there being a detected trend in the first place? (Timothy Carter, Finnish Environment Institute)	After considerable discussion, we have adopted the practice that detection is necessary in order to make an attribution statement, but the confidence in attribution is not conditional in a probabilistic sense on the confidence in detection. We have made the description of these concepts more direct in 18.2 for clarity.
1038	79078	18	99	0	0	0	Figure 18 - 4: Please explain why you give multiple small letters in a cell, because this just crowds the table. If you want to indicate multiple subsets of a system, giving multiple letters is pointless if it is not displayed how large the absolute number of subsets that could be affected or have been studied is. I suggest to delete the superfluous letters and include a statement in the heading that small letters refer to 1 or more regional subsets of a respective system. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	We now explain that individual smaller letters correspond to individual continents or other regions used in the cited tables.
1039	74161	18	99	0	0	0	Figure 18-4: Caption should clearly indicate what is meant by "detection" and "detection and attribution" in the figure, since multiple definitions are used in the chapter. (UNITED STATES OF AMERICA)	see response to comment 992 - no, the chapter uses just one single set of definitions
1040	84523	18	99	0	0	0	Figure 18-4: I am not sure how much this figure adds beyond the information presented in Table 18-10, as immediately I want to know things like what region each small letter represents. There are other visual ways to represent this information, such as a map-based presentation, that would convey more information more clearly. This could be combined with the information in Figures 18-5 and 18-6. (Michael Mastrandrea, IPCC WGII TSU)	We have dropped Table 18-10 to remove redundancy.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1041	77688	18	99	0	0	0	It would be useful to add a few words in the caption that give a better sense of what is meant by a "full-scale system", and what is viewed as a "regional subset". I can try to imagine these things, but I would probably imagine something different from what the authors have in mind. (Francis Zwiers, Pacific Climate Impacts Consortium)	We now refer to these in the caption as "global" and "regional", with a citation to Tables 18-5 through 18-9 as the basis of the regional statements.
1042	77319	18	99	0	99	0	Figure 18-4, this figure is abit cluttered and not easily legible - perhaps could be redrawn with the key outside of the figure (like in figure 18.6 on p.101) to reduce the clutter and focus on it as part of the visual potrayal/effect thus making it more comprehensible. (Maggie Opondo, University of Nairobi, Kenya)	We have moved the legend outside of the figure and attempted to make it more visually "smooth".
1043	79077	18	99	0	102	0	Figures 18 - 4 to 18 - 7: Please check this graph. You give three different measures her (excluding regional / global scope) and do not address that confidence in detection and confidence in attribution may not be equal. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	We explain these graphs in more concise detail now. Confidence in detection and confidence in attribution are often not equal for statements marked on these plots.
1044	80415	18	99	0	102	0	Figures 18-4 to 18-7: Since figures have changed substantially from FOD to SOD, please make sure to maintain consistency with confidence levels given in WGI AR5 Ch10 for the relevant D&A components. (Gian-Kasper Plattner, IPCC WGI TSU)	These figures do not cover content described in WGI Ch10, although consistency has been checked in areas of overlap with WGI Ch2, 3, and 4.
1045	74162	18	100	0	0	0	Figure 18-5: Caption should clearly indicate what is meant by "detection" and "detection and attribution" in the figure, since multiple definitions are used in the chapter. Hopefully only one set of definitions applies within the figure. Confidence in detection of a change in tropical cyclones could be high if the definition of detection and climate change is broad and includes climate change driven by low-frequency internal climate variability. (UNITED STATES OF AMERICA)	We have deleted this figure and no longer assess the detection of trends in climate phenomena.
1046	78892	18	100	0	0	0	Figure 18-5: I cannot find any statement in this chapters that supports an attribution (at the global scale) of an increase in inland floods to increasing GHG concentrations. Either remove or provide the evidence. The current text provides only one attribution study, for England and Wales for the 2000 floods. That is not sufficient. (Andy Reisinger, New Zealand Agricultural Greenhouse Gas Research Centre)	see response to comment 1045
1047	84524	18	100	0	0	0	Figure 18-5: Like with the previous figure, I think the table version may be more informative, and a map-based presentation would visually communicate further information. (Michael Mastrandrea, IPCC WGII TSU)	see response to comment 1045
1048	79079	18	101	0	0	0	Figure 18 - 6, panels a, b: Please explain why you give multiple letters in a cell, because this just crowds the table. If you want to indicate multiple subsets of a system, giving multiple letters is pointless if it is not displayed how large the absolute number of subsets that could be affected or have been studied is. I suggest to delete the superfluous letters and include a statement in the heading that small letters refer to 1 or more regional subsets of a respective system. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	We now specify that the repeated symbols within a box refer to assessments concerning different systems (or rather different aspects of a system) listed in Tables 18-5 through 18-9.
1049	82948	18	101	0	0	0	Figure 18-6. Within the description of this figure, it could be helpful to be more explicit about the reference to tables 18-6 through 18-9--do all examples used originate from these tables? (Katharine Mach, IPCC WGII TSU)	Done
1050	84525	18	101	0	0	0	Figure 18-6: Like with the previous two figures, it would be useful to consider map-based approaches to presenting this information. (Michael Mastrandrea, IPCC WGII TSU)	We have now produced a map figure displaying this data, while retaining this figure.
1051	77689	18	101	0	0	0	I'm confused by this figure - if a particular type of system is mentioned more than once for a given region, does that mean that the region contains more than one assessed system of that type? Also, I think a traceable account detailing where the various letters come from is required. (Francis Zwiers, Pacific Climate Impacts Consortium)	We now specify that the repeated symbols within a box refer to assessments concerning different systems (or rather different aspects of a system) listed in Tables 18-5 through 18-9.
1052	74163	18	102	0	0	0	p. 102, Fig. 18-7. Clearly indicate what definition of "climate change" is being referred to in the caption: anthropogenic climate change, or climate change that includes low-frequency internal or natural variability. (UNITED STATES OF AMERICA)	see response to comment 992