ESSL Newsletter 2024-4

December 2024

ECSS2025 first announcement

The **ESSL** and **KNMI** invite you to the **12th European Conference on Severe Storms** to be held **17-21 November 2025 in Utrecht in the Netherlands**.

The conference covers all aspects of severe convective storms and is open to scientists, forecasters, emergency managers, and others from around the world.

Travel support for students and early career scientists will be available from both ESSL and our co-sponsor EMS (via their Young Scientist Conference Award). In addition, a new and attractive student registration fee is introduced for 290 EUR only.

There will be special attention for new storm detection & monitoring capabilities by the **Meteosat Third Generation geostationary satellites**.

The First Announcement (PDF) is available here.

For abstract submission, registration, and more information, visit: **www.ecss.eu**
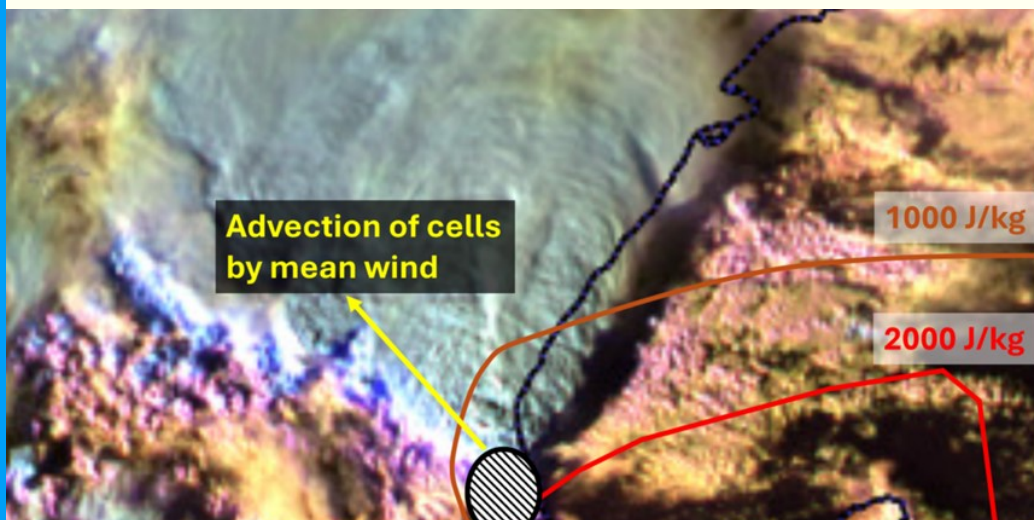
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Meteorological analysis of extreme

flash flood situation in the Valencia region

On October 29th, the Valencia region in Spain experienced devastating flash floods. ESSL researcher and senior trainer **Dr. Tomáš Púčik** conducted a detailed analysis of the meteorological conditions using ingredient-based forecasting and **Meteosat Third Generation** satellite data.

The analysis revealed a high-end environment for severe convective storms, characterized by elevated CAPE and strong vertical wind shear. This resulted in well-organized storms with strong updrafts and a high precipitation intensity. The continuous strong onshore flow of a very moist airmass, in combination with a persistent maximum in the low-level synoptic- and mesoscale-scale lift over the area kept the updraft redevelopment locked in the same position for several hours. This resulted in the extremely high precipitation intensity to persist for several hours.

You can read the full article here.
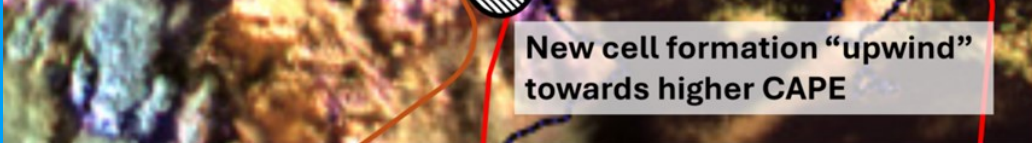
MTG Cloud phase RGB at 15:40 UTC combined with a schematic showing the distribution of CAPE in the area (brown and red contours), the orientation of the mean wind vector, and the region where new updrafts are initiated (ellipse with black stripes).

