2014 Convection Working Group Workshop - Minutes

07 - 11 April 2014, Hotel Dubrovnik, Zagreb, Croatia

The Workshop starts Monday 7 April at 13:00.

Present:

Chairs:

Marianne König (EUMETSAT), Martin Setvák (ESSL)

Secretary:

Pieter Groenemeijer

Participants:

Humberto Alves BARBOSA (UFAL LAPIS), Kristopher BEDKA (NASA-Langley), Miria CELANO (ARPA-ER), CHUNG Sung-Rae (NMSC/KMA), Martina ĆURIĆ (U. Zagreb), Wayne FELTZ (CIMSS, U. Wisconsin-Madison), José Miguel FERNÁNDEZ SERDÁN (AEMET), Pierre FRITZSCHE (DWD), Volker GÄRTNER (EUMETSAT), Steve GOODMAN (NOAA/NESDIS), Tomislava HOJSAK (DHMZ), Ján KAŇÁK (SHMÚ), Jochen KERKMANN (DWD), KIM Jin-Cheol (NMSC/KMA), Martin KLAIĆ, Kristina KLEMENCIĆ (DHMZ), KOCSIS Zsófia (OMSZ), Igor KOŠ (CroatiaControl), Ivana HAVRLE KOZARIĆ (DHMZ), Thomas KRENNERT (ZAMG), Oleksii KRYVOBOK (UHMI), Luiz A. T. MACHADO (INPE, Brazil), Agostino MANZATO (OSMER-ARPA FVG), Ivana MARINOVIĆ, John MECIKALSKI (U. Alabama-Huntsville), Davide MELFI (Aeronautica Militare), Petra MIKUŠ JURKOVIĆ (DHMZ), Vesa NIETOSVAARA (EUMETSAT), Luca NISI (MeteoSwiss), Monika PAJEK (IMGW-PIB), Izidor PELAJIĆ (EUMETSAT/DHMZ), Ralph PETERSEN (CIMSS, U. Wisconsin-Madison), Ana PETROV (U. Zagreb), Mária PUTSAY (OMSZ), QIN Danyu (NSMC/CMA, China), Tanja RENKO (DHMZ), Daniel ROSENFELD (HUJI), Fabian SENF (TROPOS), Vinko ŠOLJAN (CroatiaControl), Ivan SMILJANIĆ (DHMZ), Jindřich ŠŤÁSTKA (CHMI), Nataša STRELEC MAHOVIĆ (DHMZ), Yasuhiko SUMIDA (JMA), Pao WANG (U. Wisconsin-Madison)

Monday 07 April 2014

13:00	**Welcome speech by Ivan Čačić, Director of the Meteorological and Hydromeorological Service of Croatia (DHMZ) and President of WMO Region VI**	Ivan Čačić
	Introduction of the workshop, logistics, adoption of the agenda, action review and future chairmanship Small changes in the agenda were announced by Marianne which are reflected in these Minutes. Several participants will arrive later. Dennis Stich (DLR) and Kathrin Wapler (DWD) could not attend due to illness. Marianne announces that she will retire in March 2015 and Vesa Nietosvaara will be new chair for EUMETSAT. EUMETSAT and ESSL have concluded an Agreement arranging that ESSL will perform secretarial tasks for the CWG secretariat for the next 3 to 5 years.	Marianne König Martin Setvák

Session 1
Pre-convective Environment, Part I

Session chair:
Ralph Petersen

GII and forecast background fields- RTTOV

Presenter:
Marianne König

Marianne presents her work on Global Instability Index retrievals. She says that a comparison between GII retrievals using different models is needed now, in order to see how much of the signal comes from the model and how much from the retrievals. Situations with strongly differing model predictions are needed. Ralph says he can in principle run GII using NCEP models. In addition, Marianne notes that high-resolution IASI retrievals look similar to GII, which lends confidence to the GII product.

Satellite derived instability indices – some further insights (part I)

Mária Putsay

Mária Putsay and Zsófia Kocsis developed a method to retrieve CAPE from SEVIRI data. Differences are noted between the results and, for example, ECMWF CAPE. They may (at least in part) be due to different definitions of CAPE that are used. It is suggested that CWG and ESSL recommend to make recommendations to the respective WMO body on a standard describing how CAPE should be computed (see Action Items at the end of these minutes). It is also noted that radiosondes, because they reflect point measurements and no spatial averaged values, often show very big differences with respect to both satellite-derived values or modelled data. Ralph adds that his experience is that using analysed surface and dew point data to satellite-based helps to improve satellite-estimated CAPE.

