

2022 Convection Working Group Meeting

17-20 May 2022, Hungary, Budapest



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Recommendations

8th CWG Recommendation 1: The Working Group sees great value for RSS. Particularly valuable it is for monitoring the Convection Initiation, Overshooting Top (updrafts) detection, monitoring updrafts re-creation and rapidly growing Cb towers, storm top cloud microphysics and large hail detection, to name a few. Benefits in monitoring convection over maritime areas with no radar coverage has also been emphasized. Storm top divergence product, useful for large hail nowcasting, can only be produced with RSS data. Hence, the working Group strongly recommends having several rapid scan campaigns (April/May, summer, September/October), covering full days, during the FCI commissioning phase in 2023, to have a possibility to have valuable early data about the new capabilities RSS will offer.

8th CWG Recommendation 2: The working Group also recommends to combine RSS data with lightning data (LI) and involve machine learning to derive new products.

8th CWG Recommendation 3: Crowdsourcing of (severe) weather observations should be fostered (EUMETNET Crowdsourcing Group is working on standardizing real time volunteer observer Reports <https://portal.eumetnet.eu/display/WC/Subgroup+App+Data>).

8th CWG Recommendation 4: EUMETSAT is encouraged to put effort in reducing the timeliness for the dissemination of FCI and LI Level-1 and Level-2 products.

8th CWG Recommendation 5: EUMETSAT is encouraged to rethink how to better engage the research community/academia in the satellite data processing training activities. For example, by focusing more on physical principles and processes embedded in the satellite data and products. EUMETSAT encourages all participants to actively invite present and former colleagues from research/academia to EUMETSAT training events.

8th CWG Recommendation 6: National Meteorological and Hydrological Services (NMHS) are encouraged to follow the approach of CHMI in establishing nowcasting working groups alongside the forecasters. It is noted that such initiatives should rather be proactive rather than reactive, given the potential impact of severe weather events as observed in 2021 which initiated the initiative at CHMI.

8th CWG Recommendation 7: It is recommended to also include user-provided ground observations for severe weather nowcasting activities. This is done by e.g., ZAMG that developed an application for collecting on-ground observation reports in Austria. The potential risk of false/inaccurate reports if such a service is open to the public is noted.

8th CWG Recommendation 8: Retain and disseminate operationally produced soundings from both MTG-IRS and MTG-FCI and make them easily available to the users and research/development communities. For example, the archiving of the derived vertical temperature/humidity profiles from the FCI GII products would be helpful.

8th CWG Recommendation 9: Encourage making real-time microwave products operational for NOAA and Metop satellites for use in Nowcasting over Europe.

8th CWG Recommendation 10: It is recommended to use different radar territory for RDT tuning and validation.

Actions

6th CWG Action 3: CWG members are invited to share links to their most relevant scientific publications on convection, to be published on the CWG webpage. [ALL]

7th CWG Action 1: Investigate different work flows (regarding practices in warning operations in severe convective situations) within Met Services. This could be carried out as a survey. [CWG Co-Chairs]

7th CWG Action 3: Update the CWG Convection Guidance with new products. [CWG Co-Chairs]

8th CWG Action 1: Clarify the possible differences in the *accumulated flash* and *accumulated flash area* datasets (seem to be identical in the test data) presented by Blanka Gvodzikova. [Jochen Grandell, Bartolomeo Vittichie, Blanka Gvodzikova]

8th CWG Action 2: Circulate with all CWG and 3T members the inquiry from NWC SAF about interests to join discussions for Nowcasting collaborative environment in European Weather Cloud. [CWG Co-Chairs]

8th CWG Action 3: Investigate how can non-European scientists continue to get more involved in MTG developments. [CWG Co-Chairs]

8th CWG Action 4: Check the status of the NWCSAF CTTH problem with low level humidity with Meteo France. [Pilar Ripodas]

8th CWG Action 5: Add to the report concerning the OT what improvement is to be expected of MTG rapid scan data. [Jean-Mark Moisselin]

Session summary

Opening session:

CWG workshop was organized jointly with the MTG 3T workshop for the first time. CWG part started on Tuesday with welcoming words from OMSZ vice president and head of forecast office, Mihály Szűcs and Joachim Saalmueller from EUMETSAT.

