# ANNUAL REPORT 2007


# European Severe Storms Laboratory

**ESSL e. V.**

**c/o Dr. Nikolai Dotzek**
**DLR-IPA, Oberpfaffenhofen**
**Münchner Str. 20**
**82234 Wessling**
**Tel.: +49-8153-28-1845**
**Fax: +49-8153-28-1841**

**nikolai.dotzek@essl.org**

**http://essl.org**

**Oberpfaffenhofen, 2 October 2008**

# CONTENTS


**1. INTRODUCTION ..... 3**

**2. SCIENTIFIC REPORT ..... 4**

2.1. Science ..... 4

2.2. ECSS conference and Heino Tooming award ..... 6

2.3. Publications and outreach ..... 6

2.3.1. Presentations and posters ..... 7

2.3.2. References ..... 8

**3. TECHNICAL REPORT ..... 9**

3.1. ESWD version 2 ..... 9

3.2. New users ..... 9

3.3. ESWD version 3 development ..... 9

3.4. ECSS conference websites ..... 9

3.5. Technical description of ESWD version 2 output ..... 10

**4. FINANCIAL AND ADMINISTRATIVE REPORT ..... 11**

4.1. Overview ..... 11

4.2. Financial status 2006 ..... 11

4.3. Financial status 2007 ..... 11

4.4. Administrative report ..... 13

4.5. Executive Board and Advisory Council ..... 14

4.5.1. Executive Board ..... 14

4.5.2. Advisory Council ..... 15

**A. APPENDIX ..... 16**

A.1 Heino Tooming award 2007 poster ..... 16

A.2 Member list 2007 ..... 17

## 1. INTRODUCTION

Severe thunderstorms inflict a total damage of 5 to 8 billion € all over Europe each year.

Even without any climate change impact, this annual amount of damage is far too high to be neglected. The European Severe Storms Laboratory, ESSL, tackles this problem by:

- Fundamental and applied research on severe convective storms in Europe;
- Operation of the European Severe Weather Database, ESWD;
- Organisation of the European Conferences on Severe Storms, ECSS.

The European Severe Storms Laboratory e. V. was founded as a private, non-profit research organisation in December 2006, so 2007 was ESSL's first full business year. It is a spin-off of German Aerospace Center DLR in Oberpfaffenhofen, and relies on the long-term expertise of its international team. Presently, the ESSL office is located at DLR-*Institut für Physik der Atmosphäre*.

ESSL recruited its first part-time collaborators in 2007. The mid-term goal is to reach full-time employment of the Executive Board members by 2010 and a critical mass of about 10 full-time equivalent positions until 2012. The long-term vision is to create permanent ESSL facilities in central Europe hosting about 100 employees, about half of which are funded by research project third-party funds.

The present Annual Report reviews ESSL's very first steps in this direction.

Nikolai Dotzek, ESSL Director

The Annual Report was approved by the

- ESSL Advisory Council on 2 October 2008, and by the
- ESSL General Assembly on 2 October 2008.

## 2. SCIENTIFIC REPORT

### 2.1. SCIENCE

One major building block of ESSL's scientific activities is the application of its European Severe Weather Database (ESWD) to climatological studies of severe thunderstorms in Europe. Other potential applications of the ESWD lie in the verification of forecast and nowcast products, or warnings. The latter applications must be done in collaboration with national weather services or research organisations involved in forecasting or warning, as these are not within the scope of ESSL's activities. Verification studies of this kind in cooperation with the German weather service DWD have been described by Dotzek et al. (2006) or Dotzek et al. (2007c). Here, we highlight climatological results which had been unavailable before the establishment of the ESSL.

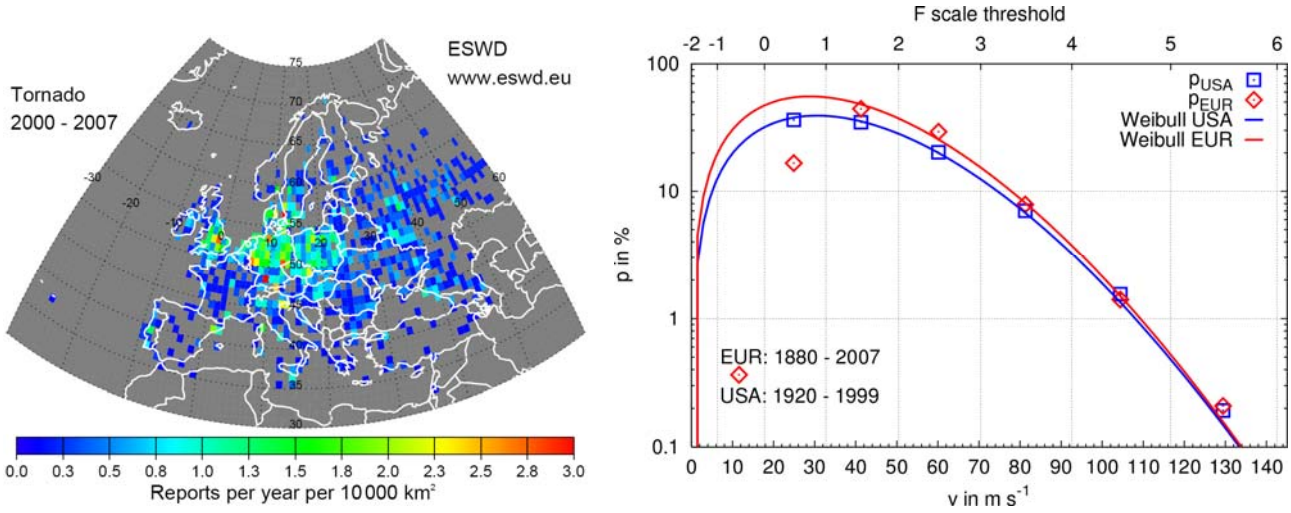



**Figure 1**: Left: Short-term (2000-2007) map of tornado incidence in Europe as a primary metric of tornado hazard is given in number of ESWD reports per year per 10,000 km$^2$ on a 1° x 1° latitude-longitude grid. Right: Comparison of long-term tornado intensity distributions from the USA (boxes, 1920-1999) and Europe (diamonds, 1880-2006) over wind speed and Fujita scale. The smooth curves are fits by Weibull distributions from F1 to F5 intensity (www.essl.org/research/ and Dotzek et al., 2007c).

Fig. 1 shows an enhanced tornado hazard extending from the United Kingdom over the Benelux countries, Germany and Poland towards the Baltic States. This corroborates the earlier findings by Wegener (1917), but needs further substantiation as the ESWD records grow. Presently, about 3500 reports are added to the ESWD each year, with growing homogeneity all over Europe. So while the years 2000-2004 are still subject to an inhomogeneous reporting also reflected in Fig. 1, this should improve quickly in the future. Similar results follow for other main ESWD phenomena, see www.essl.org/research/.

The right panel of Fig. 1 presents an analysis in which inhomogeneous reporting does not play a significant role, as only the numbers of tornado reports with F-scale rating enter this intensity distribution. In comparison with data from the USA, a remarkable similarity of the two distributions emerges, except for the weak F0 tornadoes for which strong underreporting seems to persist in Europe. Of course, the number of reported events has risen strongly over time both in the USA (since 1950) and Europe (since 2000). For this reason, long time series have been used which both include this reporting trend. From the similarity of the two distributions for higher intensities, we can expect strongly rising numbers of weak tornado reports in Europe – and a hazard of even F4 and F5 tornadoes.

