Benchmark data analysis of the intense weather event occurred in Italy around the Como Lake area in July 2021

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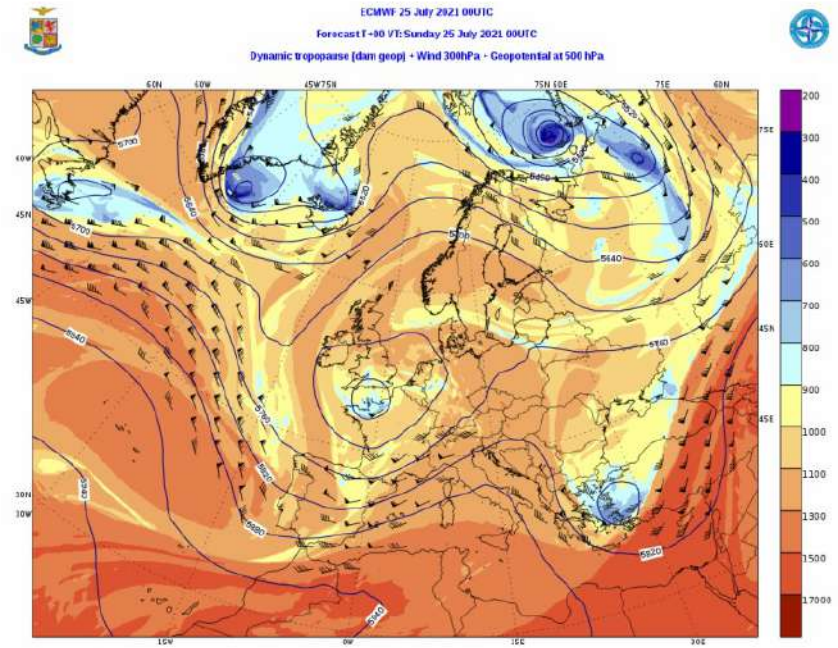
Introduction

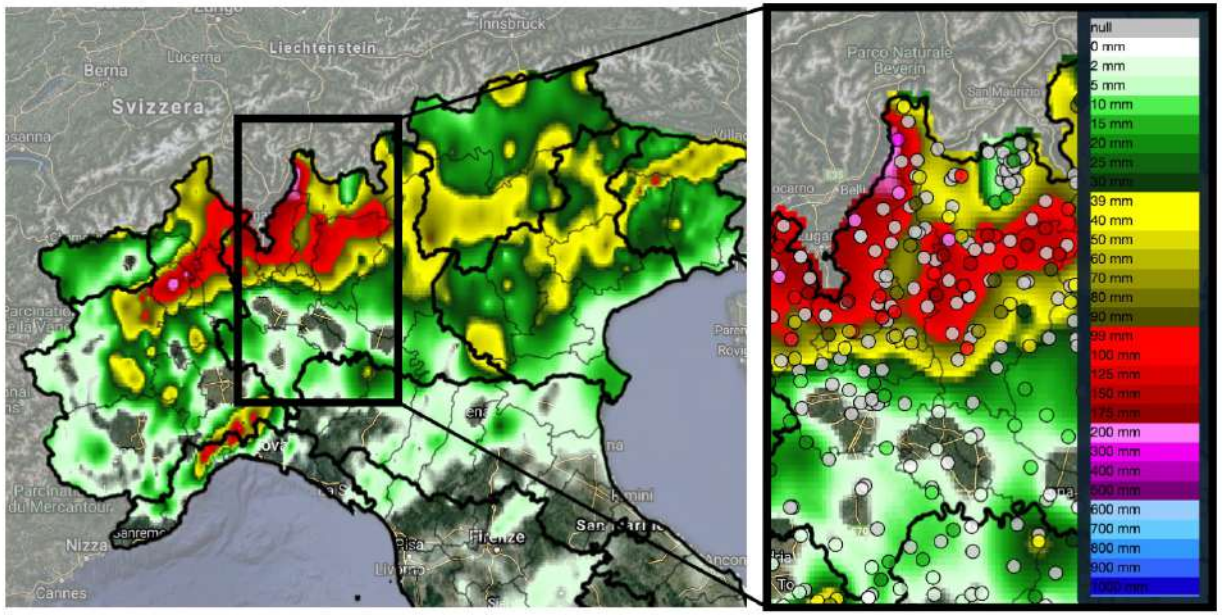
Over the last few years, there has been an **increase in severe weather events** that have a **significant impact** on population, structures, and infrastructure, causing damages and losses.