First block of presentations focused on the MTG mission with details on resolution, and timeliness of the data as well as the preparation of planned activities and training. MTG preparation is ongoing; launch is planned on 30th November 2022.

Stephan Bojinski explained that fully representative FCI L1c test had been released. He explained the partnership EUMETSAT has with ESSL about expert workshops and training. Results of these expert workshops will be shared with everybody. The operational baseline of MTG has been explained. Estelle de Coning has expressed the importance of the work done for MTG in particular all data supporting early warning especially in Africa.

Natasa Strelec Mahovic presented EUMETSAT's current work and future plans for MTG training. Discussion touched upon how to engage discussion/exchange with Academia. Importance of scientific papers was mentioned.

Miguel Angel Martinez gave a detailed update on the iSHAI and qIRS developments.

Research to Operations

In this session, the main focus was shifted towards the operational usage of the products. This session included five presentations.

Pao Wang explained the generation of storm top features especially AACPs using numerical thunderstorm model. The most central mechanism responsible for generating all these features is the interaction between the storm top winds and updrafts.

Michaela Valachova has explained the concept and the work of the CMHI Convective Group which has been created after the big Moravia tornado case last year. This group is composed of forecasters who advice CMHI forecaster on shift on thunderstorm warnings during the convective season. CWG group welcomed this initiative and encourages NMSs to follow the example.

Jindrich Statska gave a demonstration on their satellite labelling tool which can be used to annotate different type of storm top features on images. The tool is also working with other type of images, any georeferenced image can be used. Several participants expressed the usefulness of the tool and the desire for centralized database such that labelling results can be shared among users, which could also be possible to use for machine learning purposes. Participants also expressed interest in having additional labelling shapes (in addition to rectangles).

Piotr Struzik presented several winter storm case studies from last winter. The analysis of historical meteorological data shows that the climatic conditions in Poland are becoming more and more unstable, which results in an increase in the frequency and intensity of hazardous weather events.

Humberto Barbosa gave a presentation about Training Course in Brazil on behalf of Catarina O. Burati.

Lightning

In this session, first Felix Erdmann talked about automatic lightning jump detection using GEO satellite data. Average lead time of lightning jumps to severe storm report was 36 minutes. In the following discussion it was suggested to do the analysis also with ground-based networks in order to assess the added value of the satellite observations. Furthermore NWC-SAF suggested to also compare the results with the lightning jump information available in NWC-SAF RDT v2021.

Steve Goodman highlighted the use of lightning data in Nowcasting for improved severe storm warnings and public safety, wildfire ignition, and climate variability and change.

Tino Manzato presented detailed climatology on lightning and convection initiation based on lightning data over the pan Alpine region.

Blanka Gvozdkova demonstrated their work on LI test data visualization. Accumulated flash area is shifted towards NE compared to the point data (flash data). The reasons behind this shift is unclear. Lack of parallax correction may be one reason. Participants expressed interest in the software and suggested it to be made available via e.g., GitHub.

New Imagers

This session included four presentations covering possibilities from the new generation satellites.

Maria Putsay talked about the VIIRS Cloud Phase RGB with focus on cloud top microphysics. The added value of the 2.25 micrometre future new FCI channel was shown. Interesting discussion topic arose whether the small ice crystals shown for the AACPs are real feature or artificial arising from the viewing geometry.

John Mecikalski shared their work on microphysical signatures of AACP clouds. There appears to be higher reflectance signature in AACPs in 0.64, 1.6 and 2.24 μm channels which suggest that smaller ice particles comprise the AACP as compared to the surrounding convective anvil. More cases will be studied to confirm this.

John Cooney gave a presentation about automatic AACP detection. He demonstrated that OT and AACP patterns can be accurately detected at the satellite pixel scale using U-Net semantic segmentation deep learning models and cloud computing. The detection models identify features that “look like” OT/AACPs in types of imagery input to the models, but the model “accuracy” depends on the precision of the labels.

Dan Lindsey presented the plans on NOAA’s future GEO satellites. New channels (f.e. 5.15 μm) and improved spatial resolution (f.e. 3.9 μm in 1 km resolution) are foreseen along with hyperspectral sounding capabilities.