A prize for our lightning sensor project

ESSL researchers collaborated with a team from **Danube University Krems**, led by **Dr. Wilfried Hortschitz**, on the development and study of sensors designed to warn of potential lightning strikes. Specifically, they developed and tested innovative microsystem-based sensors capable of measuring the electrostatic field in the atmosphere. Their work was showcased at the [Science Goes Public 2024](#) event in Vienna, where they proudly secured 3rd place.

Sensor system for lightning warnings FTI19-019

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ABSTRACT

Various studies showed that the convective available potential energy that feeds thunderstorms has been increasing [1-3]. This increase has been attributed to rising low-level humidity. This trend is consistent with increased evapotranspiration that could be expected as a result of the observed rising temperature climate change. Future projections based on regional climate models suggest that the frequency of thunderstorms will continue to increase during the current century, most prominently across central, eastern

■Function Principle

Microsystem-based electric field mill sensor (MEMS-EFM) were developed within the project. These sensors measure the outer electric field due to induced currents on periodically shielded electrodes.

■Fabrication of Sensors

Improved design-layouts of the micro-system were processed in the cleanroom of ISAS-TUWIEN. The chips were wire-bonded into ceramic dual line standard packages enabling simple exchange in combination with universal DIP sockets as part of the new version of the actuation and evaluation circuit. The improved designs are based on the best prior chip-layout; especially drive- and/or sensing electrodes were enhanced. Figures 1 a) and b) show an exemplary SEM image of a fabricated micro-sensor and the packaged chip inside a ceramic package. The newly designed circuit board enables the use of both, laboratory devices and a commercially available microcontroller unit (MCU).

■Measurement and Results

The sensorsystem was characterized and tested in various measurement set-ups in the laboratory as depicted in Fig. 1 b) and Fig. 2 and outdoors shown in Fig. 4. Exemplary measurement results for measurements taken in the laboratory are given in Fig. 3. Although the requisite sensitivity has been attained, the long-term stability of the system remains a topic
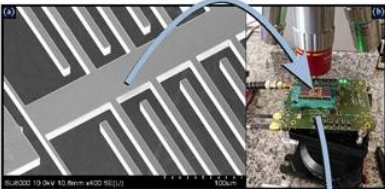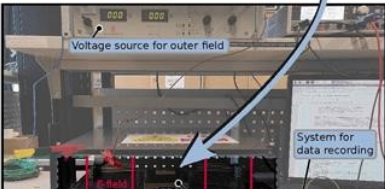
Figure 1: a) SEM picture of a fabricated structure. The part in the middle with the side combs is the shielding electrode between the sensing electrodes. b) A PCB with the electric field sensor in a ceramic package supplied via lab equipment below a Micro-System-Analyzer.

Voltage source for outer field

System for data recording

Figure 2: Typical measurement set-up for testing the sensor-system in electric field. The field is generated outside the sensor-system by applying a voltage between two parallel electrodes. The MEMS itself was tested before by applying voltages directly on the floating electrode.

