Summary of the evaluation of DWD NWP products and visualizations at the ESSL Testbed 2014

ESSL Report 2014-01

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1. Overview

General

The ESSL Testbed 2014 took place from 2 to 27 June 2014 at the ESSL Research and Training Centre in Wiener Neustadt. The Testbed was visited by three DWD R&D employees (Wiegand , Hengstebeck, James), who gave a presentation on site as part of their participation and, additionally, provided an online presentation each. ESSL would like to thank them for their efforts! Three DWD forecasters participated (Fruntke, Rudolph, Tschapek). In total, 42 persons from Europe took part in the Testbed, in addition to 5 scientific ESSL staff.

Technical difficulties due to the database transition

Unfortunately, some technical difficulties occurred shortly before the ESSL Testbed. On 28 April, ESSL was informed by Marcus Paulat (DWD) that the NWP data would be switched from GRIB1 to GRIB2 during the Testbed. Because of the software at ESSL being not fully compatible with GRIB2, this meant that considerable work was necessary in making the system GRIB2 compatible. In addition it was necessary to test that the transfer from GRIB1 for GRIB2 on one of the Testbed days could be handled at the time the database would be switched. Marcus Paulat assisted us with this testing, for which we are grateful.

The fact that time was used to be invested in the data format change, meant that considerably less time was available to develop new COSMO-based post-processed products and visualizations. We regret that, as a consequence, not all products and visualizations could be finalized in time for the 2014 edition of the Testbed. ESSL has now scheduled all evaluations that could not be carried out in 2014 for the upcoming 2015 edition of the ESSL Testbed.

The following table summarizes the status of the evaluations:

Product	**Status**
1. Probabilistic COSMO-DE-EPS products for extreme precipitation, using the local, upscaled and fuzzy methods	Implementation was not finished on time. Evaluation scheduled for 2015.
2. Visualizations of COSMO-DE-EPS probabilities of exceedance of CAPE and CIN	Implementation was not finished on time. Evaluation scheduled for 2015.
3. Simulated total graupel as a predictor for large hail	Evaluation carried out at ESSL Testbed 2014.
4. Simulated total water and vorticity as a comparison with comparable radar products (VIL), rotation (track).	Evaluation of total water was carried out at ESSL Testbed 2014. Evaluation of vorticity/rotation scheduled for 2015.
5. General assessment of model performance (including ensemble visualizations that were available in 2013)	Evaluation carried out at ESSL Testbed 2014.

Weather

A number of active weather days occurred across the domain covered by DWD products (Germany and surrounding regions). Very large hail (5 cm +) occurred on 8, 10 and 11 June, and on 24 May and 20 July before and after the Testbed period. A very intense convective windstorm affected western Germany on 9 June. The month of July saw many local flash floods and a number of cases with severe wind gusts. To illustrate the behavior of some of the products, some illustrations are shown in the chapter "**Events**".

Testbed Resources

The following online resources can be used to obtain more detailed information about the Testbed 2014 that is contained in this summary document:

The ***Testbed Data Interface*** showing all products and all data, is available online after the end of the Testbed at: http://www.essl.org/testbed/data

A ***Blog*** describing the daily activities at the Testbed can be found at:
http://www.essl.org/testbed/blog

Background information and ***all presentations*** given at the Testbed can be accessed at:
http://www.essl.org/testbed/blog

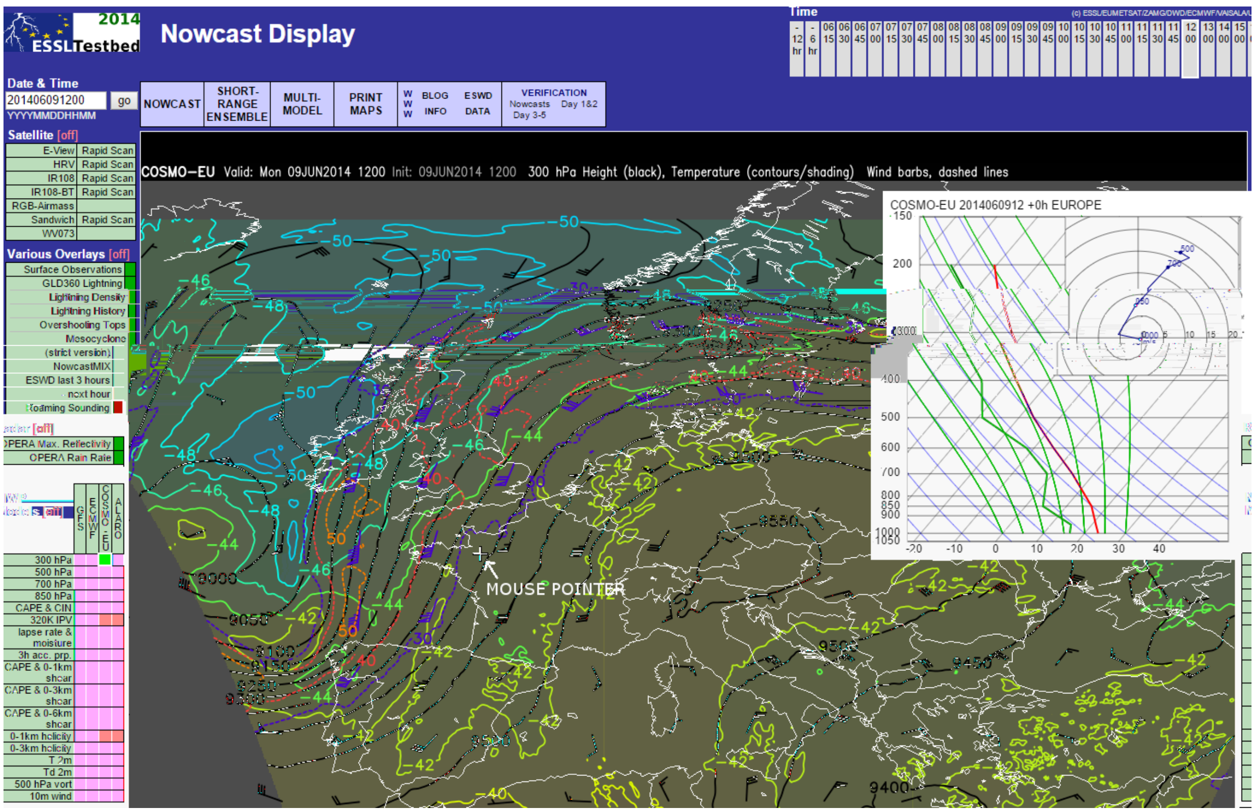
Feedback

Feedback on the products was collected throughout the Testbed, partly in **direct discussion with the DWD R&D participants**, partly through the **documentation of answers to questionnaires** that was filled out jointly by the participants (contained in full as an Appendix to this document).

2. New visualization options of model data at the Testbed

For the ESSL Testbed 2014, a number of new possibilities were introduced to display data as part of the Nowcast Display. More overlays of model data were made available, and a so-called "roaming sounding" tool was introduced, which can be activated as soon as any model field is selected. This tool allows forecasters to obtain a vertical profile of temperature, humidity and wind from any model at any given time and location. A strength of this tool is that the sounding smoothly transitions by dragging the mouse, so that it is easy to see the gradual changes. The tool is also very quick and responsive as it computes the sounding "on the fly" within the web browser. **DWD forecasters at the Testbed commented that they would welcome the implementation of a similar tool within NinJo**. We plan to extend this tool by incorporating parcel curves.