Multi-Sensor Approach

Pieter Groenemayer gave an insight to the first expert workshop which is part of the training collaboration ESSL has with EUMETSAT. This workshop was mainly about moisture detection particularly low-level moisture detection in view of MTG and EPS-SG satellites, including potential synergies between the two. ESSL also gave a demonstration on their display which is used during the test bed workshops.

Humberto Barbosa talked about kinetic energy rate of the rain drops based on the impact signal analysis. The kinetic energy of precipitation, associated to certain types of soil, allows the determination of the potential of the erosion caused by the rains.

Jan Kanak showed the software developments done in SHMU to visualize FCI and LI data. Feedback from the software testers was welcomed.

Ulrich Haman presented the work done in Meteo Swiss using machine learning for thunderstorm nowcasting. Recurrent-convolutional, deep learning network was developed to predict lightning occurrence. It is planned to implement it in operations in the near future.

Xavier Calbet showed that gravity and other waves can be better detected in water vapour imagery from GEO satellites. These features can create problem for AMVs derived from WV channels.

A NASA study was presented by Kyle Itterly which uses satellite observations and model parameters in a deep neural network to perform climatological hailstorm analysis in support of catastrophe model development, with the hope of promoting risk resilience particularly in regions without adequate weather radar coverage.

Fabian Senf talked about two open-source packages: the Python package "CTyPyTool") which allows to derive a consistent cloud typing from Meteosat observations and from data of weather forecast models; and the Python package called "tobac" or "Tracking and Object-Based Analysis of Clouds" which aims to handle very different types of input data, e.g., cloud-microphysical and dynamical properties from cloud-resolving model simulations or observational fields like geostationary satellite data

Kris White showed how operational meteorologists can use multi-sensor data and integrated approaches to better assess evolving weather risks in the convective continuum.

Hyperspectral Sounders

The upcoming MTG IRS has triggered new developments regarding hyperspectral data usage in nowcasting.

Thomas August gave an update on EUMETSAT's Hyperspectral Sounders and derived products. Capabilities and limitations of these measurements were discussed.

Ralph Petersen summarized the changes made to the CIMSS NearCast system, including both the extension of the system to include the lowest portion of the atmosphere using terrain-following flow. Results of validations of analyses and very-short-range forecasts of satellite-based Total Precipitable Water (TPW) products using independent surface GPS-based TPW observations was shown.

NWCSAF

Pilar Ripodas presented the implemented improvements in the new software package NWC SAF GEO v2021 released in April 2022. NWCSAF plans for the CDOP4 were also shared. Participants were interested in the NWCSAF plans to establish beta tester group during MTG commissioning. Users can contact Pilar Ripodas if they wish to become Beta tester of the NWCSAF MTG software

Jean-Mark Moisselin talked about the convection products developed within the NWCSAF namely about Convection Initiation and RDT products. Recent improvements of the products and future development plans were shown.

Martin Setvak gave a presentation about the gravity waves generated by Hunga Tonga volcano eruption.

Monika Pajek talked about In-depth multianalysis of extreme convective cases in the last year in Poland.