Satellite derived instability indices – some further insights (part II)

Zsófia Kocsis

Zsófia analysed the sensitivity of CAPE on the temperature and dew point temperature. The results show that CAPE is very sensitive to lower tropospheric moisture, which cannot be retrieved with very high accuracy using SEVIRI. Zsófia says that maybe we cannot do indices that are so dependent on variables we have little information about.

15:30   *Coffee Break*

Diagnosing and predicting the pre-convective environment on 20 June 2013

Ralph Petersen

Ralph reports on the continuing evaluations of the NearCast product, and in particular, discussed the evaluation at the ESSL Testbed. He shows that on 29 June the NearCast product gave better guidance for the potential of storms than NWP. Ralph stresses that there is a very good potential to extend extending NearCasting to POES retrievals (IASI, CrIS AIRS). For example, IASI retrievals retrievals show 5-6 independent moisture layers in the troposphere. In the long run (~2021), such capabilities should also be available from a

geostationary satellite within the MTG programme. (see action items)

Preliminary results on using hyperspectral data in stability analyses
Izidor presents first preliminary results of a study to compare IASI retrievals with radiosonde data.

Izidor Pelajić

Tuesday, 08 April 2014

08:30 | **Session 2** | Session chair:
Pre-convective Environment, Part II | Mária Putsay

Use of satellite measurements of surface skin temperature for retrieving the intensity of thermals
Daniel reports on a new technique (see title) developed by him and his group, that should be useful in forecasting convection and should have applications in assimilation to NWP.

Daniel Rosenfeld

Development of Instability Index of GEO-KOMPSAT-2A
Sung-Rae reports on a method that retrieves CAPE by means of a neural network. Marianne comments that the use of a neural network makes it hard to uncover which of the channels influences the results most, which precludes a deeper understanding of it workings and its potential weaknesses. She therefore recommends to move away from the neural network approach. Agostino adds that a neural network is only suited for problems about which one does not aim to obtain further physical understanding, such as directly modelling thunderstorm occurrence from satellite data instead of an intermediate quantity such as CAPE.

Sung-Rae Chung

Brief introduction to a tool upgrade
José Miguel discusses products that are being developed or will be developed by the NWC-SAF until 2015. These include the SPhR products Lifted Index, Precipitable Water in various layers, and separately, differences of these fields from their model background values. Additionally, color enhancements will be revised and a single display combining field values and differences will be developed. Several additional ideas are also presented. Further enhancements planned until 2015 were also presented (see José's slides for details).

José Miguel Fernández-Serdán

10:30 | *Coffee Break*

Lessons learned at the ESSL summer experiment regarding current and future observations and predictions of the pre-convective moisture structures

Ralph Petersen

Ralph reports several experiences and conclusions based on the Nearcast evaluation at the Testbed. Among other points, he suggests that CWG and ESSL should recommend a recommendation on how to calculate instability indices. He also suggests the ESSL to explore options to deliver remote training by developers to forecasters on site.

Action Item to Ralph: update Best Practices document description of NearCAST.

Symmetric instabilities in DMC initiation

Thomas Krennert

Thomas proposes that conditional symmetric instability may be of importance for the initiation of orographically induced pulse convection. He provides forecasters at ZAMG with maps of slantwise CAPE. Pieter says that conditional symmetric instability cannot be relevant, since this type of instability is released in slantwise (as opposed to upright) convection, which is not what we observe in initiating storms.

Action Item Thomas: Summarize this theory for potential inclusion into the Best Practice Document

12:30   *Lunch Break*

Session: Early Convection

Session chair:
John Mecikalski

Use of high-resolution NPP/VIIRS imager for retrieving cloud base temperature and application for estimating boundary layer vapour mixing ratio

Daniel Rosenfeld

Daniel shows that 375 m resolution VIIRS temperature data can be used to derive cloud base height using a sounding. This yields quite accurate information on boundary layer moisture, or, more accurately, the moisture of the air flowing into convective clouds. Daniel mentions that this data, once operationally available, can be assimilated into NWP models. Pieter remarks that such data can in principle also support forecasters in assessing the pre-convective environment without using NWP.