In late 2006 and 2007, ESSL was involved in four proposals to the European Commission or the European Science Foundation for research projects. The rules of EU-projects specify that the ESSL has to cover up to 25% of its total costs in the project from its own resources. The first three proposals were coordinated by the ESSL Director and dealt with development of the ESWD database (ESWD, eContent*plus* programme), European storm risk (ESTRAGO, FP7 collaborative project) and with the effects of climate change on severe storms (STORM-CLIMATE, ERC starting grant). The fourth was a proposal for a COST Action on "Severe thunderstorm forecasting" coordinated by ESSL founding member Jenni Teittinen of the Finnish Meteorological Institute FMI. The ESWD eContent*plus* and the ESTRAGO proposal were backed up by a number of Statements of Interest by potential ESWD users, see Table 1. Yet unfortunately, none of these proposals was invited for grant agreement negotiations, despite generally good evaluation results.

**Table 1**: Statements of Interest received for use of ESSL research services or the ESWD database within the ESWD eContent*plus* and ESTRAGO proposals.

| | **Organisation** | **CC** | **Sector** |
|---|---|---|---|
| 1 | Munich Re Group AG | DE | Reinsurance |
| 2 | Deutsche Rück AG | DE | Reinsurance |
| 3 | Louis Braun GmbH | DE | Reinsurance |
| 4 | Risk Prediction Initiative, Garrett Park | US/BM | Reinsurance |
| 5 | Allianz Zentrum für Technik GmbH | DE | Insur. / Consult. |
| 6 | Tokio Marine & Nichido Fire Insurance Co., Ltd | JP/US | Insurance |
| 7 | Association of Insurance Companies Greece | GR | Insurance |
| 8 | WMO-Global Climate Observing System | INT | Research |
| 9 | NOAA-National Severe Storms Laboratory | US | Research |
| 10 | Naval Research Laboratory | US | Research |
| 11 | NowCast mobile GmbH | DE | Research |
| 12 | ESPERE Association | PL | Training |
| 13 | Panagia Philanthropini | GR | Social / Health |
| 14 | Bulgarian State Agency for Information Technology & Communications | BG | Information |
| 15 | Hellenic Republic Region of Central Macedonia | GR | Administration |

However, other collaborative actions on a smaller scale were more successful. First of all, climatological research results based on the ESWD data for Germany contribute to the BMBF-funded project RegioExAKT. Another small applied and third-party-funded research project aiming at the specific damaging wind hazard in the Munich region in southern Germany was successfully completed.

A further collaboration within a small research and development project is still in progress with German weather service DWD and will terminate in 2008. This DWD-funded project enabled the development of a major upgrade of the ESWD-Software and in addition creation of software to read and apply ESWD reports in the verification of severe weather forecasts and warnings issued by DWD.

An already existing collaboration could also be put on a firmer basis in 2007. At the EMS Annual Meeting 2007, a cooperation agreement with the European Meteorological Society was signed. There had already been an individual collaboration with the EMS in which Fulvio Stel and Dario Giaiotti, two of ESSL's founding members, had organised a dedicated "Atmospheric Hazards" session at the EMS Annual Meetings in recent years. Establishing tighter cooperation with the EMS was one of ESSL's statutory tasks.

## 2.2. ECSS CONFERENCE AND HEINO TOOMING AWARD

The ESSL hosted and initiated the web pages for the European Conference on Severe Storms (ECSS) 2007, see www.essl.org/ECSS/2007/). Two ESSL founding members (Fulvio Stel and Dario Giaiotti) were the main organisers of this successful conference which took place from 10-14 September 2007 in the International Centre for Theoretical Physics (ICTP) in Trieste. The ECSS was attended by about 150 participants from Europe and the USA. From 5-7 September 2007, the organisers had already held the traditional dedicated EUMETSAT training workshop. Members of the ESSL Executive Board further contributed to the scientific programme committee (SPC) of the ECSS and so assured the quality of the submitted conference presentations as well as of the proceedings prepared later on as refereed publications in the journal *Atmospheric Research*.

The Heino Tooming award presented for the first time at the ECSS 2007 commemorates this late Estonian tornado researcher (22 Oct 1930-18 Sept 2004) who had inspired so many younger scientists at the ECSS conferences in 2000 and 2002. The Tooming award is endowed with a prize of 300 €.

Eligible for the award is any outstanding scientific presentation at the ECSS conference by a group led by a European scientist and involving collaborators from at least one other European country, fostering in this way collaboration across this continent in the field of severe weather research.

At the ECSS 2007, the first Heino Tooming award was presented to Marianne König (EUMETSAT), Monika Pajek, and Piotr Struzik (both IMGW, Poland) for their poster "Air stability indices derived from satellite data as convection and storm predictors". The poster is reproduced in Appendix A.1.

## 2.3. PUBLICATIONS AND OUTREACH

The ESSL web site (www.essl.org) was further developed and enhanced by more information for the public. This aimed at presenting the newly-founded ESSL and at raising awareness of the ESWD database with its public web interface www.essl.org/ESWD/. Background information on the ESWD can be found at www.essl.org/projects/ESWD/.

For the same purposes, and to attract new ESSL members or registered ESWD data users, an information flyer, a poster and tailored presentations for NMHS and private-sector users were developed, updated and presented at various meetings, workshops and conferences. In addition to the list of meetings in Sec. 2.3.1, ESSL members also attended the *3rd Extremwetterkongress* in Hamburg, Germany, with its special audience of scientists and weather services as well as the public and the media.

Several ESSL Executives and founding members had presentations at national and international meetings or forecaster training and public educational workshops. A number of manuscripts for formal publications have been prepared (Sec. 2.3.2), and the ESSL Director is a Contributing Author of the current IPCC 4$^{th}$ Assessment Report (IPCC, 2007).

For a more educational academic purpose, the ESSL also makes a number of important older publications available in electronic form. These papers and books are neither copyright-protected any more, nor easily available from libraries nowadays, and yet they

still bear a great significance as resources for contemporary research. Among others, these are the works by Reye (1872), Wegener (1917), Letzmann (1923, 1939), or Koschmieder and Letzmann (1939).

We have received the feedback at the ECSS 2007 conference that ESSL's outreach was too much focused on Central Europe in its first year, and that a more balanced distribution of ESSL activities or representatives in the bodies of the association should be pursued. This message was heard and understood.

While the ten founding members already represented seven European countries, ESSL's activities in 2007 were indeed focused on more local collaborations in order to quickly and effectively advance the new association in its first business year. We intend to broaden the perimeter of ESSL activities in 2008 and also to enlist candidates to the Advisory Council from a balanced distribution of countries.

Suggestions by the ESSL members are welcome!

### 2.3.1. PRESENTATIONS AND POSTERS

Berling, A., and B. Feuerstein, 2007: War der Tornado von Hamburg vorhersehbar? *2nd Extremwetterkongress*, Hamburg, 23 March 2007.

Dotzek, N., and P. Groenemeijer, 2006: European Severe Weather Database, ESWD: Eine europaweite Unwetter–Datenbank für Klimatologie, Risikoanalyse, und Verifikation von Vorhersagen und Warnungen. *7. Deutsche Klimatagung*, Munich, 10 October 2006.