List of Registered Participants

	Given name (First Name)	Family name (Last Name)	Country	Institution/Organization
1	Marko	Blaskovic	Croatia	DHMZ
2	John	Cooney	United States of America	NASA LaRC
3	Kyle	Itterly	United States of America	Science Systems & Applications, Inc.
4	Estelle	de Coning	Switzerland	WMO
5	Yasmin	Markl	Austria	ZAMG
6	Catarina	Buriti	Brazil	Brazilian Institute for Semi-arid (INSA)
7	Petra	Mikus Jurkovic	Croatia	Croatian Meteorological and Hydrological Service
8	Matevz	Osolnik	Slovenia	ARSO
9	Tamás	Csonka	Hungary	Hungarian Meteorological Service
10	Kornél	Kolláth	Hungary	Hungarian Meteorological Service
11	Ivan	Smiljanic	Germany	EUMETSAT
12	Ulrich	Hamann	Switzerland	MeteoSwiss
13	Jean-Marc	Moisselin	France	METEO-FRANCE
14	Xavier	Calbet	Spain	AEMET
15	Tomas	Pucik	Austria	European Severe Storms Laboratory
16	Pieter	Groenemeijer	Austria	European Severe Storms Laboratory - Science & Training
17	Oleksii	Kryvobok	Ukraine	UHMI
18	Piotr	Struzik	Poland	Institute of Meteorology and Water Management - NRI
19	John	Mecikalski	United States of America	University of Alabama in Huntsville
20	Humberto	Barbosa	Brazil	Federal University of Alagoas (Ufal)
21	Michaela	Valachová	Czech Republic	Czech Hydrometeorological Institute (CHMI)
22	Johan	Strandgren	Germany	EUMETSAT
23	Blanka	Gvozdikova	Czech Republic	Czech Hydrometeorological Institute
24	Jindrich	Stastka	Czech Republic	Czech hydrometeorological institute
25	Mária	Putsay	Hungary	retired from Hungarian Meteorological Service
26	Davide	MELFI	Italy	Italian Air Force Met Service - COMet
27	Ki-Hong	Park	South Korea	National Meteorological Satellite Center/ Korea Meteorological Administration
28	MEEJA	KIM	South Korea	National Meteorological Satellite Center

29	Fabian	Senf	Germany	Leibniz Institute for Tropospheric Research (TROPOS)
30	Dieter	Poelman	Belgium	Royal Meteorological Institute of Belgium
31	Márta	Diószeghy	Hungary	OMSZ - Hungarian Meteorological Service
32	Felix	Erdmann	Belgium	Royal Meteorological Institute of Belgium (RMIB)
33	Matic	Šavli	Slovenia	Environmental Agency of Slovenia
34	EUNHA	SOHN	South Korea	NMSC/KMA
35	Mateja	Irsic Zibert	Slovenia	ARSO
36	Ralph	Petersen	United States of America	University of Wisconsin-Madison, SSEC/CIMSS
37	Gerrit	Holl	Germany	Deutscher Wetterdienst
38	Pilar	Ripodas	Spain	AEMET
39	Luca	Nisi	Switzerland	MeteoSwiss
40	Thomas	AUGUST	Germany	EUMETSAT
41	Jochen	Grandell	Germany	EUMETSAT
42	Valentina	Rosati	Italy	Italian Air Force Met Service
43	Dóra	Cséke	Hungary	Hungarian Meteorological Service
44	Zsófia	Kocsis	Hungary	OMSZ - Hungarian Meteorological Service
45	Dunja	Placko-Vrsnak	Croatia	Croatian Meteorological and Hydrological Service
46	Ioannis	Matsangouras	Greece	Hellenic National Meteorological Service (HNMS)
47	Jochen	Richters	Germany	Deutscher Wetterdienst - DWD
48	Kristopher	White	United States of America	National Weather Service - Huntsville / NASA Short-term Prediction Research and Transition Center (SPoRT)
49	Stephan	Bojinski	Germany	EUMETSAT
50	Steve	Goodman	United States of America	GOES-R/TGA
51	Ján	Kaňák	Slovakia	Slovak Hydrometeorological Institute
52	Kathrin	Wapler	Germany	Deutscher Wetterdienst
53	Jean-Baptiste	Hernandez	France	Météo-France
54	Sylvain	Le Moal	France	Météo-France / Centre de météorologie Spatiale
55	Martin	Setvák	Czech Republic	Czech Hydrometeorological Institute
56	Thomas	Krennert	Austria	ZAMG
57	Agostino	Manzato	Italy	Arpa FVG - OSMER
58	Pao	Wang	Taiwan	Academia Sinica
59	Jason	Otkin	United States of America	University of Wisconsin-Madison