CMA rapid development convective clusters algorithm for FY-4

Danyu Qin

Danyu describes the algorithm that uses cloud top cooling rates from 6-minute rapid scans from the FY-2 satellite, which is being adapted to the new FY-4 satellite. It uses a watershed method to identify convective objects. Further validation activities are planned.

Efforts of upgrading Rapidly Developing Cumulus Area product using NWP data and the satellite simulator Yasuhiko reports on the enhancements of the products and specifically discusses the timing of maximum storm intensity relative to brightness temperature in simulated cases. Daniel comments that it is important to recognize the large influence of the NWP parameterizations of the model used for the simulated satellite images.	Yasuhiko Sumida

15:30   *Coffee Break*

Session 3
Mature Convective Clouds, Part I

Session chair:
Wayne Feltz

Dynamical processes at the storm top Pao discusses several dynamical processes that his storm-scale simulations reveal. He addresses in particular the interference of gravity waves and the transport of water vapor from the troposphere into the stratosphere, which seems not to be a rare occurrence and possibly accounts for most water vapor observed in the stratosphere. Within the discussion, Martin stresses also another aspect of Pao's simulations – influence of the storm itself on its environment, namely on the temperature (increasing or decreasing it at various levels). This may have impact on various BT-based products.	Pao Wang
Using MSG retrieved cloud parameters for nowcasting of severe convective storms Daniel demonstrates that profiles of the satellite-derived effective radius can be used to infer updraft speed and nucleation speed. It has been demonstrated that this is useful for early warnings for forecasters. Daniel shows how the performance of the product depends strongly on satellite resolution and viewing angle, with best results obtained using VIIRS.	Daniel Rosenfeld
Case study of cold ring-shaped storm Jochen gives a brief presentation of a cold ring-shaped storm case, that was also observed by him from an airplane	Jochen Kerkmann

Wednesday, 09 April 2014

08:30
Session 3
Mature Convective Clouds, Part II

Session chair:
Nataša Strelec Mahović

Status of LI proxy data Jochen reports the planned Lightning Imager that will be on board of MTG-I (to be launched 2018 or 2019). He explains characteristics of the data set that the sensor will deliver. Before this data becomes available 'proxy data' (i.e. data with the same format from on earth-based sensors) is being	Jochen Grandell

developed using LINET and EUCLID data. The proxy data is to be delivered to NHMS users who will identify potential applications of this data. The ESSL Testbed will later also be involved in these activities.

Nowcasting the fortracc and lightning – the CHUVA campaign Luiz reports on the large CHUVA campaign that approaches its conclusion, which included several field campaigns. Luiz presents his group's work on modelling the life cycle and propagation vectors of convective systems, for which CHUVA data is used.	Luiz Machado
Importance of remote sensing data in cases where NWP does not capture convection Mateja argues that hyperspectral sounders as well as aircraft measurements have important capabilities in probing the pre-convective environment. She illustrates this with a case in which NWP gave quite poor guidance and soundings provided more data. Ralph suggests an action item (see concluding discussion) to request to WMO to strongly support more moisture measurements to be collected on aircraft.	Mateja Iršič Žibert

10:30   *Coffee Break*

Weather watches and warnings for the 20 May 2013 Moore, OK, tornado outbreak' Using the tornado outbreak case as an example, Wayne gives an overview of how several new GOES-R products are used to provide information at different stages of the forecasting process for a specific severe weather event. These products are (with decreasing lead time to the severe event) the NearCast product, Convective Initiation, Convective Cloudtop-cooling, and final the geostationary Lightning Mapper and Overshooting top detection.	Wayne Feltz
The African Easterly Waves and their influence on hurricane activity in the tropical North Atlantic: An assessment of hurricane Bill (2009) using SEVIRI data and products Humberto shows how he uses SEVIRI data, including the MPE product, to develop understanding of hurricanes. Action Item: Humberto is asked to add new conceptual models to the Best Practices document.	Humberto Barbosa
Short information: More on hurricanes Jochen demonstrates that, with the 3.9 channel, one can detect a combination of low temperatures and small ice particles (convective-storm RGB) not only at tops of convective storms (for which this product was developed), but also atop hurricanes. He has found that when these occur near the center of a cyclone, they are often a	Jochen Kerkmann

precursor for intensification of the system.