Dotzek, N., 2006: Tornados und lokale Unwetter in Deutschland – (Statistische) Klimatologie auf Basis von Ereignismeldungen. *Fachschaftstagung Cusanuswerk*, Bonn, 14 October 2006.

Dotzek, N., T. Kratzsch, and P. Groenemeijer, 2006: The European Severe Weather Database ESWD: An inventory of convective high-impact weather events for forecast and warning evaluation, climatology, and risk assessment. *2nd THORPEX Int. Science Symposium (STISS)*, Landshut, 4-8 December 2006. (Poster)

Dotzek, N., P. Groenemeijer, F. Stel, and D. Giaiotti, 2007: European Severe Weather Database, ESWD: Motivation and Current Status. *2nd EU–India Strategic S&T Workshop on Climate Change Research Needs*, New Delhi, 9 February 2007.

Dotzek, N., B. Feuerstein, and P. Groenemeijer, 2007: European Severe Storms Laboratory. *2nd Extremwetterkongress*, Hamburg, 22-23 March 2007. (Poster)

Dotzek, N., 2007: Potential benefits for pan-European forecasting of severe storms from the establishment of a "European Storm Prediction Centre" according to the US model. *2nd Int. Workshop "Severe Storms over Europe – A Cross–Border Perspective of Disaster Reduction*", Akademie Schloss Hohenkammer, DKKV, 27 March 2007.

Dotzek, N., B. Feuerstein, and P. Groenemeijer, 2007: European Severe Storms Laboratory. *Stiftung Umwelt und Schadenvorsorge, Symposium 2007 – Extremwetter: Vorhersage und Schadensvorbeugung*, Sparkassenakademie Rastatt, 29-30 March 2007. (Poster)

Dotzek, N., 2007: Derivation of physically motivated wind speed scales – The E-scale concept. *4th European Conference on Severe Storms*, Trieste, 10-14 September 2007. (Poster)

Dotzek, N., P. Groenemeijer, and B. Feuerstein, 2007: Overview of ESSL research on severe storms climatology - ESWD database and reporting, intensity distributions, and verification. *4th European Conference on Severe Storms*, Trieste, 11 September 2007.

Dotzek, N., P. Groenemeijer, and B. Feuerstein, 2007: The European Severe Weather Database (ESWD) - Design, quality-control and applications. *7th EMS Annual Meeting*, San Lorenzo de El Escorial, 1 October 2007.

Dotzek, N., P. Groenemeijer, and B. Feuerstein, 2007: The European Severe Weather Database (ESWD) - Design, quality-control and applications. *3rd ESA International Geohazards Workshop*, Frascati, 8 November 2007.

Friedrich, A., 2007: Tornadoes in Germany - Treatment at DWD. *4th European Conference on Severe Storms*, Trieste, 10-14 September 2007.

Peyraud, L., C. Salamin, A. Hering, and U. Germann, 2007: Analysis of the 18 July 2005 Tornadic Supercell over the Lake Geneva Region. *4th European Conference on Severe Storms*, Trieste, 10-14 September 2007. (Oral and Poster)

## 2.3.2. REFERENCES


Bissolli, P., J. Grieser, N. Dotzek, and M. Welsch, 2007: Tornadoes in Germany 1950-2003 and their relation to particular weather conditions. *Global and Planetary Change*, **57**, 124-138.

Doswell, C. A. III, H. E. Brooks, and N. Dotzek, 2007: On the implementation of the Enhanced Fujita scale in the USA. Submitted to *Atmos. Res*.

Dotzek, N., 2007a: Potential benefits for pan-European forecasting of severe storms from the establishment of a "European Storm Prediction Centre" according to the US model. Prepr., 2nd Int. Workshop "Severe Storms over Europe – A Cross-Border Perspective of Disaster Reduction", Akademie Schloss Hohenkammer, DKKV, 26-28 March 2007, 3 pp.

Dotzek, N., 2007b: Derivation of physically motivated wind speed scales. Submitted to *Atmos. Res*.

Dotzek, N., and P. Groenemeijer, 2006: European Severe Weather Database ESWD – Eine europaweite Unwetter-Datenbank für Klimatologie, Risikoanalyse, und Verifikation von Vorhersagen und Warnungen. Preprints, 7. Deutsche Klimatagung, Munich, 9-11 October 2006, 3 pp.

Dotzek, N., and K. Friedrich, 2007: Downburst-producing thunderstorms in southern Germany: Radar analysis and predictability. Submitted to *Atmos. Res*.

Dotzek, N., T. Kratzsch, and P. Groenemeijer, 2006: The European Severe Weather Database (ESWD): An inventory of convective high-impact weather events for forecast and warning evaluation, climatology, and risk assessment. Preprints, 2nd THORPEX Int. Science Symposium (STISS), Landshut, 4-8 December 2006, WMO/TD No. 1355, WWRP/THORPEX No. 7, 228-229.

Dotzek, N., P. Lang, M. Hagen, T. Fehr, and W. Hellmiss, 2007a: Doppler radar observation, CG lightning activity, and aerial survey of a multiple downburst in southern Germany on 23 March 2001. *Atmos Res*., **83**, 519-533.

Dotzek, N., R. E. Peterson, B. Feuerstein, and M. Hubrig, 2007b: Comments on "A simple model for simulating tornado damage in forests". *J. Appl. Meteor. Climatol.*, in press.

Dotzek, N., P. Groenemeijer, B. Feuerstein, and A. M. Holzer, 2007c: Overview of ESSL's severe convective storms research using the European Severe Weather Database ESWD. Submitted to *Atmos. Res*.

Groenemeijer, P. H., and A. J. van Delden, 2007: Sounding-derived parameters associated with large hail and tornadoes in the Netherlands. *Atmos. Res*., **83**, 473-487.

IPCC (Eds.), 2007: *Climate Change 2007 – The Physical Science Basis*. Cambridge University Press, Cambridge, 996 pp.

Kaltenböck, R., G. Diendorfer, and N. Dotzek, 2007: Evaluation of thunderstorm indices from ECMWF analyses, lightning data and severe storm reports. Submitted to *Atmos. Res*.

Koschmieder, H., and J. P. Letzmann, 1939: Erforschung von Tromben (Research on tornadoes). Anlage XI, 85-90. In: Secretariat de l'Organisation Météorologique Internationale (Ed.), Klimatologische Kommission, Protokolle der Tagung in Salzburg, 13.-17. September 1937. IMO Publ. Nr. 38, Edouard Ijdo, Leyde, 149 pp. [In German, with commenting English letters by J. B. Kincer, U. S. Weather Bureau, available at www.essl.org under "References"]

Letzmann, J. P., 1923: Das Bewegungsfeld im Fuß einer fortschreitenden Wind- oder Wasserhose (The flow field at the base of an advancing tornado). Ph.D. thesis, University Helsingfors. Acta et Commentationes Universitatis Dorpatensis AVI.3, C. Mattiesen Verlag, Dorpat, 136 pp. [In German, available at www.essl.org under "References"]

Letzmann, J. P., 1939: Richtlinien zur Erforschung von Tromben, Tornados, Wasserhosen und Kleintromben (Guidelines for research on tornadoes, waterspouts, and whirlwinds). Anlage XI, 91-110. In: Secretariat de l'Organisation Météorologique Internationale (Ed.), Klimatologische Kommission, Protokolle der Tagung in Salzburg, 13.-17. September 1937. IMO Publ. Nr. 38, Edouard Ijdo, Leyde, 149 pp. [In German, available at www.essl.org under "References"]

Rauhala, J., and D. M. Schultz, 2007: Severe thunderstorm and tornado warnings in Europe. Submitted to *Atmos. Res*., submitted.