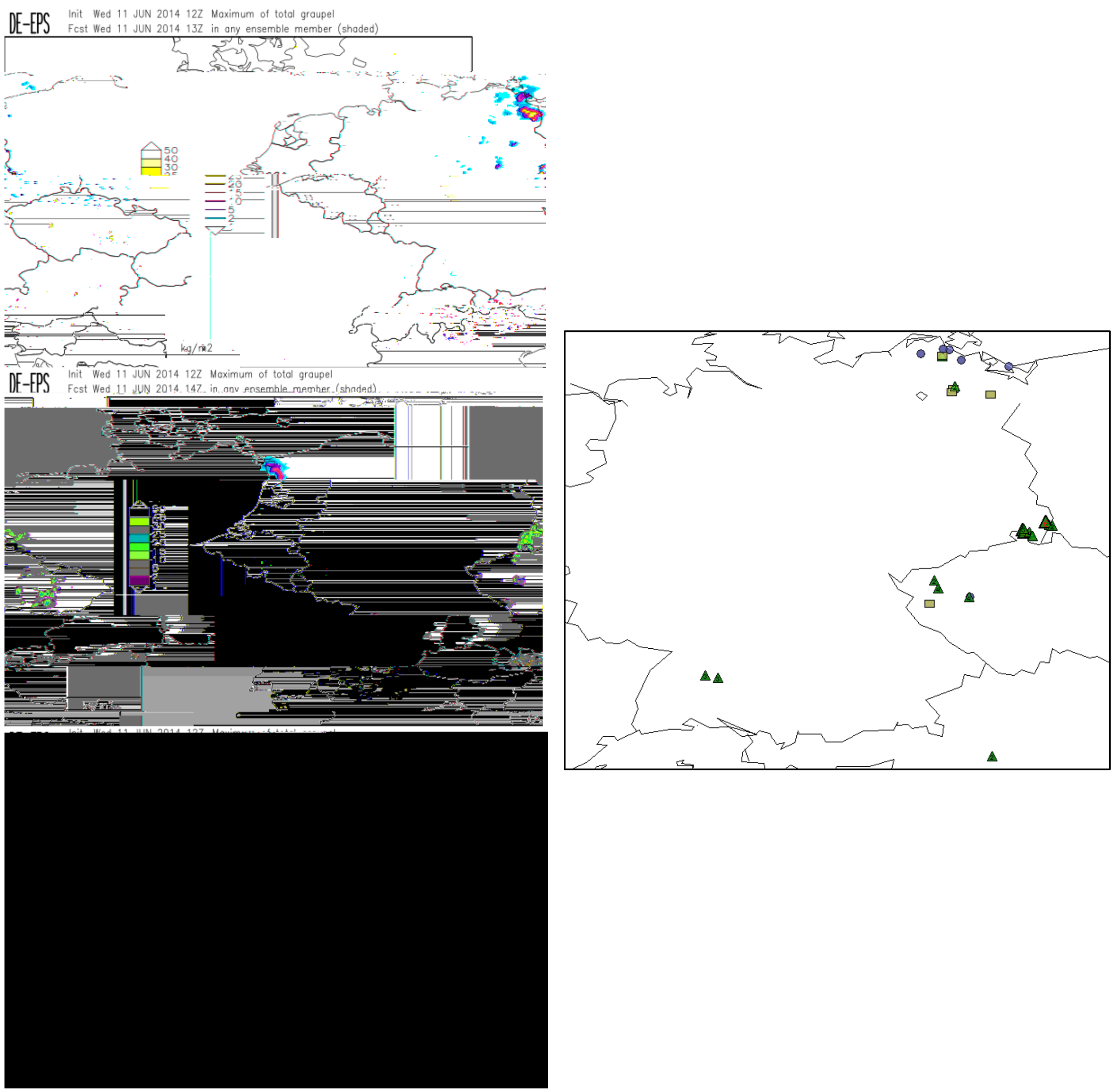
In addition to the introduction of the sounding tool, the labelling and display of the various products was significantly improved.



Roaming sounding tool. The diagram on the right-top appears and responds to the mouse, when it is dragged (i.e. mouse button pressed and moved) over the map. The interface is available online at <u>www.essl.org/testbed</u>

3. Simulated total graupel as a predictor for large hail

The reactions to the use of graupel as a hail predictor were generally positive, as a good correspondence could be found between values of high integrated graupel. Large hail reports typically located where the maximum of simulated total graupel exceeded around 20 to 30 kg/m2.



Left: Maximum integrated graupel of any ensemble member at 13, 14 and 15 UTC on 11 June 2014.

Right: ESWD severe weather reports between 12 - 15 UTC on 11 June 2014. Green triangles: hail reports (with max. diameter in cm), yellow rectangles: wind reports, blue circles: heavy rain reports.

The example above shows that a good correspondence exists between the integrated graupel product and the hail reports. Here, this was the case over Mecklenburg-Vorpommern and eastern Saxony. Prerequisite for the use of this metric is, of course, the initiation of the storms that produce the hail.

This particular ensemble of COSMO runs did not produce as much deep convection in the Western Czech Republic or the Black Forest as in reality. The graupel product, as a result, did not perform well either in those areas.

An important question is if the integrated graupel really gives more information than reflectivity only. A few cases give indications that this might be so. This is illustrated by the following comparison of two cases:

11 July 10 June

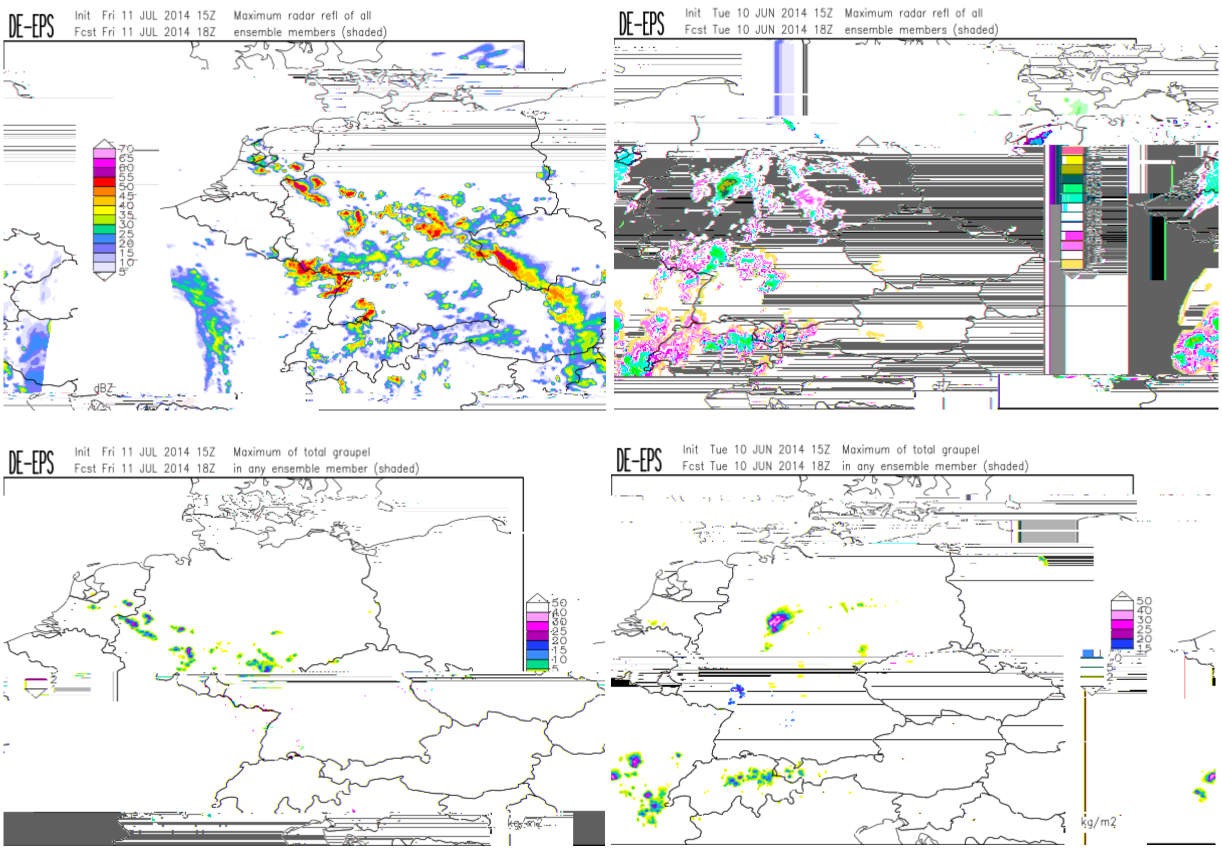
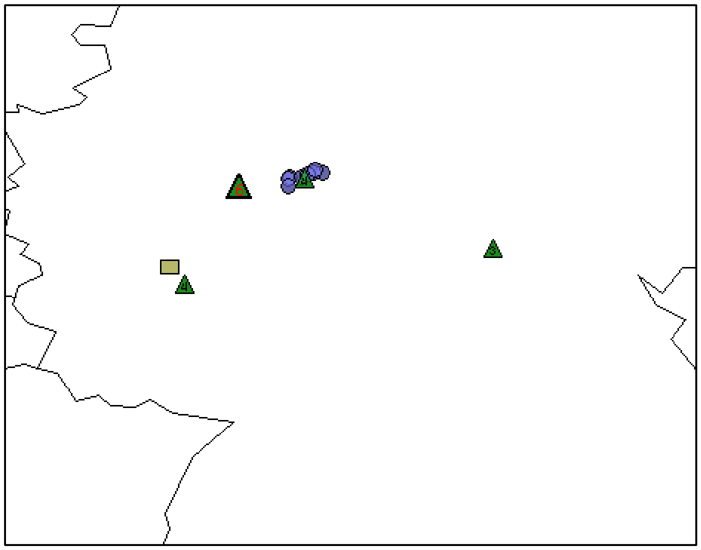


Figure: Comparison of two cases. Left 11 July 2014 18 UTC, Right: 10 June 2014 18 UTC. The top panels show the maximum reflectivity of any ensemble member at a given location. The bottom panels show the maximum integrated graupel of any ensemble member at a given location.

The maximum reflectivity images look quite comparable in severity, but the graupel product shows much higher values in the right-hand case. The left case had no hail > 2cm reports in the 15-18 UTC time frame. The right-hand side saw a number of reports of very large hail up to 6 cm in diameter:



ESWD reports in the 15-18 UTC time frame on 10 June 2014. Green triangles: hail reports (with max. diameter in cm), yellow rectangles: wind reports, blue circles: heavy rain reports.

4. Simulated total water as a comparison with radar-based VIL.

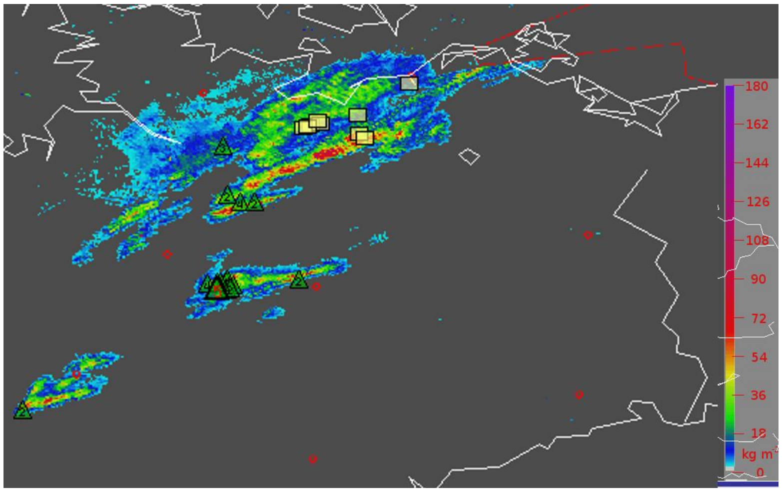
We carried out an evaluation of total water and compared it to radar-based VIL in discussions among Testbed participants.

