European Severe Storms Laboratory

ESSL Newsletter 2024-3

October 2024

Dr Francesco Battaglioli, ESSL researcher

ESSL researcher **Francesco Battaglioli** obtained his doctoral degree from **Freie Universität Berlin**. ESSL Deputy Director Tanja Renko took the opportunity to ask him a few questions about his PhD journey and his experiences as a young scientist.

TR: How did your journey with ESSL begin, and what determined the main topic of your doctoral research?

FB: My ESSL journey started in 2019 at the 10th

European Conference on Severe Storms (ECSS) in Krakow where I had the opportunity to meet ESSL Director Pieter Groenemeijer and ESSL researcher and senior trainer Tomáš Púčik. During the ECSS conference, we decided to work together on the thesis for my master's at the University of Reading. After my graduation, the opportunity to work on the **project "Convective Hazard Evolution under Climate Change"** came up and I joined ESSL as a research associate while working on my PhD at the Free University of Berlin.

TR: As a young researcher, what was the most challenging part of your research and PhD journey?

FB: Like many PhD students, I experienced the most difficult part of the program between the first and second year. At some point, it becomes clear that it will not be possible to achieve everything that was expected within the PhD and some priorities need to be set. Leaving some topics behind can be difficult but I believe it is somewhat necessary to steer your academic career in a certain direction.

TR: Could you briefly tell us about the main results of your research?

FB: During my PhD, I developed a statistical model called AR-CHaMo (Additive Regressive Convective Hazard Model) that uses lightning observations, severe weather reports, and novel atmospheric parameters from the ERA5 reanalysis to predict

the occurrence of lightning and (very) large hail. AR-CHaMo allowed us to reconstruct the climatology and the long-term trends of hail in Europe and North America. The most remarkable result is that the modelled hail frequency has increased across large parts of Europe, most strongly in Northern Italy, where it is now 3 times as frequent as it was in the 1950s.

TR: What do you enjoy most or find most motivating as a scientist?

FB: The idea of creating knowledge and answering questions related to complex topics has always motivated me to become a scientist. In a way, my journey to ESSL started already back in 2014 when Genoa, my hometown, was hit by severe flooding. Since then, it has always been my dream to contribute to a better understanding of severe convective storms and their relationship with climate change. The idea of contributing even in small part to a better understanding of this topic is very gratifying and motivates me every day as a scientist.

TR: Do you already have new research topics in

mind?

FB: Yes, over the next months, I will be working on the application of the AR-CHaMo models to the CMIP6 climate models in order to identify how the frequency and severity of large hail will change by the end of the century. At the same time, together with [ECMWF](#), we aim to apply AR-CHaMo to the ECMWF-EPS allowing forecasters to have a medium-range probabilistic tool for predicting lightning, large and very large hail.

ESSL (and EUMETSAT) Testbeds of 2024

Author: Tomáš Púčik

The last [Testbed week](#) in 2024, which is taking place this week, motivated us to look back at all the activities related to Testbed this year. Weather models promise an active weather pattern with many storms across the Mediterranean area and the last Testbed will be devoted to the training and

evaluation of new products available from the MTG FCI and LI. The satellite data will have a chance to prove themselves over the areas where weather radars or ground-based observations can't reach.

In total, there were **7 Testbed weeks this year, with 99 participants from 28 countries**, not counting the ESSL and EUMETSAT staff. 5 weeks have been co-organized and sponsored by [EUMETSAT](#) with heavy focus on the satellite data. One of these weeks was held directly in the EUMETSAT headquarters in Darmstadt. There, the scientists and engineers behind the new satellites and their instruments could look at how the data that they provide is used in the operations. There were many severe storms during this period. The weather also affected the travel to the course as two ESSL trainers arrived in Darmstadt Monday early morning instead of Sunday evening.

Participants and trainers at the ESSL-EUMETSAT Testbed in Darmstadt.

A big step for ESSL-EUMETSAT Testbeds were the

(pre-)operational FCI and LI data that became available over the summer/autumn and for the last two Testbed weeks. New RGBs, total moisture products and various characteristics of the LI data have been evaluated.
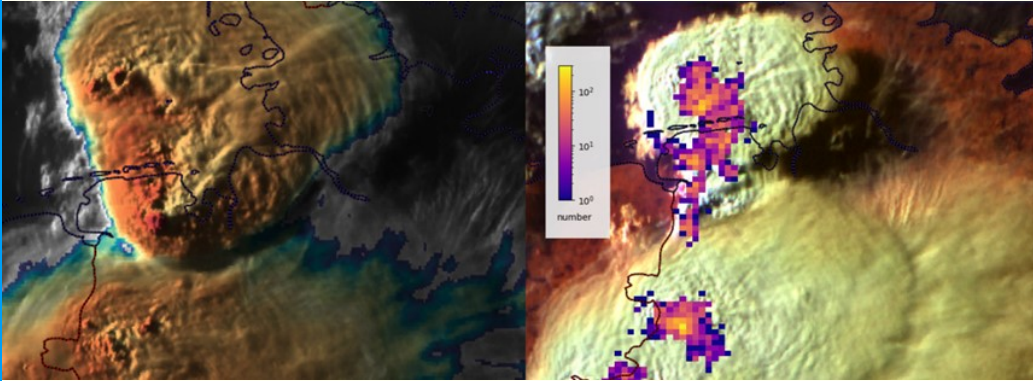