Reye, T., 1872: *Die Wirbelstürme, Tornados und Wettersäulen in der Erdatmosphäre mit Berücksichtigung der Stürme in der Sonnen-Atmosphäre (The cyclones and tornadoes in the earth's atmosphere, considering also storms in the solar atmosphere)*. Carl Rümpler, Hannover, 250 pp. [In German, available at www.essl.org under "References"]

Romero, R., M. Gayà, and C. A. Doswell III, 2007: European climatology of severe convective storm environmental parameters: A test for significant tornado events. *Atmos. Res*., **83**, 389-404.

Wegener, A., 1917: *Wind- und Wasserhosen in Europa (Tornadoes in Europe)*. Verlag Friedrich Vieweg & Sohn, Braunschweig, 301 pp. [In German, available at www.essl.org under "References"]

# 3. TECHNICAL REPORT

## 3.1. ESWD VERSION 2

The technical work in 2006 and 2007 focused on the operation and development of the European Severe Weather Database (ESWD). Version 2 of the database software was installed on the web server prior to the formal founding of ESSL in December 2006. With help of volunteers, several translations of the English interfaces have been developed. Version 2 is available in the following additional languages: German, French, Spanish, Finnish, Italian, Dutch, and Slovenian.

The ESWD V1.40 data format description appeared as ESSL Technical Report 2006-1. It is available from the ESSL website under “Publications”. The ESWD V.2 output for registered users is illustrated in Sec. 3.5.

## 3.2. NEW USERS

The statutory cooperation of the ESSL with national meteorological services (NMHS) has been advanced by finding three of them as partners of the ESWD. To facilitate this, an ESWD software version and associated data transfer procedure were developed that allows the ESWD to be installed locally. The partner organisations are thus enabled to access and submit severe weather events through their locally installed ESWD. Once per day, their data is synchronised with that of the ESSL database by FTP (file transfer protocol) file exchange. Partners DWD (Germany), ZAMG (Austria) and INM (Spain) have received the version 2 software and have installed those on their local computer systems. With DWD and ZAMG, a regular data transfer has successfully been set up.

In addition to the partners above, one commercial user of the data has registered in 2007.

## 3.3. ESWD VERSION 3 DEVELOPMENT

ESWD Version 2 lacks the possibility of editing or deleting severe weather reports simultaneously in both the partner's dataset and that of the ESSL: any deleted entry would remain present in the other instance of the same data. Additionally, editing submitted data is still relatively cumbersome. DWD started a project with ESSL to improve the ESWD in those respects and enable the usage of ESWD data for the verification of DWD's warnings and forecasts. This required a redesign of the ESWD database to make it compatible with established professional database packages such as Oracle and MySQL. The work on this assignment started in October 2007 and continues into 2008.

## 3.4. ECSS CONFERENCE WEBSITES

The ESSL provided the web space and resources on its server for the websites of the 4th ECSS 2007 conference (www.essl.org/ECSS/2007/). Initial web pages were set up by the Director. These were then modified and extended by Fulvio Stel and Dario Giaiotti, two of the ESSL funding members, who were the organisers of the ECSS 2007.

## 3.5. TECHNICAL DESCRIPTION OF ESWD VERSION 2 OUTPUT

### a) Digital, geo-referenced maps

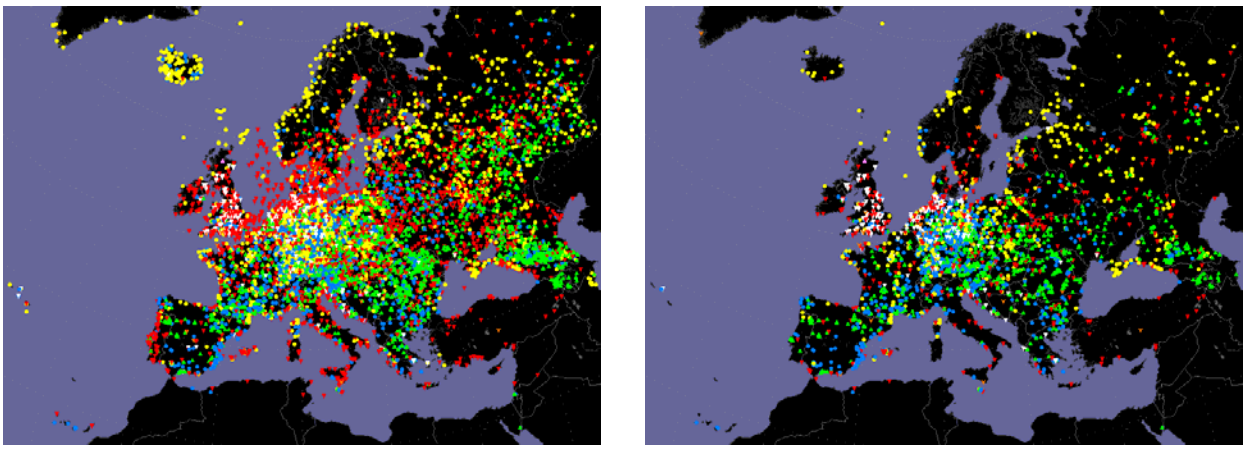


**Figure 2**: All ESWD reports from 1 January 1950 to 31 December 2007 (*n = 9868*, **left**) and for the year 2007 (*n = 3413*, **right**). Red: tornadoes, yellow: straight-line winds >25 m/s, green: hail >2 cm, blue: heavy precipitation / flash flooding, white: funnel clouds, orange: lesser whirlwinds (gustnadoes, dust devils). Database enquiry: 7 September 2008.

### b) HTML table (Selected event: F4 Pforzheim tornado, Germany, 10 July 1968)

| | |
|---|---|
| **Tornado**<br><br>**Ittersbach, Pforzheim**<br><br>BW, **Germany**<br>(48.9055 N, 08.5270 E)<br><br>**10 07 1968** (Wednesday)<br><br>**20:30** UTC (+/- 1 hrs.) | based on: information from an eye-witness report, a report in scientific literature, a newspaper report, a television or radio broadcast, a report by a weather service, a report on a website<br>terrain: hilly<br>land use: rural area (crops, grassland, both or unknown), town or city<br>land use where event was first observed: rural area (crops, grassland, both or unknown)<br>F4 T8, the intensity rating was based on a written account of the damage (e.g. in a newspaper).<br>total event duration: 20 min.<br>The funnel cloud was observed. Suction vortices were not observed.<br>path length: 35 km, maximum path width: 1000 m, direction of movement: W-E<br>damage to property: DM:150M, damage to crops and forests: 170kFm<br>number of people injured: 300, number of people dead: 2<br>*Same cell as T7/F3 tornado at Sarrebourg, Eschbourg, Hagenau*<br>This report has been verified.<br>contact: TorDACH V1.6.00, tordach.org/de, de@tordach.org; D. Fuchs, Promet 4'81, 8-10 ==> Monatl. Witterungsber. DWD;; Monatsarbeit der Wetterdienst-Referendarausbildung, 1978, 56 S.;; Pers. comm. 2000; R. Nestle, Meteor. Rdschau. 22 (1969), 1-3; Becht H. P., Stadtarchiv Pforzheim, pers. comm. (1998); Fulks, H.W., 1969: A synoptic review of the Pforzheim tornado of; 10 July 1968. 2nd Wea. Wing Tech. Bull, Air Wea. Service, US Air Force,; April 1969, 26-43. |