Most importantly, it became clearer what total water means. It is the vertical integral of water in all its phases, including the gas phase (i.e. water vapour). This differentiates it from the radar-based VIL product, which is essentially a vertical integral of reflectivity and thus includes both liquid and solid water, i.e. rain, snow, hail and graupel. A direct comparison is therefore not entirely ‘fair’, especially where water vapour is a significant contributor to the total water, i.e. outside of storms.

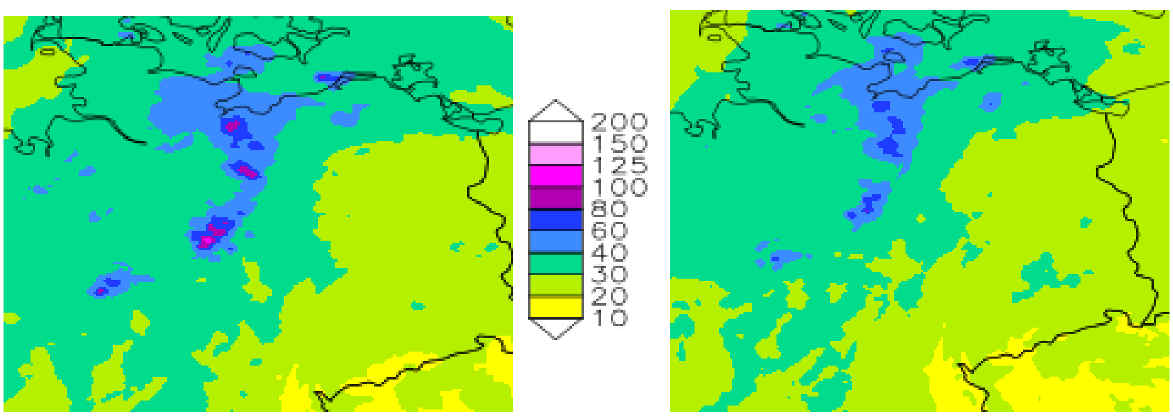
Outside of simulated convective storms, total water typically was in the range of 10 - 40 kg/m^2. There, it is similar to the parameter “precipitable water”, which is a parameter typically computed from radiosonde sounding data and which some forecasters use to get an idea of the potential for very heavy rainfall. Within simulated convective storms, values of 50 - 120 kg/m^2 were typically found in the stronger Testbed summertime storms.

It was found that despite the discrepancy of the definitions of VIL and simulated total water, they typically correspond rather well with each other, illustrated by the following example:

Example event: 8 June 2014



Radar-based VIL-Track product showing the maximum VIL value over the 14-17 UTC period and ESWD reports over the same period. Green triangles: hail (with maximum diameter in cm); yellow rectangles: severe wind reports (25 m/s or more). There were no reports of flooding.



Simulated total water (left: maximum of all COSMO-DE-EPS members; right: deterministic COSMO) at 16 UTC.

Radar VIL-Track and simulated total water both show maximum values in the storms of 80 kg/m^2. Note that despite the high VIL values, and the overall severity of the storms (wind and large hail reports), no flooding was reported to the ESWD. Probably, the strong storm motion prevented very high accumulations.

The Testbed participants occasionally found good correlations (see questionnaire) between flash floods and simulated integrated total water, but as the example above illustrates, this was not always so.

Compared to the use of integrated graupel as a proxy for large hail, the use of integrated total water as a proxy to indicate heavy precipitation is much less straightforward. For high precipitation accumulation not only the precipitation rate (for which integrated total ward may be a reasonable proxy) but also the duration of precipitation is important. To illustrate this: the occurrence of very heavy rainfall during 5 minutes will rarely cause serious problems, however if large hailstones fall for 5 minutes, this typically ***is*** a problem. The duration of a storm depends on i) the storm motion and ii) the size and iii) orientation (with respect to the flow) of the entire convective system. Therefore, flash flood potential is much less a property of a convective cell than a cell's potential to produce hail.

Since the COSMO model directly outputs precipitation accumulations, it seems to be overly complicated to consider a storm-based property like total integrated water with the aim to perform better than what the model is already doing.

For hailfall on the ground, or any other parameter that the model cannot deliver, this is a different story.

5. General assessment of model performance (including ensemble visualizations that were available in 2013)

The Testbed staff and the participants monitored the COSMO-DE and COSMO-DE-EPS during the Testbed phase and afterwards.

These are a number of findings from the testbed:

1. The model **simulates the evolution of mesoscale convective systems (MCS) well**, once these systems are present within the COSMO domain. This was demonstrated on 8 June, 6 July and 7 July. See **Events 1 and 2** in the next section.

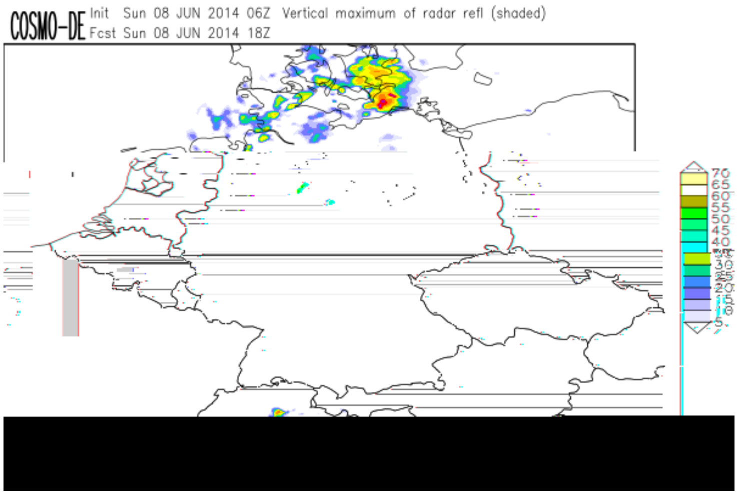
2. The model system **performed poorly with the intense convective windstorm on 9 June** (bow echo) that affected parts of western Germany. For a **discussion**, see **Event 3** in the next section.

3. The model shows a **reluctance in initiating convection away from mountain ranges and weather systems on warm, high-CAPE days**. This was evident on several days in early June, and reminded of similar behaviour noted in 2012 and 2013. See **Event 4** in the next section. On relatively cool days with lower CAPE and more relative humidity, there is no evidence of this problem.

4. **Convective initiation over the Alps seems to be handled very well by the model**. Several events south and east of the Alps were also simulated very well.

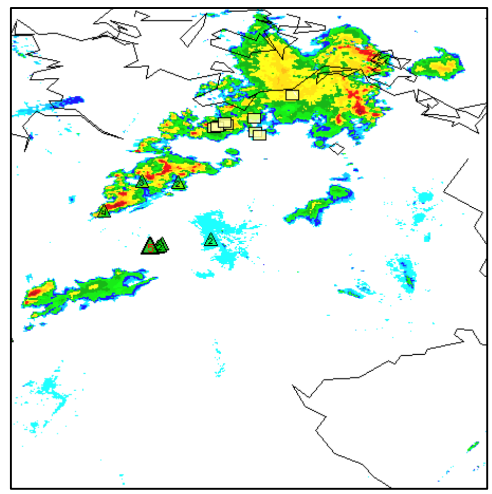
6. Events

Event 1: MCS 8 June 2014 18 UTC



Reflectivity.
+12 hour deterministic COSMO-DE forecast.

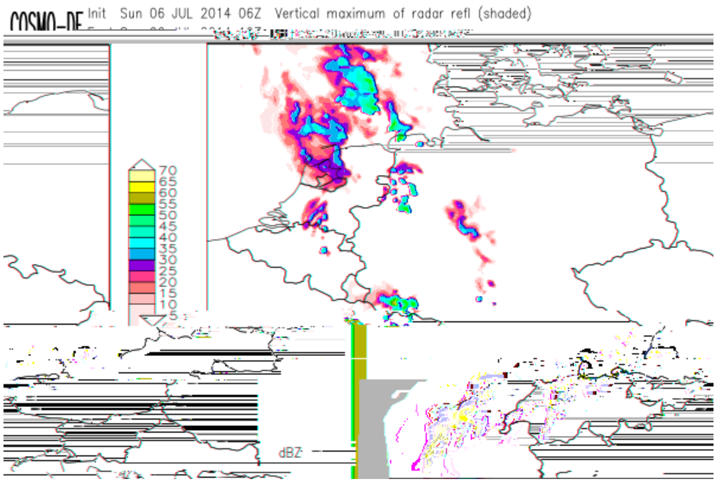
Verification:



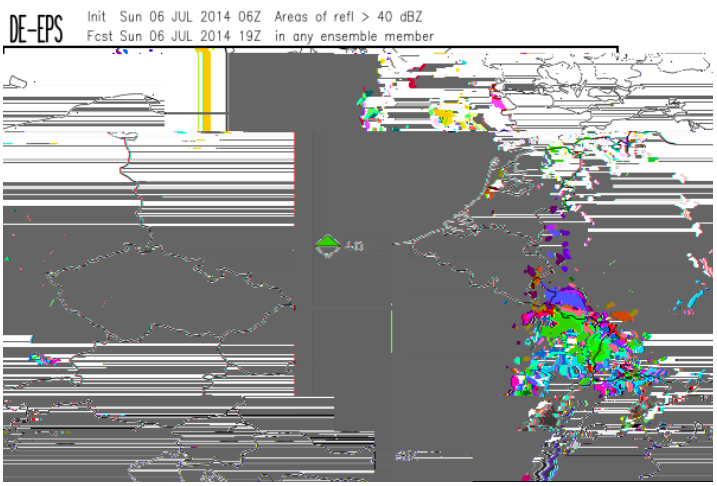
Reflectivity.
+12 hour COSMO-DE-EPS forecast.
Members exceeding 40 dBZ.