12:30   *Lunch Break*

Session 3
Mature Convective Clouds, Part III

Session chair:
Ján Kaňák

The use of multi-channel imagery for inner cloud wind extraction and cloud classification
Luiz reports on ongoing work to detect mesoscale horizontal flows using a BTD motion vector technique. Marianne offers her help with evaluation work in this study.

Luiz Machado

Use of the VIIRS Day-Night Band for nocturnal storm-top studies and for night-time sandwich products
Martin shows several examples of nocturnal storms, tops of which are illuminated by Moon at its various phases, as observed by VIIRS (Day Night Band, DNB). He discusses availability of the moonlight with respect to NPP overpass timing and Moon phases. Besides that, he shows an example of mesoscale waves of airglow excited by storms, documented by DNB. Martin suggests to look for similar cases across Europe and namely above Mediterranean Sea, and attempt to find out what types of storms excite these waves. He also demonstrates an example of nocturnal sandwich product that uses the 'Day Night Band' (DNB) instead of regular daytime channel.

Martin Setvák

15:30   *Coffee Break*

Session 4
Rapid Update Imagery, Part I

Session chair:
Vesa Nietosvaara

1-min super rapid scan demonstrations at the GOES-R proving ground
Steve presents the U.S. activities within the GOES-R proving ground programme with particular attention to the Rapid Scans.

Steve Goodman

The co-evolution of total lightning, ground-based radar derived fields, and GOES 1-min super rapid scan satellite observations of deep convective cloud tops
Kris has studied several super-rapid scan cases in detail using many different data sets. His powerpoint presentation contains his main findings.

Kristopher Bedka

2013 MSG 2.5 min rapid scan experiments - summary and early results
Martin describes the 2013 experiments, and notes that the 20 June 2013 is probably the best case that was captured, with 29 July being another good date. Imagery and detailed

Martin Setvák

information about this experiment is available on the CWG website. A database of subjectively detected overshooting tops for these two days will be set up, which can be used for various studies and will be shared with others after its completion next fall or winter; it will be available through the CWG website. More results from these experiments will be presented at the upcoming EUMETSAT and ECSS conferences.

Thursday, 10 April 2014

08:30   **Session 4**
         Rapid Update Imagery, Part II

Session chair:
Mateja Iršič Žibert

Evaluation of overshooting tops observed in super RSS experiments in both HRV and IR spectral channels with respect to detectability of OT brightness temperatures and penetration heights

Ján Kaňák

Marianne within the discussion raises the point that we need to ask ourselves if OT's also have a clear relation to high impact weather. In reply, it was noted that a clear relation between OT's and a turbulence hazard to aviation is present and has already been documented in peer-reviewed papers. Ján proposes to improve overshooting top detection algorithms by integration of a correlation matrix test, which will be helpful for the detection of relatively warm overshooting tops.

2.5 min scans: Case study in NE Italy - a supercell outbreak

Agostino Manzato

Agostino presents a case study of 12 September 2012, when several short-lived supercells occurred in NE Italy, using both satellite and radar data. John Mecikalski remarks that it would be interesting to find out if systematic differences exist between overshooting tops above mesocyclonic and non-mesocyclonic updrafts.

Uses of 1-min GOES data for understanding in-cloud processes

John Mecikalski

John reports on two different efforts. First, he discusses how, using several parameters, including those related to cloud microphysics, he is working on a method to forecast storm severity at a very early stage in a storm's life cycle. Second, he presents preliminary results on correlating GOES-R 1-minute rapid scan-derived cloud growth rate to CAPE.

Preliminary remarks and analysis of Meteosat 2.5 min data in convective situations

Monika Pajek

10:30   *Coffee Break*

Session 5
Combining Datasets, Part I

Session chair:
Luiz Machado

Consistency checks of RSS and super RSS image time sequences and their importance in evaluation of storm top features
Ján Kaňák conducted consistency checks of RSS and super RSS image time sequences on the base of consultations with Johannes Mueller from EUMETSAT (STG-SWG action-35.13). The resulting full report can be found on the CWG website.