### c) Raw ASCII data (Selected event: F4 Pforzheim tornado, Germany, 10 July 1968)

INFO|10|V01.40|3|QC2|EYEWTN LIT NWSP TV WXSVC WWW|TorDACH V1.6.00, tordach.org/de, de@tordach.org; D. Fuchs, Promet 4'81, 8-10 ==> Monatl. Witterungsber. DWD;; Monatsarbeit der Wetterdienst-Referendarausbildung, 1978, 56 S.;; Pers. comm. 2000; R. Nestle, Meteor. Rdschau. 22 (1969), 1-3; Becht H. P., Stadtarchiv Pforzheim, pers. comm. (1998); Fulks, H.W., 1969: A synoptic review of the Pforzheim tornado of; 10 July 1968. 2nd Wea. Wing Tech. Bull, Air Wea. Service, US Air Force,; April 1969, 26-43.|1|Nikolai Dotzek, ESSL|20051231

TIME&PLACE|19|1968|07|10|WED|20|30|1H|DE|BW|Ittersbach, Pforzheim|||48.9055|08.5270|HILLS|RURAL|RURAL URBAN

TORNADO|23||4|8|DMGTEXT||FNLOBS|NOSVTCSOBS||||20|35||1000|W-E|DM:150M|170kFm||300|2|Same cell as T7/F3 tornado at Sarrebourg, Eschbourg, Hagenau#

Note the high level of detail in the ESWD report (b), as well as how much this information is condensed in the raw data (c) to minimize the physical data volume – an important point in accessing online data.

# 4. FINANCIAL AND ADMINISTRATIVE REPORT

The goal of the financial management was to ensure a stable development, to secure the non-profit-status of the ESSL, and before all, to provide the necessary funds for the three statutory purposes of the ESSL:

- Advance meteorology and related sciences in the field of research on severe convective storms and extreme weather events on a European level;
- Operate and extend the European Severe Weather Database (ESWD);
- Support or organise the European Conferences on Severe Storms (ECSS).

## 4.1. OVERVIEW

The first full year of operation, 2007, was dominated by further establishing the accounting structures and also by the transfer of the financial duties from the Director, who served both as Director and as Treasurer during the founding stage, to the newly elected ESSL Treasurer Alois M. Holzer, who stepwise took over responsibility between his election at the General Assembly in September 2007 and the first months of 2008.

According to the three main statutory purposes of ESSL, cost centres have been established in the financial accounting and controlling. As required by the tax authorities, these distinguish also between the ideational branch of ESSL (*Ideeller Bereich*, i.e. management of the association) and its branches directly serving the statutory purposes of the ESSL (*Zweckbetriebe*). Thus, the cost centres comprise:

- Cost centre 0: Ideational field of activity;
- Cost centre 1: ESSL fundamental and applied research;
- Cost centre 2: ESWD data and research;
- Cost centre 3: ECSS conferences.

## 4.2. FINANCIAL STATUS 2006

The financial year 2006 started only on 28 September with the founding of the association and the establishment of ESSL e. V. on 8 December. Revenues were restricted to the membership fees of the ten founding members (840.- €) while founding costs summed up to 119.32 €. That led to a positive yearly balance of 720.68 €.

## 4.3. FINANCIAL STATUS 2007

The first full accounting year was dominated by establishing administrative structures and the build-up of a thorough accounting, conforming to the law and tax regulations and allowing efficient controlling by the Treasurer. The cash-based accounting for 2007 can be found in the “Statement of revenues and expenditures” below. Both, most of the income and most of the costs were generated within cost centre 2, ESWD activities.

## Statement of revenues and expenditures 2007

| | | | |
|---|---|---|---|
| | **Cash at bank:** | 1 Jan 2007 | 720.68 € |

### A. Ideational field of activity

**Cost centre 0a**

| | | |
|---|---|---|
| Revenues | Membership fees | 5.035.00 € |
| Expenditures | Third party services | 25.19 € |
| | Travel costs | 213.80 € |
| | Registration fees | 90.71 € |
| | Office expenses | 94.01 € |
| **Balance ideational field** | | **4.611.29 €** |

### B. Asset management

**Cost centre 0b**

| | | |
|---|---|---|
| Revenues | VAT 2006 | 3.93 € |
| | VAT | 376.50 € |
| | Advance turnover tax return | 11.38 € |
| Expenditures | Input VAT | 44.77 € |
| | Advance turnover tax return | 370.09 € |
| **Balance Asset management** | | **-23.05 €** |

### C. *Zweckbetriebe* (business branches pursuing the purpose of the association)

**Cost centre 1 - ESSL research**

| | | |
|---|---|---|
| Revenues | | 0.00 € |
| Expenditures | Office expenses | 33.44 € |
| **Balance ESSL research** | | **-33.44 €** |

**Cost centre 2 - ESWD data and research**

| | | |
|---|---|---|
| Revenues | Data use and software development | 5.450.00 € |
| Expenditures | Third party services, data protection | 50.27 € |
| | Travel costs | 78.99 € |
| | *Übungsleiterpauschalen* (simplified labour allowances specific to e.V.s) | 3.234.00 € |
| **Balance ESWD data and research** | | **2.086.74 €** |

**Cost centre 3 - ECSS conferences**

| | | |
|---|---|---|
| Revenues | | 0.00 € |
| Expenditures | Third party services, domain acquisition | 224.37 € |
| | Office expenses | 38,.24 € |
| | Heino Tooming Award | 300.00 € |
| **Balance ECSS conference** | | **-562.61 €** |

| | | |
|---|---|---|
| **Balance total** | | **6.078.93 €** |

| | | |
|---|---|---|
| **Cash at bank:** | 31 Dec 2007 | 6799.61 € |

In summary, the financial figures for 2006 and 2007 show a stable upward trend on a still modest level, due to the start-up phase. Financial controlling in 2008 and planning for 2009 gives us confidence that ESSL will be able to securely bear the costs for participation in proposed scientific projects as well as for support of the ECSS conference 2009 in Landshut, Germany.

## 4.4. ADMINISTRATIVE REPORT

The year 2007 saw the completion of the ESSL founding process which had started with the founding meeting on 28 September 2006 and the grant of legal body with status of a registered association (*eingetragener Verein*, short: e. V.) on 8 December 2006. The document granting the non-profit status and corresponding taxation benefits arrived at the ESSL secretariat on 21 December 2006.

In order to professionally run its businesses, in particular the branches assigned to cost centres 1 (research), 2 (ESWD), and 3 (ECSS), the ESSL had to apply for a VAT number and sign up with the employers' liability insurance association. After being assigned a VAT number, ESSL also started to submit regular advance VAT notifications to the tax authorities as well as the VAT declaration for 2006.

Many administrative documents also had to be drafted and completed in 2007, in order to build up the necessary tools for business operations. This reached from simple documents like membership application forms to more advanced ones, like financial accounting tools or draft versions of rules of procedure for the Executive Board, cooperation agreements for users and NMHS partners, an ESWD data protocol, or specifications for the organisers of future ECSS conferences. The process of finalising all these documents will extend into 2008. For some of them, also assistance by ESSL's legal advisors will be necessary.