This event illustrates how well the ensemble system propagated an MCS that was within the COSMO domain at initialization time (at 06 UTC).

Event 2: MCS 6 July 2014 19 UTC

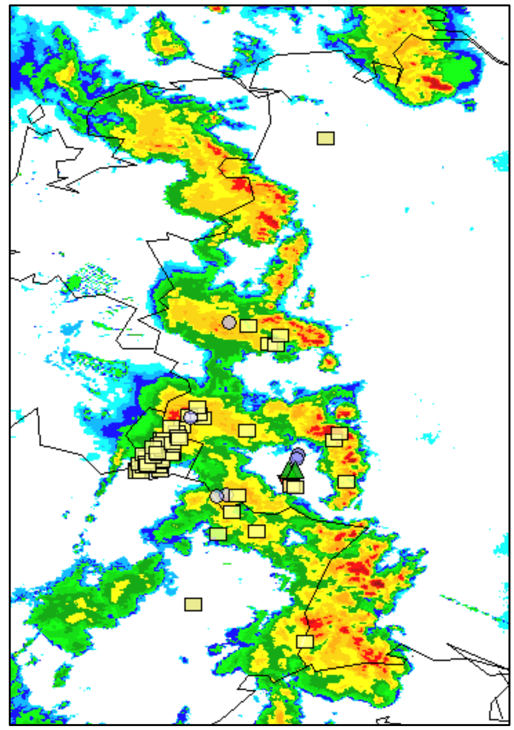


Reflectivity.
+13 hour deterministic COSMO-DE forecast.



Reflectivity.
+13 hour COSMO-DE-EPS forecast.
Members exceeding 40 dBZ.

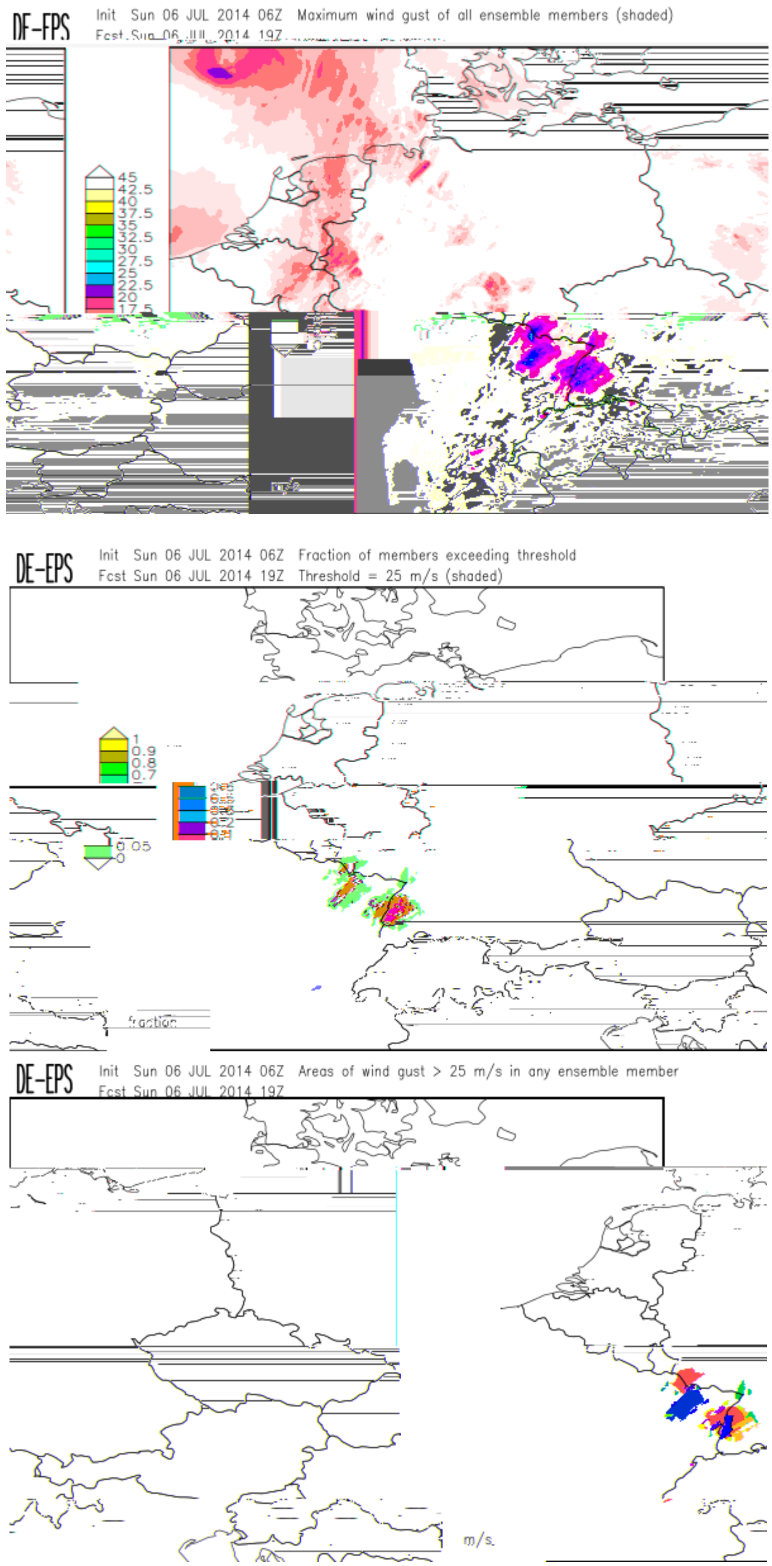
Verification:



Radar reflectivity and ESWD reports 16-19 UTC.

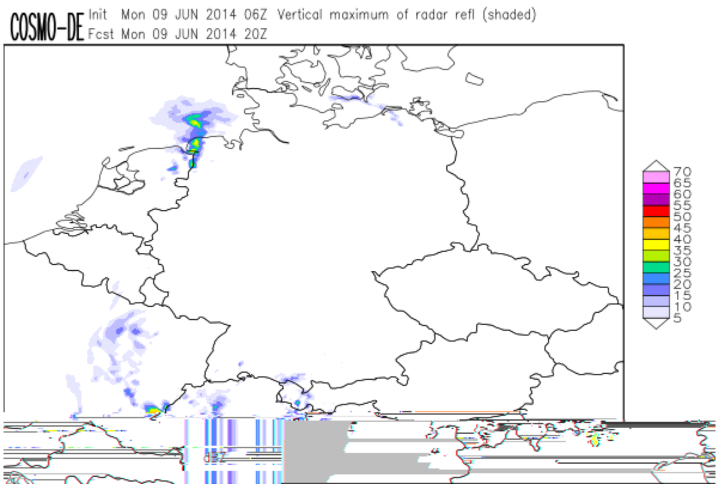
This event was an MCS that developed from isolated cells over NE France. Stretches of winds >25 m/s over Luxemburg, Saarland, Alsace, Rhineland-Palatinate can be seen in observations.

The evolution of the MCS was moderately well predicted by the deterministic run. The ensemble shows that many member have a zone of high reflectivity, reminiscent of a squall line, over the area that experienced the strongest winds. Wind gust ensemble products shown on the next page gave fairly good guidance that a severe wind event might evolve:

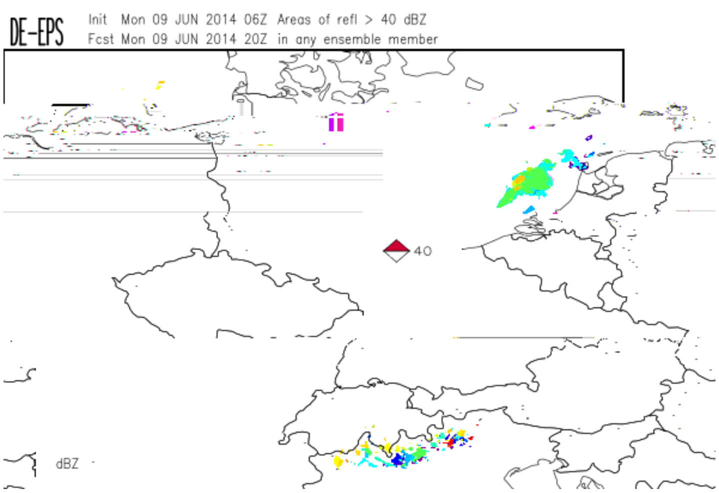


Wind gust products from COSMO-DE-EPS (06 UTC) valid 19 UTC. See descriptions above figures for details.