Ján Kaňák

Relationship between lightning, radar fields and satellite IR data for convective storms
John presented new work to increase the understanding of the relationships between lightning and non–lightning storms as well as growing cumulus clouds using satellite, radar and lightning detection data.

John Mecikalski

Synergetic use of multi-sensor data
Fabian gives an overview of the OASE project. Focal points have been the development of a climatology of lightning, and work on the use of polarimetric radar.

Kathrin Wapler, presented by Fabian Senf

12:30   *Lunch Break*

Session: Combining Datasets, Part II

Session chair:
Marianne König

Forecast verification and forecasters' feedback: one year of COALITION operational service
Luca gives a overview of the COALITION product that integrates NWP, radar, satellite, and lightning data into a fully automatic storm severity nowcast product.

Luca Nisi

Integrated Observations for Probabilistic Severe Storm Prediction
Wayne presents a product that combines several data sources to yield a storm-based 'probability of severe weather' using a Bayesian statistical model.

Wayne Feltz

OTs and lightning and connection to hail occurrence
Nataša presents results of a study in which hailpad observations where compared to LINET lightning detection data and overshooting tops.

Nataša Strelec Mahović

Short-range forecasting and nowcasting operational products for severe weather
Oleklsii discusses how satellite imagery is used in addition to NWP data to support storm forecasting in Ukraine.

Oleksii Kryvobok

Analysis of a tornadic storm case with use of model data

Monika Pajek

Monika presents a case study of a violent tornado, using satellite, NWP and radar data. Several data sets indicated that instability was not particularly high. Pieter stresses that more than strong instability, wind shear in the lowest kilometres is highly relevant for tornadoes.

15:30   *Coffee Break*

Short information: Development of satellite-based climate data records of hazardous convective storm activity
Kris shows how overshooting top detection data over long time periods can be used to obtain a spatial distribution of severe storm risk and discusses the challenges in obtaining a temporally and spatially homogeneous data set.

Kristopher Bedka

The OASE project within the Hans Ertel Centre for Weather research – data composite and early results
Fabian presents various focal points of research in the OASE project. The activities include a study on the early stages of the storm life cycle, a study on the relation between lightning frequency and effective droplet radius, a comparison of synthetic with real satellite images, and efforts to develop an object-based verification framework.

Fabian Senf

Hail project and the Alpine Thunderstorm Archive (ATA): New research activites at MeteoSwiss
Luca presents his work on establishing a climatology of the hail risk in Switzerland using radar, insurance and storm report data.

Luca Nisi

The severe storm geographical observation system
Luiz present the globally usable visualization system SigmaCast for nowcast data.

Luiz Machado

Friday, 11 April 2014

08:30   **Session 5:**
         Combining Datasets, Part II (continued)

Demonstration of what we can learn from combining satellite, radar and model data at the ESSL Ttestbed
Pieter gives an overview of the ESSL Testbed activities, and its goals. He discusses the products that were evaluated in the past and suggests products developed by CWG members that could first the first time, or for a second time be evaluated. These include the Convective Initiation product, the Global Instability Index, NearCast (from Polar Satellites!), OT detection, Reff-based storm severity estimates, convective BL humidity (as presented by Daniel Rosenfeld), and lightning imager proxy data. He points out that a small

Pieter Groenemeijer

amount of funding is required to enable such evaluations, given the lack of permanent funding for ESSL. ESSL can only rarely make exceptions.

Pieter raises the question why there is no formal 'Meteosat Third Generation Proving Gound'. Marianne and Martin reply that the move from MSG to MTG is much less significant than the move to GOES-R in the USA, since MSG is already a very advanced satellite, so such a programme is not necessary.

10:30   *Coffee Break*

Final Discussion Items

Marianne König
Martin Setvák
Pieter Groenemeijer

Topic: CWG Website, other CWG actions

We note that the number of contributions to the CWG Website has been very limited, with the notable exceptions of the longer contributions by Martin Setvák (on Rapid Scans) and Maria Putsay.

The chairs urge the CWG members to regularly provide short texts, preferably with a small picture, about ongoing work. These short text can be sent any time by e-mail to Marianne.koenig@eumetsat.int, martin.setvak@chmi.cz and pieter.groenemeijer@essl.org.