60	Dan	Lindsey	United States of America	NOAA
61	Miguel Angel	Martinez	Spain	AEMET
62	Natasa	Strelec Mahovic	Germany	EUMETSAT
63	Vesa	Nietosvaara	Germany	EUMETSAT
64	Julián	Palacios	Spain	AEMET
65	Michaël	Claudon	France	Météo-France
66	Frederic	Autones	France	Météo-France
67	Monika	Pajek	Poland	IMGW-PIB
68	Miria	Celano	Italy	Arpae Emilia-Romagna
69	Philip	Watts	Germany	EUMETSAT
70	Ondrej	Nedelcev	Czech Republic	ZCHMI
71	Kristopher	White	USA	NOAA
72	Loredana	Spezzi	Germany	EUMETSAT
73	Hans-Joachim	Lutz	Germany	EUMETSAT
74	Christo	Georgiev	Bulgaria	NHMI
75	Cornelia	Strube	Germany	DWD
76	Carla	Barroso	Germany	EUMETSAT
77	Andrey	Kulishev	Bulgaria	NHMI
78	Andreas	Wirth	Austria	ZAMG
79	Mariann	Daranyi	Hungary	OMSZ - Hungarian Meteorological Service
80	Simon	Proud	UK	University of Oxford
81	Sven-Erik	Enno	Germany	EUMETSAT
82	Kiril	Slavov	Bulgaria	National Institute of Meteorology and Hydrology
83	Jana	Campa	Slovenia	ARSO
84	Benjamin	Rösner	Germany	DWD - Deutscher Wetterdienst
85	Gabriele	Fasano	Italy	ARPA FVG OSMER
86	Arturo	Pucillo	Italy	ARPA FVG - OSMER
87	Sergio	Nordio	Italy	ARPA FVG OSMER
88	Kristopher	Bedka	United States of America	NASA Langley Research Center
89	Dieter	Poelman	Belgium	Royal Meteorological Institute of Belgium
90	Joachim	Saalmüller	Germany	EUMETSAT

CWG Workshop Agenda, 2022

Time (CEST)	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-10:45	ESSL Workshop (all Monday and Tuesday) - <i>for invited participants only</i>	Opening of the Joint CWG – 3T (Chair: Vesa Nietosvaara) Joachim Saalmueller, Mihály Szűcs: opening words Stephan Bojinski: Next-generation MTG observation missions: products, resolution, timeliness Natasa Strelec Mahovic: Training (EUMeTrain, etc) Miguel Angel Martinez: Update on MTG era preparation (online) Discussion	Networking (off-site) *	(Chair: Stephan Bojinski) ESSL: Report on first Expert Workshop: Low-level moisture detection Application demo: ESSL Weather Data Displayer Humberto Barbosa: Kinetic Energy Rate of the Rain Drops Based on the Impact Signal Analysis Application demo Jan Kanak: Status of development of satellite application software for FCI and LI at SHMU in context of monitoring severe storms Discussion	NWC-SAF (Chair: Xavier Calbet) Pilar Ripodas: New software version NWC SAF GEO v2021 (online) Jean-Marc Moisselin, Frédéric Autonès, Michaël Claudon: NWCSAF Convection Products: outcome of CDOP3 (2017-2022) and CDOP4 (2022-2027) plans (online) Martin Setvak: Waves generated by Hunga Tonga eruption Discussion
10:45-11:15		break	break	break	break

Time (CEST)	Monday	Tuesday	Wednesday	Thursday	Friday
11:15- 13:00		Research to Operations (Chair: Zsofia Kocsis) Pao Wang : Refined analysis of the generation of AACCP and related storm top phenomena Michaela Valachova : New „Convective Group“ as an advisory body for meteorologists Piotr Struzik : Winter storms in January 2022 in Poland (online) Application demo: Jindrich Stastka : Satellite labelling tool (online) Catarina Buriti : The 2021 training course of EUMETSAT in Brazil (online) Discussion	Group discussions * Topics according to proposals from participants: - Natasa Strelec Mahovic : Rapid Scans - Xavier Calbet : Nowcasting Collaboration at European Weather Cloud - -	Multisensor and integrated approaches (Chair: Agostino Manzato) Ulrich Hamann : Using Machine Learning for Thunderstorm Nowcasting (online) Xavier Calbet : Detecting water vapor features from GEO orbit Olex Kryvobok : Detection of extreme severe weather using high resolution global lightning detection network and satellite data Kyle Itterly : Deriving Severe Hail Likelihood from Satellite Observations and Model Reanalysis Parameters using a Deep Neural Network Discussion	Monika Pajek : In-depth multianalysis of extreme convective cases in the last year in Poland CWG administration Closing
13:00	Lunch	Lunch	Lunch	Lunch	Lunch