Event 3: Bow-echo 9 June 2014 20 UTC

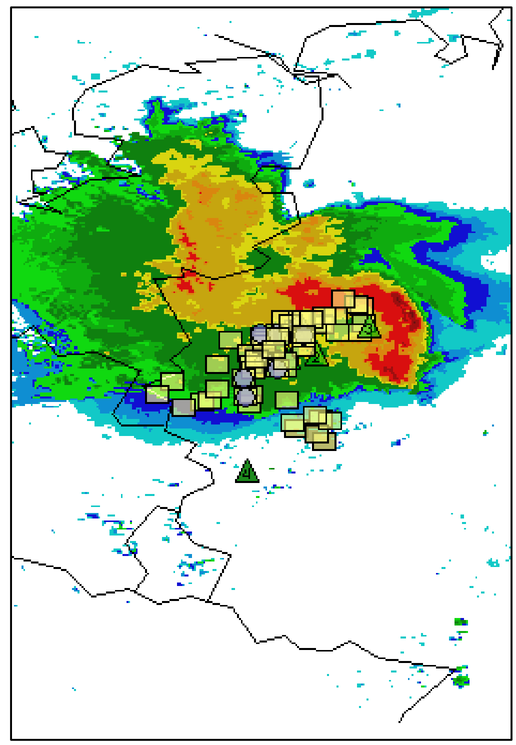


Reflectivity at 20 UTC.
06UTC +14 hour deterministic COSMO-DE forecast.



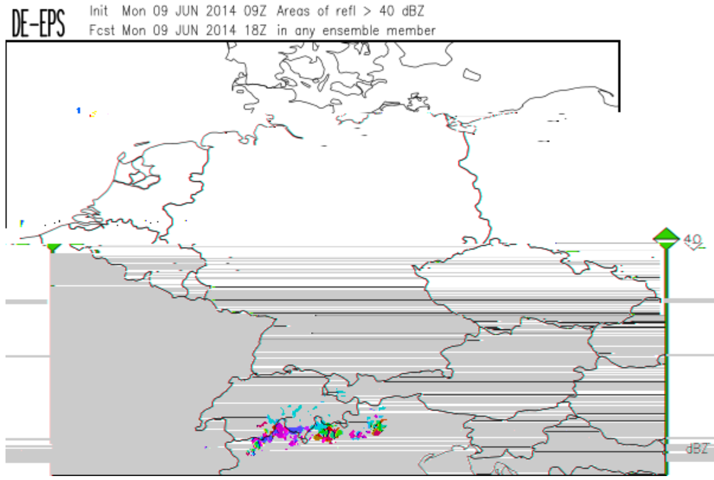
Reflectivity at 20 UTC.
06 UTC +14 hour COSMO-DE-EPS forecast.
Members exceeding 40 dBZ.

Verification:



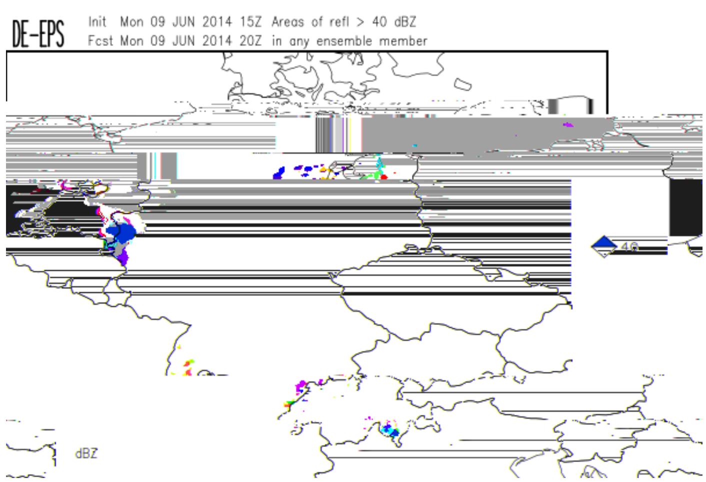
Radar reflectivity and ESWD reports
17-20 UTC.

This case is one of poor performance of the COSMO-DE-ENS. The figure above shows that the intense bow echo with wind speeds up to 44 m/s was completely absent in the entire ensemble initialized at 06 UTC. The same is true for the 09 and 12 ensemble runs. The first runs to pick up the system are those initialized at 15 UTC (see figure on next page).



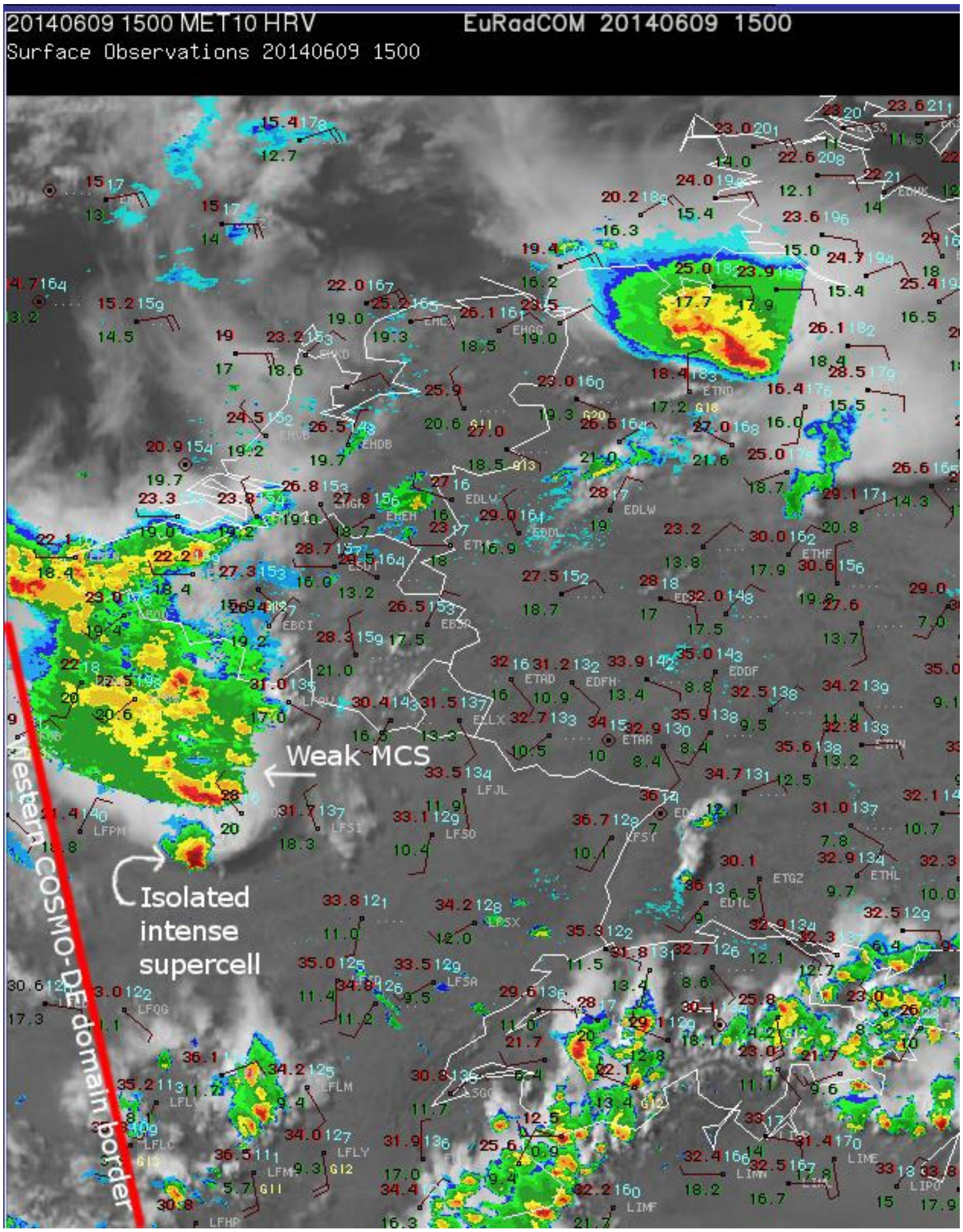
09 UTC **+ 11 hour** COSMO-DE-EPS forecast. Members exceeding 40 dBZ.