In addition, the foundation of ESSL e. V. was reported to the German Meteorological Society (DMG), the European Meteorological Society (EMS), and the National Severe Storms Laboratory (NSSL) in the USA. The EMS responded by mail, and the NSSL launched an online press release on the foundation of the ESSL

Another major task from late 2006 until summer 2007 was ESSL's participation in the Munich Business Plan Contest (MBPW, www.mbpw.de). In three stages, a full business plan was developed and reviewed by a jury of entrepreneurs, management consultants, and venture capitalists. Like other such business plan contests, the MBPW is mainly focused on commercial start-up enterprises. Nevertheless, ESSL was nominated for an award both in stage 1 (Ideas Stage) and stage 3 (Excellence Stage), see for instance www.mbpw.de/index.php?id=153. This was an encouraging success for the ESSL, also from the point of view of DLR's technology marketing department, which had provided valuable advice during the start-up phase.

The regular annual General Assembly took place during the ECSS 2007 conference in Trieste, Italy. The main topics were to confirm the initial Executive Board members, to elect the Treasurer, and to implement minor amendments to the Articles of Association. In 2007, the activities of the Director – and later on the Treasurer – mainly comprised:

- Opening and management of bank accounts;
- Fiscal reports, social security system handling and tax handling;
- Accounting and costing management;

- Financial staff administration;
- Continuous and long-term budgeting;
- Setting up a member-, staff- and cooperation partner-database.

Early in 2007, there were only the ten individual founding members of the ESSL. Yet at the end of the year, the ESSL had

- 15 Individual Full Members
- 1 Institutional Full Member (DWD)
- 1 Institutional Supporting Member (Munich Re)

The complete member list is shown in Appendix A.2.

## 4.5. EXECUTIVE BOARD AND ADVISORY COUNCIL

The Executive Board and the Advisory Council are two of the three bodies forming the ESSL. Fig. 3 outlines these and their responsibilities.

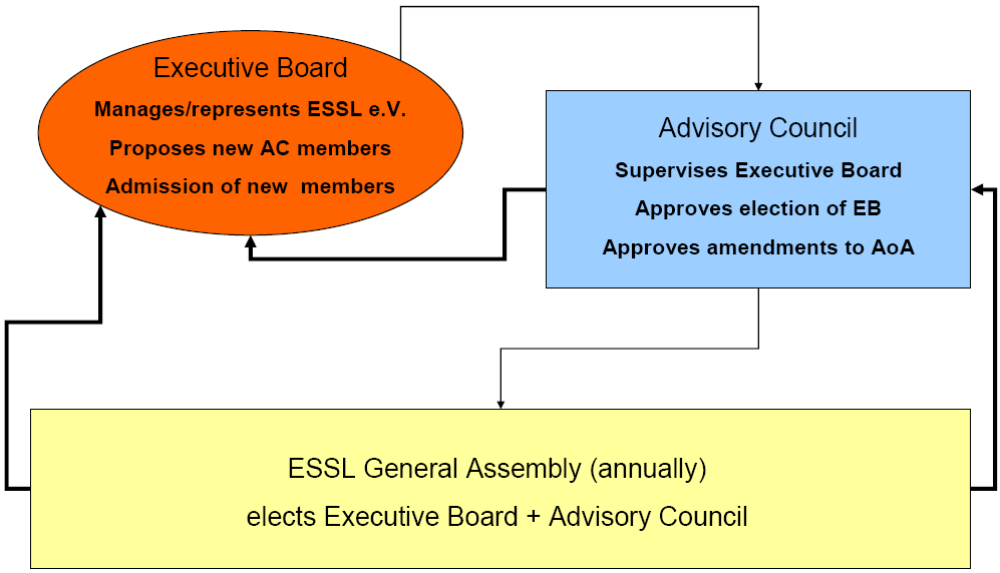



**Figure 3**: Bodies of the ESSL. The Advisory Council in final form will consist of nine members from three groups (three members each): (1) Science, (2) NMHS / EUMETNET, (3) other ESSL user groups.

### 4.5.1. EXECUTIVE BOARD

**Dr. Nikolai Dotzek**, Director:

He has over 12 years' expertise in research on severe thunderstorms, a topic for which he was Contributing Author for the IPCC 4th Assessment Report (IPCC, 2007). He has done extensive ESSL-related preparatory networking since founding and heading the TorDACH research network in 1997. In 2002, he was visiting scientist at the National Severe Storms Laboratory (NSSL) in the USA, where he prepared an award-winning ESSL Pilot Study.

His professional duties at DLR are coordination and management of national (e. g. RegioExAKT, 11 partners) and EU-projects (e. g., QUANTIFY, 41 partners), and the

preparation of research proposals also involving the ESSL. To complement his main skills, he has participated in several workshops on start-up entrepreneurship by the Chamber of Industry and Commerce (*Industrie- und Handelskammer*, IHK).

**Dr. Bernold Feuerstein**, deputy Director:

He is a scientist at the Max-Planck Institute for Nuclear Physics (MPIK) in Heidelberg and a university lecturer at the Faculty of Physics there. Very much interested in severe weather phenomena, he joined the TorDACH Centre of Competence for Severe Local Storms in 2003 and the storm spotter association Skywarn Deutschland e. V. in 2004. Several publications in peer-reviewed journals and invited talks testify his active research in tornado climatology.

From 2007 on, he has taken the position of Chief of Press and Public Relations at the MPIK. Consequently, within the ESSL, he is responsible for public affairs and outreach.

**M.Sc. Pieter Groenemeijer**, Technical Director:

He is currently pursuing his PhD at Research Centre Karlsruhe (FZK), *Institut für Meteorologie und Klimaforschung*, studying the differences between environments producing severe and non-severe thunderstorms in Europe. He earned his M.Sc. degree in Physics and Astronomy at Utrecht University for research on radiosonde measurements nearby large hail and tornadoes. In 2002, he studied the topic of severe thunderstorms at the University of Oklahoma and worked on the application of Doppler radar to severe weather detection at the Royal Netherlands Meteorological Institute, KNMI.

He is the main developer of the ESWD database software and handles the technical operations of the ESSL web server and data exchange with the collaborating NMHSs.

**Mr. Alois M. Holzer**, Treasurer:

He is currently senior forecaster at the weather department of the Austrian Broadcasting Corporation (ORF) in Vienna with a main focus on extreme events, severe weather warnings, development and in-house training. He is an ESSL-member from the very first in matters of severe weather and tornado research. He had already joined the TorDACH Centre of Competence for Severe Local Storms in 1997 and has been coordinator for Austria since then. He offers a wide economic and fiscal experience not only because of his 5 year term in business school, but much more because of the long-term experience in the business management of his own scientific small enterprise. Further, he has been organizing and funding many international workshops and seminars.

Short-term and long-term budgeting of different projects has been part of his day-to-day work, and that has earned him the position of ESSL treasurer.