■**References**
[1] Kunz et.al, 2009: Recent trends of thunderstorm and hailstorm frequency and their relation to atmospheric characteristics in southwest Germany, International Journal of Climatology.
[2] Pistotnik et.al, 2016: Validation of Convective Parameters in MPI-ESM Decadal Hindeasts (1971–2012) against ERA-Interim Reanalyses. Meteorologische Zeitschrift, 25, 753–766.
[3] Rädler et.al, 2018: Detecting severe weather trends using an Additive Regressive Convective Hazard Model (AR-CHaMo). Journal of Applied Meteorology and Climatology.
[4] Rädler et.al 2019: Frequency of severe thunderstorms across Europe expected to increase in the 21st century due to rising instability, Climate and Atmospheric Science.
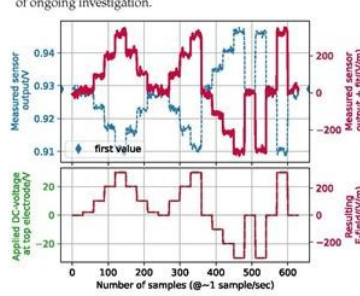
Figure 3: Exemplary sensor recordings versus the applied field. The lower plot depicts the applied voltage and the resulting electric field. The results were gained by the internal MCU-demodulation.
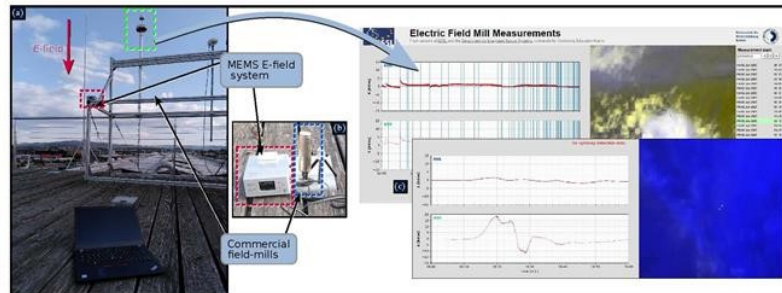
Figure 4: (a, b) two set-ups on the sensor-platform at DISS for testing MEMS-EFM system in comparison to other commercial field-mills. The MEMS-EFM was supplied for measurements over several hours by a battery-pack which was stored inside the housing. c) Monitoring interface of the electric field sensors at ESSL (top left plots) and DISS (bottom left plots) with hourly satellite images (right) and plotted lightning strike locations kindly provided on a case-to-case basis by ALDIS (yellow dots on satellite image).

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Tailored courses by ESSL - choose your ingredients

ESSL typically organizes the courses, seminars or Testbeds at our premises of ESSL Research and Training in Wiener Neustadt. That said, there is always an option for ESSL trainers to travel to a particular institute and give a tailored course. For us it is always a nice opportunity to visit another place and experience a different work environment.

During 2024, we gave two such tailored courses. The first one was in early May in Torino, Italy, lasting 3 days. The **course for ARPA Piemonte** started with cold and rainy weather, rather uncharacteristic for this location and the time of

the year. We followed typical course structure of the "Forecasting severe convection" courses, with greater **emphasis on the influence of local orography on pre-convective environments and storm evolution**. Great pasta, pizza and Tiramisu were enjoyed during this week!

The second tailored course took place in November in Sofia, Bulgaria for **BULATSA**. We barely saw any sun that week and Sofia even showed us its snowy nature. The main topic of the course was the **new forecasting/nowcasting opportunities offered by the MTG**. For example, we practiced nowcasting convective initiation with the new **Cloud Phase and Cloud Type RGBs** or nowcasting the intensity of storms using the data from the Lightning Imager. Besides the weather talk, we enjoyed the great hospitality of the local organizers.

In **2025**, we are planning to visit Sofia once more and to give two tailored courses for **ARSO** in Ljubljana, Slovenia. Can't wait!

ESSL training calendar 2025

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

Date	Activity
13 – 17 January 2025	*Tailored forecaster training week in Bulgaria - closed event*
11 – 13 February 2025	*Tailored forecaster training course in Slovenia - closed event*
18 – 20 March 2025	*Tailored forecaster training course in Slovenia - 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 Forecaster 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 Forecaster Testbed week
8 - 11 September 2025	NEW Course: Damage assessment of extreme wind events
8 – 12 September 2025	EMS Annual Meeting (co-sponsored by ESSL) Ljubljana, Slovenia
6 – 10 October 2025	Course: Forecasting Severe Convective Storms – autumn edition
13 – 17 October 2025	ESSL-EUMETSAT Forecaster 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 (ECSS venue)

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.