12 UTC **+ 8 hour** COSMO-DE-EPS forecast. Members exceeding 40 dBZ.



15 UTC **+ 5 hour** COSMO-DE-EPS forecast. Members exceeding 40 dBZ.

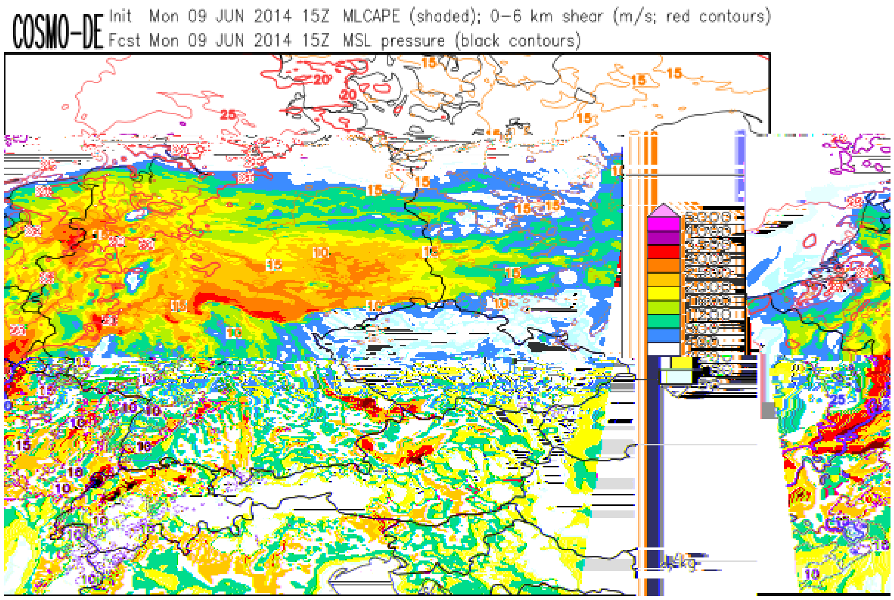
15 UTC is the first initialization time of COSMO-DE-EPS at which a weak MCS, which upon becoming surface-based turned into the bowing system, was contained within the COSMO-DE domain:



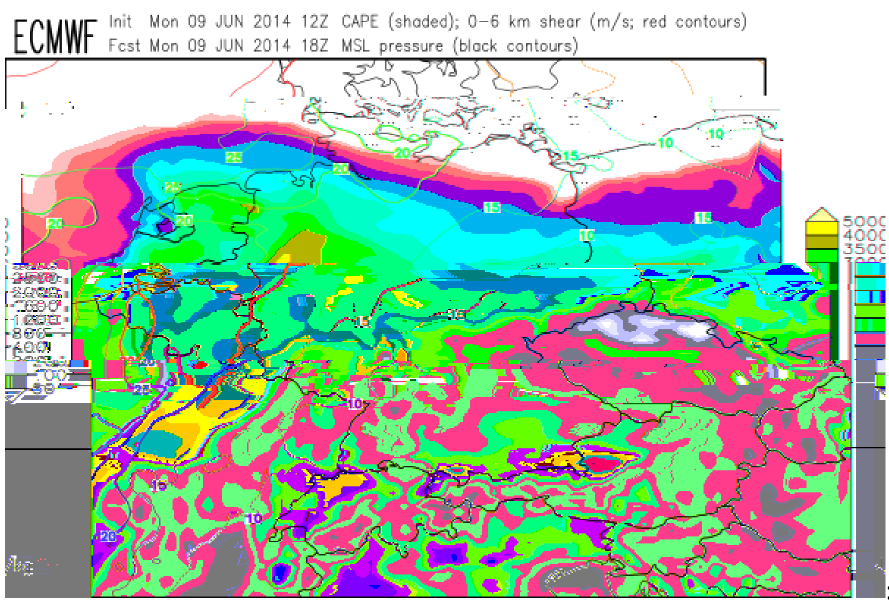
Euradcom, surface observations at 15 UTC.

The isolated supercell exhibited a very pronounced hook-echo between 12 and 14 UTC and produced hailstones with a diameter of 9 cm. Between 15 and 17 UTC it weakened and disappeared.

COSMO-DE, in agreement with ECMWF, COSMO-EU, GFS and ALARO, showed a region of very high CAPE ahead of the weak MCS, within the zone that was later affected by the bow echo (top). CAPE was expected to increase further until 18 UTC. The ECMWF even boasted in excess of 3000 J/kg of CAPE over a large area, which can be considered extreme (bottom). In addition, adequate shear around 20 m/s was present.

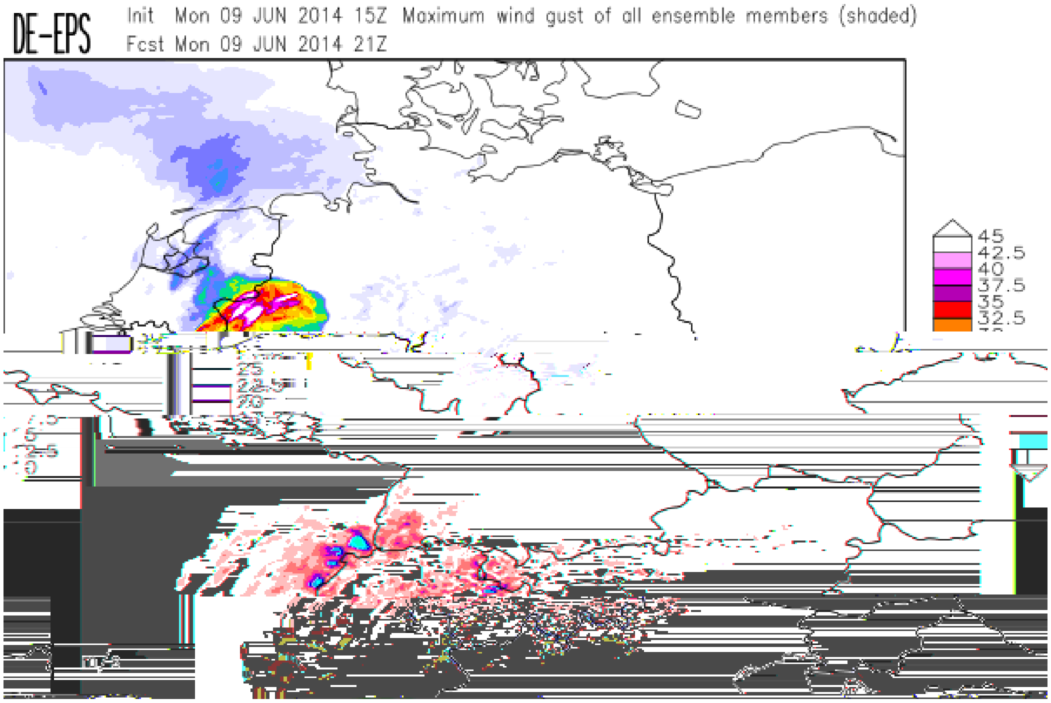


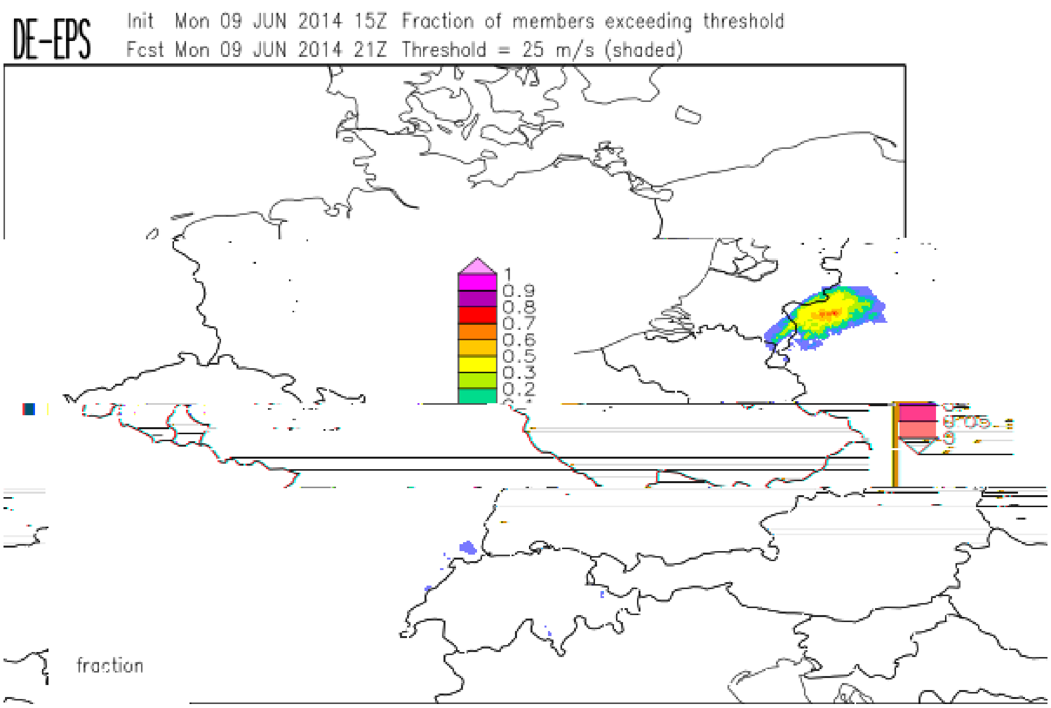
CAPE and 0-6 km shear at 15 UTC according to COSMO-DE.



ECMWF CAPE (+06 UTC) forecast for 18 UTC.

At 15 UTC the ensemble picked up the bow echo, although the timing (too slow) and location (a bit too far north) were still somewhat off. The maximum wind gust of the ensemble and the fraction of members at 21 UTC are displayed below:





The following observations can be made:

- The COSMO-DE-EPS system was only able to simulate the bow echo after it was contained within the COSMO domain at initialization time (at 15 UTC). As soon as that was the case, the re-strengthening of the old MCS was simulated fairly well, as well as its decay after 21 UTC (not shown).
- At 18 UTC, however, the intensity of the bow echo was again underestimated by COSMO-DE_EPS (not shown).
- The deterministic COSMO-DE initialized at 15 UTC did not develop the bow echo at all. Only at 18 UTC, some storms were simulated, but not nearly as strong as the real bow echo.
- If the 15 UTC EPS runs were available 3 hours later, this means that forecasters responsible for warnings along the western German border had **no lead time at all**, since the system moved into Germany at approximately 18 UTC.