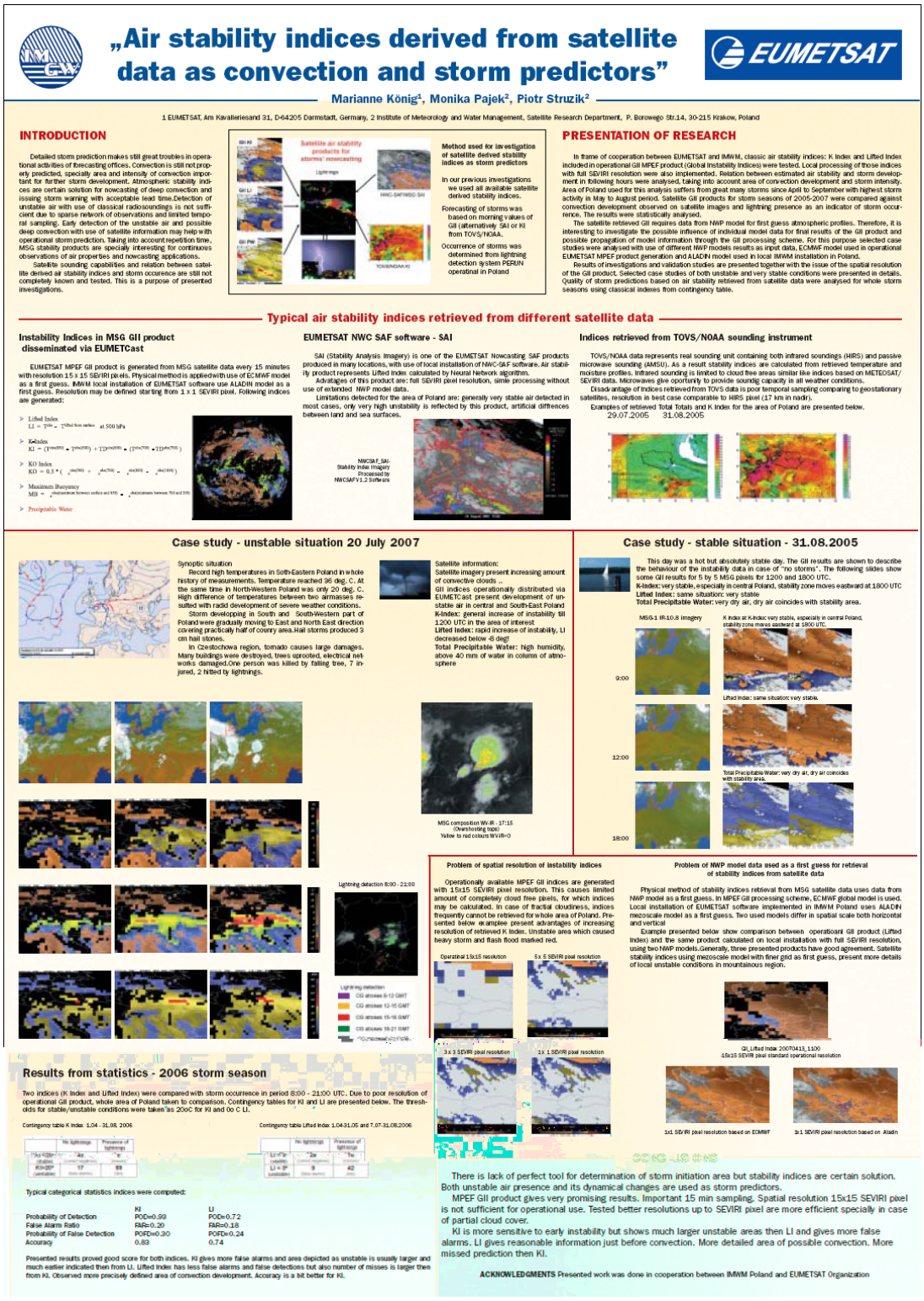
### 4.5.2. ADVISORY COUNCIL

At the 2007 General Assembly, the first ESSL Advisory Council member (of a maximum of 9) was elected in the NMHS group. This is **Dr. Gerhard Steinhorst** (DWD), who is a member of DWD's Executive Board and heads the weather forecasting branch of DWD.

The Advisory Council will be introduced in greater detail in the 2008 Annual Report.

# A. APPENDIX

## A.1 HEINO TOOMING AWARD 2007 POSTER



„Air stability indices derived from satellite data as convection and storm predictors"

Marianne König[1], Monika Pajek[2], Piotr Struzik[2]

1 EUMETSAT, Am Kavalleriesand 31, D-64205 Darmstadt, Germany, 2 Institute of Meteorology and Water Management, Satellite Research Department, P. Borowego Str.14, 30-215 Krakow, Poland

INTRODUCTION

Detailed storm prediction makes still great troubles in operational activities of forecasting offices. Convection is still not properly predicted, specially area and intensity of convection important for further storm development. Atmospheric stability indices are certain solution for nowcasting of deep convection and issuing storm warning with acceptable lead time.Detection of unstable air with use of classical radiosoundings is not sufficient due to sparse network of observations and limited temporal sampling. Early detection of the unstable air and possible deep convection with use of satellite information may help with operational storm prediction. Taking into account repetition time, MSG stability products are specially interesting for continuous observations of air properties and nowcasting applications.

Satellite sounding capabilities and relation between satellite derived air stability indices and storm occurence are still not completely known and tested. This is a purpose of presented investigations.

Method used for investigation of satellite derived stability indices as storm predictors

In our previous investigations we used all available satellite derived stability indices.

Forecasting of storms was based on morning values of GII (alternatively SAI or KI from TOVS/NOAA.

Occurence of storms was determined from lightning detection system PERUN operatinal in Poland

PRESENTATION OF RESEARCH

In frame of cooperation between EUMETSAT and IMWM, classic air stability indices: K Index and Lifted Index included in operational GII MPEF product (Global Instability Indices) were tested. Local processing of those indices with full SEVIRI resolution were also implemented. Relation between estimated air stability and storm development in following hours were analysed, taking into account area of convection development and storm intensity. Area of Poland used for this analysis suffers from great many storms since April to September with highest storm activity in May to August period. Satellite GII products for storm seasons of 2005-2007 were compared against convection development observed on satellite images and lightning presence as an indicator of storm occurrence. The results were statistically analysed.

The satellite retrieved GII requires data from NWP model for first guess atmospheric profiles. Therefore, it is interesting to investigate the possible influence of individual model data for final results of the GII product and possible propagation of model information through the GII processing scheme. For this purpose selected case studies were analysed with use of different NWP models results as input data, ECMWF model used in operational EUMETSAT MPEF product generation and ALADIN model used in local IMWM installation in Poland.

Results of investigations and validation studies are presented together with the issue of the spatial resolution of the GII product. Selected case studies of both unstable and very stable conditions were presented in details. Quality of storm predictions based on air stability retrieved from satellite data were analysed for whole storm seasons using classical indexes from contingency table.

Typical air stability indices retrieved from different satellite data

Instability Indices in MSG GII product disseminated via EUMETCast

EUMETSAT MPEF GII product is generated from MSG satellite data every 15 minutes with resolution 15 x 15 SEVIRI pixels. Physical method is applied with use of ECMWF model as a first guess. IMWM local installation of EUMETSAT software use ALADIN model as a first guess. Resolution may be defined starting from 1 x 1 SEVIRI pixel. Following indices are generated:

- Lifted Index
- K-Index
- KO Index
- Maximum Buoyancy
- Precipitable Water

EUMETSAT NWC SAF software - SAI

SAI (Stability Analysis Imagery) is one of the EUMETSAT Nowcasting SAF products produced in many locations, with use of local installation of NWC-SAF software. Air stability product represents Lifted Index calculated by Neural Network algorithm.

Advatages of this product are: full SEVIRI pixel resolution, simle processing without use of extended NWP model data.