Action Item to all: provide contributions to the CWG website.

We discuss other ways of promoting interaction within the group. Ivan Smiljanic offers to have monthly Eumetrain CWG briefings through teleconferencing software.

Action Item to Ivan: provide CWG with information about this plan

Natasa says that it is proposed to develop a CAL-module within EuMetTrain on CWG-related topics in which CWG members (including the Asian members) would be involved. The execution of this is dependent on whether funding for this programme will be awarded.

Topic: CWG Newsletter

Pieter wants to know to whom the Newsletter should be sent. It is clarified that the Newsletter should be sent to both the CWG members who take part in workshops and to persons who have registered to the Newsletter on the web site. A notice should be added to the website that people who have registered to the newsletter are not automatically entitled to workshop participation.

Topic: CWG Best Practice Document

Kris Bedka asks whether the document has any formal status, and whether it can be a formal EUMETSAT document.

AI Marianne: find this out

John Mecikalski asks whether the document is a recommendation of Best Practices or an inventory of all practices. This was discussed without a concrete conclusion. On the one hand, everyone's products which are generally accepted as physically sound should be included. On the other hand, the discussions and exchange of knowledge in the group as well as product evaluation at the ESSL Testbed should help make clear which products are truly the "Best" practices.

Marianne calls on everyone to review their contributions in the Best Practices Document to make sure that they reflect the newest level of knowledge. Also, it was discussed whether the title shouldn't be changed to a more general one (avoiding "best" in the title).

Action Item to all: The reviewed texts are to be send to Marianne before the end of August

Topic: **Recommendations by the CWG, proposed by Ralph Petersen**

Ralph Petersen proposed the following recommendations and action items, all of which were adopted:

1. The CWG recommends providing NearCast model products using SEVIRI data in real time over Europe for testing and evaluation beginning in late spring. EUMETSAT will continue to provide SEVIRI radiance data to CIMSS. CIMSS will then produce retrievals based on GFS first guess and run 9-hour NearCasts for the attached domain and for parameters of Theta-E and Precipitable Water (PW). Output will be provided for the full domain in GRIB-II and on a CIMSS web page. If resources allow, web-based loops of analyses for the past 2 or 3 days will also be made available for use in daily weather briefings and validation. In return, participating users will be asked to evaluate the NearCast products and provide summaries at the end of the test period. A limited number of more detailed, regional web pages could also be established as needed.
Action Item Ralph Petersen: cordite CIMSS activities.
Action Item to all: define European participants

2. The CWG will together with ESSL transmit a request to WMO Working Group on Numerical Experimentation with the goal of coordinating the calculation of stability perimeters required for forecaster training and satellite product development/validation.

Action Item Ralph Petersen: provide contact information across all NWP providers

3. CWG and ESSL will submit separate requests to the WMO Air-Born Observation Program (Dean Lockett) requesting expansion of high-quality aircraft moisture observations (especially profiles) for use in validating satellite-based moisture profiles and product.

Action Item Ralph Petersen: provide respective WMO contact information.

In addition, Pieter says that ESSL would like to work with the overshooting top products at a cost-neutral basis this year.

Topic: Any Other Business

The use of some of the lightning data for research purposes aimed at the 20 June 2013 super-rapid scan case is discussed, since there are license problems for some to use this data.

Action Item Jochen Grandell: Jochen offers to look whether he may contribute this data for this case according to the legal text for his use.

Pieter then raises to topic of the European Severe Weather Database, which is used intensely by the group members, and calls on the group to contribute severe weather reports to the data base.

Action Item to all: please consider if and how you can contribute to the database

Topic: Next CWG meeting:

The next Workshop will be organized by mid/end of April 2016 in Florence, as suggested by Davide Melfi.

Action Item Davide Melfi: make the necessary arrangements and communicate the exact date to the CWG chairs.

A short splinter meeting will be hosted at the ECSS conference in September 2015 in Wiener Neustadt.

Action Item Pieter: arrange availability of a meeting room.

A small meeting will take place at the EUMETSAT conference in September in Geneva.

Action Item Vesa: arrange availability of a meeting room or other location

The workshop ends at 12:00.

12:00   *Lunch*