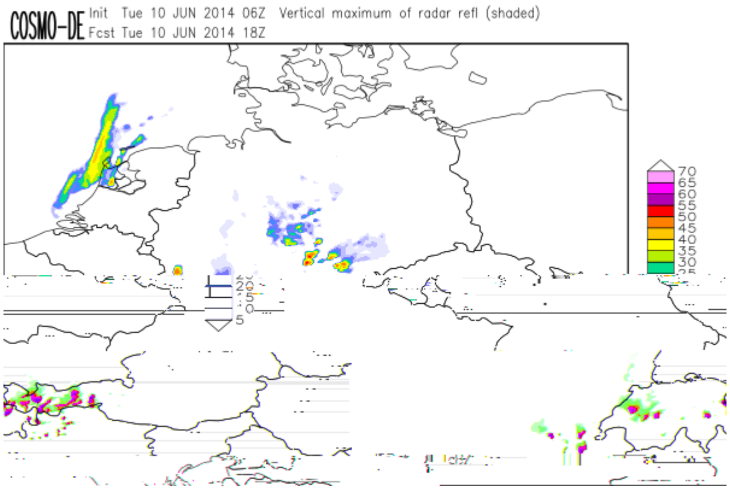
Explanations for this behaviour can be:

- Apparently, the boundary conditions provided to the COSMO-DE(-EPS) did not resolve the dynamics of the approaching weakening MCS accurately enough to force COSMO to reactivate the MCS.
- The general reluctance of COSMO-de(-EPS) to develop storms in warm, high-CAPE environments with a dry lower troposphere may have aggravated the problem.
- We cannot explain the failure of COSMO-DE to develop the system at 15 UTC in contrast to the EPS runs.

Solutions could be:

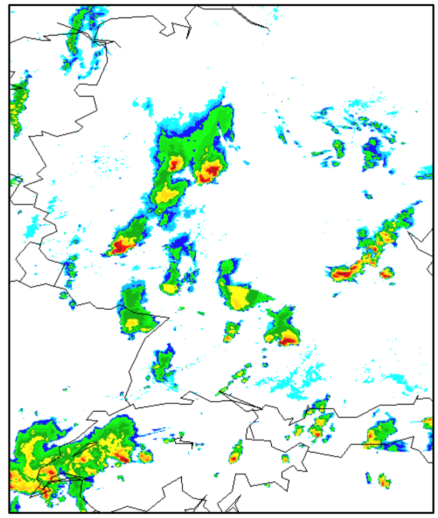
- Most importantly, the COSMO-DE domain should be enlarged to the west, and perhaps slightly to the south as well. Currently, a system moving at 90 km/h can reach western Germany within slightly over 3 hours, i.e. comparable to the time necessary for the model data to be generated and disseminated. By enlarging the domain 300 km to the west, the direction from which most severe thunderstorms arrive, lead time can be increased by 3 hours. This will ensure that a forecast that benefits from COSMO-DE's capabilities to simulate the dynamics of an approaching MCS at convection-permitting resolution will arrive at the latest 3 hours before it affects Germany, instead of 0 hours.
- The general reluctance of COSMO to initiate storms in warm, high-CAPE environments should be studied and mitigated, see also Event 4.
- The failure of COSMO-DE to develop the system and the trouble it had to maintain the system, should be studied and mitigated.

Event 4: Isolated severe storms 2014 11 June 18 UTC

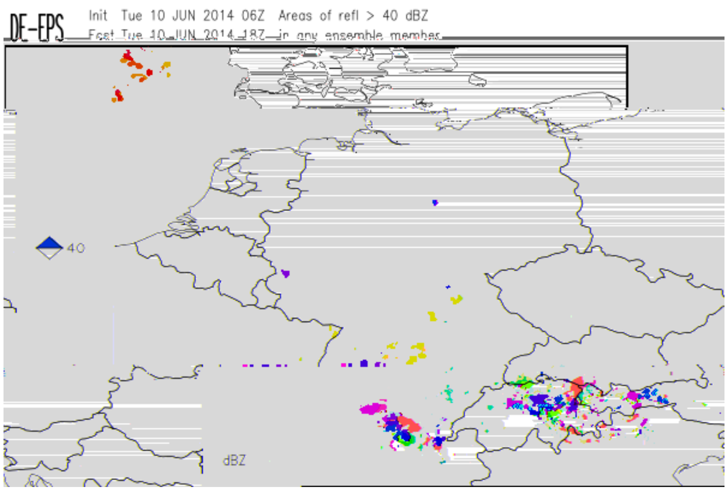


Reflectivity at 18 UTC.
06UTC +12 hour deterministic COSMO-DE forecast.

Verification:



Radar reflectivity at 18 UTC.



Reflectivity at 20 UTC.
06 UTC +12 hour COSMO-DE-EPS forecast.
Members exceeding 40 dBZ.

Event 4 is a quite typical example of COSMO-DE initiating too little storms on a warm, high-CAPE day with subtle forcing mechanisms. These storms each produced combinations (very) large hail, damaging wind gusts and flash floods. During the 2014 Testbed, there were few such days, but 8, 10 and 11 June were examples. The vertical profiles of COSMO-DE on these days do not indicate any strong biases in temperature or humidity. Yet, convective initiation does occur in reality and not (as much) in COSMO-DE or COSMO-DE-EPS. This is in line with the findings of the previous two Testbeds, where a similar reluctance for convective initiation on weakly forced high-CAPE days was noted.

A possible cause might be a lack of random up- and downdrafts on scales close to the model grid-spacing, which may be mitigated by artifically introducing them into the ensemble through local diabatic heating and cooling tendencies.

7. Notes on model behaviour on most 'convective' days in June and July 2014

These notes are partly personal notes (Pieter Groenemeijer) and partly notes by Tesbbed participants.

4 June 2014	- COSMO-DE predicted the convective case in N Italy but not all runs showed the severity, and the position was mostly too far north and therefore too close to the Alps (mountains). Early and frequent (all runs) signals in the EPS showed at least small fractions (up to 50%). Together with the single member solution (smartie plot) it was recognizable that just small shifts led to the small fractions. In total the forecast was very good and valuable.
5 June 2014	- COSMO-DE predicted the convective line over Poland at the right location 15-18h in advance. The previous forecasts (lead time > 18) showed weaker signatures.
8 June 2014	- 06 UTC was a very good forecast. Motion of small MCS travelling along a frontal zone across N Germany is forecast well. - New development to the S and W of the system is also well-forecast by the ensemble. The deterministic run was an outlier that didn't do as well.
9 June 2014	- Very poor performance of forecasting an extremely severe convective windstorm in an environment with exceptionally high CAPE and rather strong wind shear.
10 June 2014	- Intensity of storms over much of Germany was underestimated, in particular the storms over NW Germany (producing 4-6 cm hail) and far SW Germany were not captured well. - There were no severe storms moving north off the Swiss Alps in the early evening.
11 June 2014	- Activity over Black Forest underforecast. MCS over N Germany too slow in COSMO. In reality, there are no storms ahead of MCS over Brandenburg, Vorpommern. - Storms over eastern Saxony well predicted. - Storms over Vorarlberg and Tyrol do not move northward off the mountains in reality as they do in COSMO.
14 June 2014	- Storms moving southward off the Alps during the early afternoon well forecast.
22 June 2014	- Storms over the western, central and southern Alps underestimated.
23 June 2014	- Severe storms over N Italy, S Austria and Slovenia on 23 June 2014:Two right-moving supercells formed around 12 and 14 UTC over S Austria and then moved SE-ward into Slovenia within the following two hours, respectively. Both of them brought a lot of damaging hail along their paths (see ESWD reports). - SDI, total water and total graupel of the 03z COSMO-DE ensemble (used as the basis for our day 1 forecast) gave very good signals for both supercells! Also the wind gust risk with the western storm (which knocked down some trees) was correctly simulated by a distinct gust maximum in several of the ensemble runs.

	-	Reflectivity maps: Widespread storm activity over the mentioned area (N Italy, S Austria and Slovenia) in the afternoon and evening was simulated very well too. Later in the evening a cluster of secondary convection formed over W Hungary, which was also covered by strong signals in the COSMO-DE ensemble - this is particularly remarkable due to the difficult predictability of secondary initiation! Minor ¨false alarms¨ where strong reflectivity signals over the Friulian Plains in NE Italy in the afternoon (strong storms formed over the neighboring Alps, but took some more hours to propagate into the foreland) and in inland Croatia in the evening (storms did not move that far south at all) However, overall it was a **very good performance on a severe storm day**! The operational run performed much less well. **This day would be a good showcase for the benefit of an ensemble compared to a deterministic run alone.**
28 June 2014	-	Good forecast of a weak MCS moving eastward across S Germany, followed by new storms (splitting storms) over E France. SDI does not detect the many left-moving storms
4 July 2014	-	Somewhat messy but severe wind (30 m/s) producing storm system in the evening over Switzerland and extreme SW Baden-Württemberg not captured well with regard to severe windgusts, in any COSMO-DE-EPS run.
6 July 2014	-	MCS system producing severe wind over NE France, Luxemburg and W Germany **very well predicted** by 06 UTC run. An important difference between this day and 9 June is that the system develops from cells triggered within the western part of the COSMO domain
7 July 2014	-	Very good guidance that an MCS would develop over the Swiss/German border region and subsequently move northward.
	-	Good guidance that the wind gust threat would be modest and that large hail was not very likely either, except for the southeasternmost cell.
8 July 2014	-	Good guidance regarding convective wind storm over Brandenburg
10 July 2014	-	Heavy rain event over Hessen moderately well forecast.
17 July 2014	-	Severe storms over NE Italy well forecast.