Examples of the FCI and LI satellite data from severe storms in northern Germany on 13 August 2024. The left image shows "Sandwich" product, combining visible and infrared imagery. The right one shows a combination of the new RGB called "Cloud Phase" with a density of the groups of events from the LI instrument. Yellowish grids denote the areas with the highest lightning activity in the storms.

Two ESSL Testbed weeks concentrated on the evaluation of the 4 products provided by the DWD, 1 product provided by the GeoSphere and 1 product provided by the ESSL. ESSL's product was the probabilistic forecast of lightning, large hail and severe wind gusts based on the ARCHaMos applied to the ECMWF's ensemble. GeoSphere provided a new version of the CLAEF with an incredible 1 km horizontal resolution. DWD supplied several products that bridge the nowcasting and forecasting, such as the ICON-RUC EPS or KONRAD3D-SINFONY. One of these two Testbed weeks was so-called "Expert" week, in which a very strong emphasis was placed on

product evaluation sessions.

So how were the Testbeds of 2024 so far? Teaching, fun and intense with lots of social interactions. We've met dozens of talented and pleasant people from different institutes from all around Europe. And we experienced various weather situations: from long-lived supercells producing wind-driven hail, bow-echoes with damaging gusts, chaotic clusters producing heavy rainfall and some surprise tornadoes in very unsuspecting conditions. All in all, it was a blast. As always. Can't wait for what the last week brings!
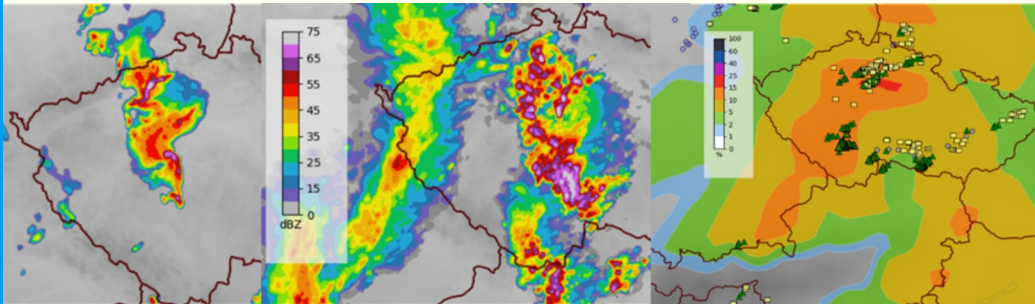
Examples of different evaluated products at the Testbed for the severe weather case of 21 June 2024. Left image shows simulated reflectivity from CLAEF 1km deterministic run, center image shows the maximum reflectivity from the ICON-RUC and the right image shows 24-h probability of hail > 5 cm overlaid with the severe weather reports from ESWD (green triangles representing hail and yellow squares severe wind gusts).

## MTG LI at the ESSL-EUMETSAT Forecaster Testbeds

Author: Alois Holzer

Within the context of the cooperation between **EUMETSAT** and **ESSL** on user preparation for the

MTG data, an experimental visualization of **Lightning Imager (LI)** data was introduced to the **ESSL Weather Displayer**. Its preliminary name is "Geometry and density" and it connects all the detected LI groups (connected pixel detections at one acquisition frame of 1 ms) within one single LI flash (collected LI groups that are correlated in space and time within 330 ms) and can be taken as a proxy for the geometry of the flash as seen from space. Each flash is given a different colour. Such a flash geometry can cover large areas, something that has earlier been discovered by using the ISS-LIS and GOES-GLM instruments.

In the ESSL Weather Displayer, the visualization combines this information with data on highly active convective cells. Those active cores are made visible via plotting the LI group density if surpassing 1 LI groups per km² within a 5 minute time frame (colour shading from black via magenta, red, orange and yellow to white). Possible applications of such a product may range from public outreach activities via identification of new active updrafts all the way to lightning safety at airports.