Time (CEST)	Monday	Tuesday	Wednesday	Thursday	Friday
15:00-16:15	Opening of 3T (Chair: Natasa Strelec Mahovic) Ivan Smiljanic : 3T Forum overview Martin Setvak : 1.38 micron bands - aerosols, ash and dust	Lightning (Chair: Martin Setvak) Felix Erdmann : Automated Lightning Jump (LJ) detection from geostationary satellite data (online) Steven Goodman : Lightning Applications for Weather and Climate (online) Discussion	New Imagers (Chair: Ivan Smiljanic) Maria Putsay : Severe convective events studied on SEVIRI and VIIRS images John Mecikalski : Quantification of the Microphysical Signatures of Above Anvil Cirrus Plumes in GOES-16/-17 Infrared and Visible Imagery (online) Discussion	Multisensor and integrated approaches (Chair: Pieter Groenemeijer) Fabian Senf : Open Source Developments for the Joint Assessment of Cloud Characteristics in Simulations and Satellite Observations Kris White : An Integrated Approach For Assessing Evolving Weather Risk in the Convective Continuum (online) Discussion	
16:15-16:45	break	break	break	break	
16:45-18:00	Ivan Smiljanic : MTG related case studies at EUMETSAT library	Lightning (Chair: Martin Setvak) Agostino Manzato : Convective initiation climatology on the Alps from lightning Application demo-Blanka Gvozdkova : Visualisation of gridded LI products (online) Discussion	New Imagers (Chair: Ivan Smiljanic) John Cooney : Automated Detection of Severe Thunderstorm Signatures Within Geostationary Satellite Imagery Using Deep Learning Dan Lindsey : Update on NOAA's future geostationary satellite plans (online)	Hyperspectral (Chair: Tomas Pucik) Thomas August : hyperspectral sounders Ralph Petersen : Recent Enhancements, Applications and Validation of CIMSS NearCasts (online) Discussion	

Location and time of next meetings

Splinter Meeting at EUMETSAT Conference in Brussels, 22 September 2022.

Next workshop is foreseen in either Fall 2023 or Spring 2024 in Prague, Check Republic depending on MTG launch in November 2022.

Terms of Reference of the Convection Working Group

Purpose

The main purpose of the Convection Working Group is to stimulate efficient utilization of satellite data in operational meteorology for detection, analysis and prediction of deep moist convection and associated phenomena.

Objectives

Developing a body of knowledge in monitoring convection through satellite observations.

Offering a meeting point for researchers, developers and operational users, for exchanging experiences and feedback on practices and operational and experimental applications aimed at convection processes in the atmosphere.

Activities

Coordination of development and enhancement of techniques for early detection and prediction of convective storms.

Stimulation of research activities for better understanding and description of processes in the convective environment and their footprints on satellite data.

Support to development of training materials and fostering the technology transfer necessary for introduction of newly developed methods and techniques into operational meteorology.

Exchange of information on an international level for leading scientist and experts in satellite meteorology, active in development and operations of nowcasting techniques.

Fostering the use of satellite data in conjunction with other available data (NWP / Radar etc.) for detection, analysis and prediction of deep moist convection and associated phenomena.

Cooperation with the specialised institutions, such as storm laboratories, which have a particular role in contributing to the CWG and robustly testing new products and algorithms for operational application. ESSL has a particular role in facilitating this in Europe.

Promote collaboration with similarly aimed groups, organizations or individuals worldwide. Therefore, CWG is open to all interested parties – individuals and organisation. No formal membership is required to attend CWG events (workshops and meetings) or to use various material available on the CWG website.

The coordination of the group will be done by co-chairing the CWG by representative(s) of EUMETSAT and appointed specialist(s). To facilitate CWG activities, a CWG secretary (individual or institution) will be appointed by EUMETSAT.

The CWG will aim to hold meetings every two years for planning and reporting on progress, in between the group will interact via Internet and teleconference and at splinter meetings, when suitable.

The CWG will maintain a web site for efficient information exchange and provision of documentation. For the exchange of information and documentation the web site should be operated under guidance of the secretary of the CWG.