Attachment: participant answers to questionnaires

#1

COMPLETE

Collector: Web Link (Web Link)
Started: Friday, June 06, 2014 3:40:51 AM
Last Modified: Friday, June 06, 2014 5:32:24 AM
Time Spent: 01:51:33
IP Address: 80.109.154.58

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Q1: Which of the visualizations do you find most useful?

The combination of COSMO-DE (deterministic run) and the EPS plots are very valuable. Especially the additional information, and the possible (non-)confirmation of the deterministic run by the EPS.

Single EPS maps:
Smartie plot (treshold exceedance single member dots): Very useful because the solutions of single members are recognizable.

Fraction/Probability plot: Very useful to see where the strongest activity is expected, especially together with the smartie plot you can asess whether just a few members predict the case (leading to low fractions) or many members are predicting the tresholds but with a slight spatial shift, which would lead to low fractions as well even the probability in the area is in fact higher.

Maximum: Is valuable, but some forecasters may take that too literally and you cannot see any structures of a single member.

Q2: How much and what information did the COSMO-DE-EPS ensemble add tothe deterministic run?

Certainty of deterministic run!

Possibility to lose cases decreases with the additional EPS information.

Q3: Do you have any other comments regarding the COSMO-DE / COSMO-DE-EPS?

In the first week of the testbed unfortunately just a few (severe) thunderstorms occured in the COSMO-DE domain. At least 2 cases could be examined. They took place over N ITA/NW GER at 20140604 and Poland/NW GER at 20140605.

Conclusions from case 1: COSMO-DE predicted the convective case in N Italy but not all runs showed the severity, and the position was mostly too far north and therefore too close to the Alps (mountains). Early and frequent (all runs) signals in the EPS showed at least small fractions (up to 50%). Together with the single member solution (smartie plot) it was recognizable that just small shifts led to the small fractions. In total the forecast was very good and valuable (see question 4 for more information).

Conclusions from case 2: COSMO-DE predicted the convective line over Poland at the right location 15-18h in advance. The previous forecasts (lead time > 18) showed weaker signatures.

Q4: Are integrated total water and integrated graupel useful as predictors for lightning?

The total water and graupel maps serve as a good indicator where the most severe thunderstorms occur. In case 1 (20140604 - see question 3) the reflectivity maps showed additionally to N Italy fractions up to 25-35% in NW GER. From that point of view a strong thunderstorm could not be ruled out in that area. But the total water and especially graupel fractions only reached high values in N Italy. It is possible that these maps can be consultated if the severity level matters.

The same can be said for case 2 (20140605): fraction/smartie plot of reflectivity showed high values at the line in POL as well as in NW GER but the fractions of graupel and especially of total water increased just over Poland.

However, it depends how severity is defined! If high lightning density is important than it can be assumed from these 2 cases that there is a fair chance of twater and graupel to serve as a predictor.

Q5: Do you have any suggestions for parameters to display from a high-resolution ensemble to benefit convective storm forecasting?

- vertical wind in middle troposphere (600/700hPa)
- moisture (several levels. most important: 700hPa)
- horizontal wind fields (10m, 1000m, 2000m)
- sfc pressure/ pressure tendency
- spaghetti of 500hPa or 320K IPV (short waves)

Q6: Is there anything else that caught your attention regarding the performance of COSMO-DE(-EPS), for example regarding under- or overforecasting convection, timing, intensity, etc... ? Please indicate the run in which you noticed this behaviour.

Cannot assess it based on just 2 cases.
But the first impression looks very useful.

#2

COMPLETE

Collector: Web Link (Web Link)
Started: Thursday, June 12, 2014 6:42:58 AM
Last Modified: Thursday, June 12, 2014 8:40:41 AM
Time Spent: 01:57:43
IP Address: 80.109.154.58

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Q1: Which of the visualizations do you find most useful?

all are usefull:

with the maximum product you can put some kind of roughly boundaries of the area where for example severe weather might occur

threshold images gives you very good estimation/ best guess where severe weather will most likely to occur

Q2: How much and what information did the COSMO-DE-EPS ensemble add tothe deterministic run?

EPS- ensemble shows if the deterministic run differs a lot from the ensemble. In some cases forecaster can rule out the deterministic run somehow.

Q3: Do you have any other comments regarding the COSMO-DE / COSMO-DE-EPS?

Respondent skipped this question

Q4: Are integrated total water and integrated graupel useful as predictors for lightning?

In Thursdays (13.6.2014 stroms S France, Alpein region, N Balkan) case:

lightning was detected over the areas where also high values of total graupel was seen in the COSMO model.

Highest total water content in the model was in the region where flooding was reported.

Q5: Do you have any suggestions for parameters to display from a high-resolution ensemble to benefit convective storm forecasting?

Addition to total water content also could be useful to have water content of the lowest troposphere.

Maybe CAPE or CIN?

Maximun wind from the lowest 3 km

Q6: Is there anything else that caught your attention regarding the performance of COSMO-DE(-EPS), for example regarding under- or overforecasting convection, timing, intensity, etc... ? Please indicate the run in which you noticed this behaviour.

Respondent skipped this question

#3

COMPLETE

Collector: Web Link (Web Link)
Started: Tuesday, June 24, 2014 6:35:10 AM
Last Modified: Tuesday, June 24, 2014 7:20:55 AM
Time Spent: 00:45:44
IP Address: 80.109.154.58

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Q1: Which of the visualizations do you find most useful?	*Respondent skipped this question*
Q2: How much and what information did the COSMO-DE-EPS ensemble add tothe deterministic run?	*Respondent skipped this question*
Q3: Do you have any other comments regarding the COSMO-DE / COSMO-DE-EPS?	*Respondent skipped this question*
Q4: Are integrated total water and integrated graupel useful as predictors for lightning?	*Respondent skipped this question*
Q5: Do you have any suggestions for parameters to display from a high-resolution ensemble to benefit convective storm forecasting?	*Respondent skipped this question*

Q6: Is there anything else that caught your attention regarding the performance of COSMO-DE(-EPS), for example regarding under- or overforecasting convection, timing, intensity, etc... ? Please indicate the run in which you noticed this behaviour.

Severe storms over N Italy, S Austria and Slovenia on 23 June 2014:Two right-moving supercells formed around 12 and 14 UTC over S Austria and then moved SE-ward into Slovenia within the following two hours, respectively. Both of them brought a lot of damaging hail along their paths (see ESWD reports). SDI, total water and total graupel of the 03z COSMO-DE ensemble (used as the basis for our day 1 forecast) gave very good signals for both supercells! Also the wind gust risk with the western storm (which knocked down some trees) was correctly simulated by a distinct gust maximum in several of the ensemble runs.
Reflectivity maps: Widespread storm activity over the mentioned area (N Italy, S Austria and Slovenia) in the afternoon and evening was simulated very well too. Later in the evening a cluster of secondary convection formed over W Hungary, which was also covered by strong signals in the COSMO-DE ensemble - this is particularly remarkable due to the difficult predictability of secondary initiation! Minor ¨false alarms¨ where strong reflectivity signals over the Friulian Plains in NE Italy in the afternoon (strong storms formed over the neighboring Alps, but took some more hours to propagate into the foreland) and in inland Croatia in the evening (storms did not move that far south at all)
However, overall it was a very good performance on a severe storm day! The operational run performed much less well. This day would be a good showcase for the benefit of an ensemble compared to a deterministic run alone.

#4

COMPLETE

Collector: Web Link (Web Link)
Started: Thursday, June 26, 2014 5:13:31 AM
Last Modified: Thursday, June 26, 2014 6:07:23 AM
Time Spent: 00:53:52
IP Address: 80.109.154.58

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Q1: Which of the visualizations do you find most useful?

Reflectivity, totalgraupel.

Q2: How much and what information did the COSMO-DE-EPS ensemble add tothe deterministic run?

It can over overcome uncertanities in position of some features which are shown in the deterministic run, e.g. giving probability of detection of these.

Q3: Do you have any other comments regarding the COSMO-DE / COSMO-DE-EPS?

For gusts: position was good, but the strength was overestimated (20140625 over Czech republic and Bavaria). No wind gusts in the area with severe convection (Croatia).
Precipitation of the individual smaller storms was not shown at all.
To much false alarm in the sdi, a lot of ensemble member show this false alarm.
High values of graupel were in the vicinity of severe storms (Croatia 20140625).
Totalwater seems to be good in this particular case.

Q4: Are integrated total water and integrated graupel useful as predictors for lightning?

Total water seems not to be special predictor, graupel is better showing lightning position but still has some false alarms.

Q5: Do you have any suggestions for parameters to display from a high-resolution ensemble to benefit convective storm forecasting?

CAPE and some other instability related parameters (low level convergence boundaries).

Q6: Is there anything else that caught your attention regarding the performance of COSMO-DE(-EPS), for example regarding under- or overforecasting convection, timing, intensity, etc... ? Please indicate the run in which you noticed this behaviour.

For gusts: position was good, but the strength was overestimated (20140625 over Czech republic and Bavaria). No wind gusts in the area with severe convection (Croatia).
High values of graupel were in the vicinity of severe storms (Croatia 20140625).