Limitations detected for the area of Poland are: generally very stable air detected in most cases, only very high unstability is reflected by this product, artificial diffrences between land and sea surfaces.

NWCSAF_SAI-Stability Index Imagery Processed by NWCSAFV1.2 Software

Indices retrieved from TOVS/NOAA sounding instrument

TOVS/NOAA data represents real sounding unit containing both infrared soundings (HIRS) and passive microwave sounding (AMSU). As a result stability indices are calculated from retrieved temperature and moisture profiles. Infrared sounding is limited to cloud free areas similar like indices based on METEOSAT/SEVIRI data. Microwaves give oportunity to provide soundig capacity in all weather conditions.

Disadvantage of indices retrieved from TOVS data is poor temporal sampling comparing to geostationary satellites, resolution in best case comparable to HIRS pixel (17 km in nadir).

Examples of retrieved Total Totals and K Index for the area of Poland are presented below.

29.07.2005 31.08.2005

Case study - unstable situation 20 July 2007

Synoptic situation

Record high temperatures in Soth-Eastern Poland in whole history of measurements. Temperature reached 36 deg. C. At the same time in North-Western Poland was only 20 deg. C. High difference of temperatures between two airmasses resulted with radid development of severe weather conditions.

Storm developping in South and South-Western part of Poland were gradually moving to East and North East direction covering practically half of country area.Hail storms produced 3 cm hail stones.

In Czestochowa region, tomado causes large damages. Many buildings were destroyed, trees uprooted, electrical network damaged.One person was killed by falling tree, 7 injured, 2 hitted by lightnings.

Satellite information:
Satellite imagery present increasing amount of convective clouds ...
GII indices operationally distributed via EUMETCast present development of unstable air in central and South-East Poland
K-Index: general increase of instability till 1200 UTC in the area of interest
Lifted Index: rapid increase of instability, LI decreased below -6 deg!
Total Precipitable Water: high humidity, above 40 mm of water in column of atmosphere

MSG composition WV-IR - 17:15 (Overshooting tops) Yellow to red colours WV-IR<0

Lightning detection 8:00 - 21:00

Case study - stable situation - 31.08.2005

This day was a hot but absolutely stable day. The GII results are shown to describe the behaviour of the instability data in case of "no storms". The following slides show some GII results for 5 by 5 MSG pixels for 1200 and 1800 UTC.
K-Index: very stable, especialy in central Poland, stability zone moves eastward at 1800 UTC
Lifted Index: same situation: very stable
Total Precipitable Water: very dry air, dry air coincides with stability area.

MSG-1 IR10.8 imagery

K Index at K-Index: very stable, especially in central Poland, stability zone moves eastward at 1800 UTC.

9:00

Lifted Index: same situation: very stable.

12:00

Total Precipitable Water: very dry air, dry air coincides with stability area.

18:00

Problem of spatial resolution of instability indices

Operationally available MPEF GII indices are generated with 15x15 SEVIRI pixel resolution. This causes limited amount of completely cloud free pixels, for which indices may be calculated. In case of fractal cloudiness, indices frequently cannot be retrieved for whole area of Poland. Presented below examplee present advantages of increasing resolution of retrieved K Index. Unstable area which caused heavy storm and flash flood marked red.

Operatinal 15x15 resolution

5x 5 SEVIRI pixel resolution

3 x 3 SEVIRI pixel resolution

1 x 1 SEVIRI pixel resolution

Problem of NWP model data used as a first guess for retrieval of stability indices from satellite data

Physical method of stability indices retrieval from MSG satellite data uses data from NWP model as a first guess. In MPEF GII processing scheme, ECMWF global model is used. Local installation of EUMETSAT software implemented in IMWM Poland uses ALADIN mezoscale model as a first guess. Two used models differ in spatial scale both horizontal and vertical

Example presented below show comparison between operatioanl GII product (Lifted Index) and the same product calculated on local installation with full SEVIRI resolution, using two NWP models.Generally, three presented products have good agreement. Satellite stability indices using mezoscale model with finer grid as first guess, present more details of local unstable conditions in mountainous region.

GII_Lifted Index 20070413_1100
15x15 SEVIRI pixel standard operational resolution

1x1 SEVIRI pixel resolution based on ECMWF

1x1 SEVIRI pixel resolution based on Aladin

Results from statistics - 2006 storm season

Two indices (K Index and Lifted Index) were compared with storm occurrence in period 8:00 - 21:00 UTC. Due to poor resolution of operational GII product, whole area of Poland taken to comparision. Contingency tables for KI and LI are presented below. The thresholds for stable/unstable conditions were taken as 20oC for KI and 0o C LI.

Contingency table K Index 1.04 - 31.08. 2006

Contingency table Lifted Index 1.04.31.05 and 7.07-31.08.2006

Typical categorical statistics indices were computed:

| | KI | LI |
|---|---|---|
| Probability of Detection | POD=0.99 | POD=0.72 |
| False Alarm Ratio | FAR=0.29 | FAR=0.18 |
| Probability of False Detection | POFD=0.30 | POFD=0.24 |
| Accuracy | 0.83 | 0.74 |

Presented results proved good score for both indices. KI gives more false alarms and area depicted as unstable is usually larger and much earlier indicated then from LI. Lifted Index has less false alarms and false detections but also number of misses is larger then from KI. Observed more precisely defined area of convection development. Accuracy is a bit better for KI.

There is lack of perfect tool for determination of storm initiation area but stability indices are certain solution. Both unstable air presence and its dynamical changes are used as storm predictors.

MPEF GII product gives very promising results. Important 15 min sampling. Spatial resolution 15x15 SEVIRI pixel is not sufficient for operational use. Tested better resolutions up to SEVIRI pixel are more efficient specially in case of partial cloud cover.

KI is more sensitive to early instability but shows much larger unstable areas then LI and gives more false alarms. LI gives reasonable information just before convection. More detailed area of possible convection. More missed prediction then KI.

ACKNOWLEDGMENTS Presented work was done in cooperation between IMWM Poland and EUMETSAT Organization

## A.2 MEMBER LIST 2007

The following table shows all ESSL members as of 31 December 2007. The 10 founding member names are printed in italics.

| | Member name | CC | Type | Status |
|---|---|---|---|---|
| 1 | *Nikolai Dotzek* | DE | Individual | Full |
| 2 | *Bernold Feuerstein* | DE | Individual | Full |
| 3 | *Dario Giaiotti* | IT | Individual | Full |
| 4 | *Pieter Groenemeijer* | NL | Individual | Full |
| 5 | *Alois M. Holzer* | AT | Individual | Full |
| 6 | Thomas Krennert | AT | Individual | Full |
| 7 | Thilo Kühne | DE | Individual | Full |
| 8 | Zhongjian Liang | CN | Individual | Full |
| 9 | *Maria-Carmen Llasat* | ES | Individual | Full |
| 10 | Georg Pistotnik | AT | Individual | Full |
| 11 | *Romualdo Romero* | ES | Individual | Full |
| 12 | *Martin Setvák* | CZ | Individual | Full |
| 13 | *Fulvio Stel* | IT | Individual | Full |
| 14 | *Jenni Teittinen* | FI | Individual | Full |
| 15 | Helge Tuschy | DE | Individual | Full |
| 16 | Deutscher Wetterdienst | DE | Institutional | Full |
| 17 | Münchener Rückversicherungs-Gesellschaft AG | DE | Institutional | Supporting |