LI group density is also visualized in gridded form. In addition, the area size of flashes is plotted for each single flash (the size of red or yellow circles related to the flash area). This allows a forecaster to identify physical processes that are ongoing within a convective complex. Large flash areas are typical for flashes in the stratiform regions while a high number of small flashes can be indicative for

a very intense updraft, as it is often seen with supercells in early LI data.

Geometry and density
VIS 0.6 HR (500m) | Group density gridded | Flash area (red)
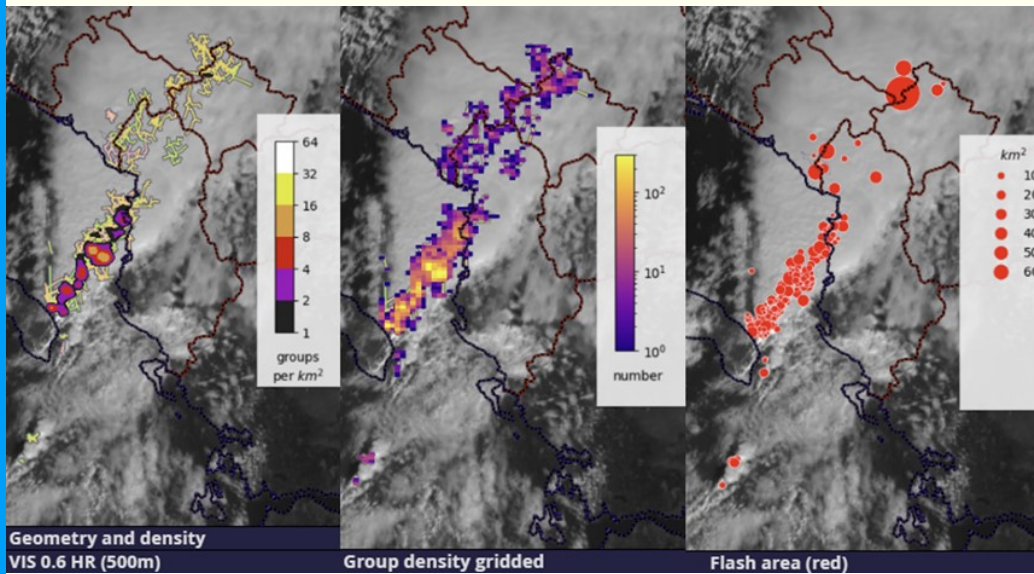
ESSL training calendar

You can find details about all events and registration at **https://www.events.essl.org/**

The radar course is fully booked. A few remaining places are available for the autumn edition of the aviation course.

Date	Activity
7 – 11 October 2024	ESSL-EUMETSAT Testbed 2024 – week 5
11 – 15 November 2024	*Tailored forecaster training week - closed event*
25 – 29 November 2024	Course: Aviation Forecasting of Severe Convection (autumn edition)
2 – 6 December 2024	NEW Course with guest lecturer Matt Kumjian: Radar Meteorology and Storm Microphysics
9 - 13 December 2024	*Course - closed event* Towards better written and oral weather communication
13 – 17 January 2025	*Tailored forecaster training week - closed event*
11 – 13 February 2025	*Tailored forecaster training course - closed event*
18 – 20 March 2025	*Tailored forecaster training course - closed event*
31 March – 4 April 2025	Course: Forecasting Severe Convective Storms – spring edition

7 – 11 April 2025	Course: Aviation Forecasting of Severe Convective Storms (spring ed.)
5 – 9 May, 12 – 16 May, 2 – 6 June 2025	ESSL-EUMETSAT Testbed weeks
23 – 27 June 2025	ESSL Testbed 2025 – expert week
30 June – 4 July 2025	ESSL Testbed 2025 – regular week
1 – 5 September 2025	ESSL-EUMETSAT Testbed week
8 - 11 September 2025	NEW Course: Damage assessment of extreme wind events
September 2025	EMS Annual Meeting (co-sponsored by ESSL) dates and venue t.b.c.
6 – 10 October 2025	Course: Forecasting Severe Convective Storms – autumn edition
13 – 17 October 2025	ESSL-EUMETSAT Testbed week
3 - 7 November 2025	Course: Aviation Forecasting of Severe Convective Storms (autumn ed.)
17 – 21 November 2025	12th European Conference on Severe Storms (ECSS2025) Utrecht, The Netherlands
21 November 2025 (afternoon)	ESSL-EUMETSAT Forecaster Workshop on MTG FCI and LI Utrecht, The Netherlands

Unsure which course to attend? Try our online quiz!

For further information about the registration for these events, please contact us at: events@essl.org .

Or approach us for tailored trainings or forecaster training on-the-job.

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ESSL General Assembly 2024

ESSL members will meet soon online at regular yearly GA on **Monday, 14 October 2024, 15:00 CEST (13:00 UTC)**. Invitations were already sent together with Annual Report 2023.

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