A comprehensive analysis of **the July 2021 event that occurred over Como Lake** (Italy) was performed, attempting to provide a **detailed analysis of the event using serveral observation sources** currently available.

Event description

Como Lake extreme weather event was used as **test study**.

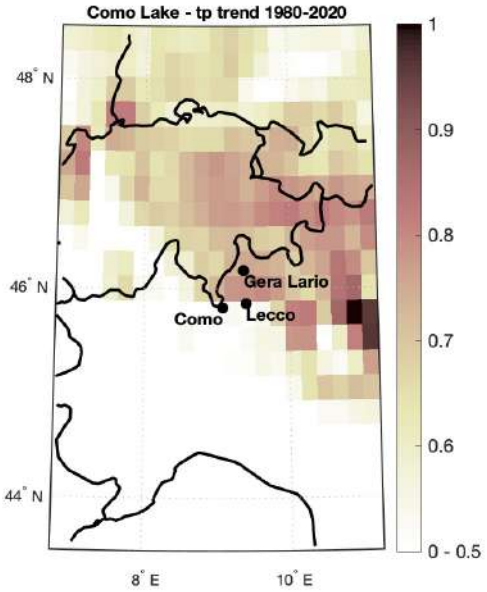


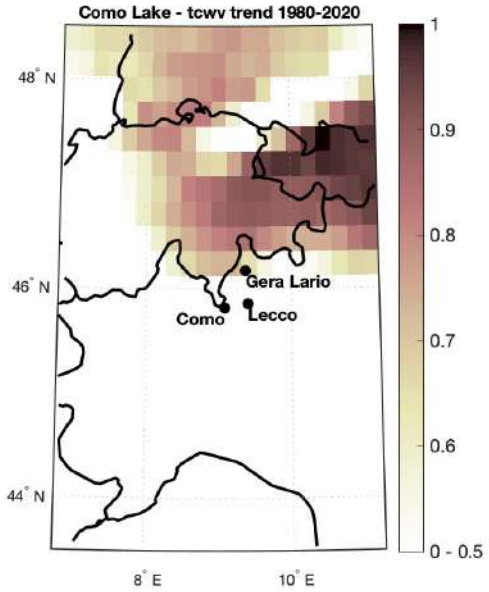


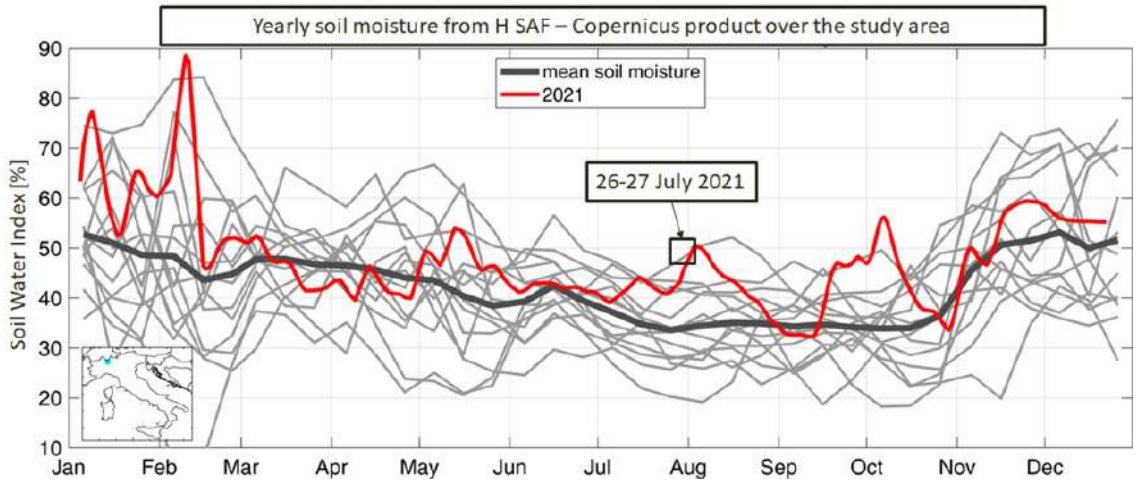
Particularly strong weather phenomena were recorded in the **period between 24 and 28 July 2021**, within Lombardy.

Climatology of the area and event exceptionality

An analysis on the **ERA5** dataset for the **period 1980-2020** showed **an increasing rate of threshold exceedences**, for both tp and tcwv parameters, **in the area affected by the studied event**.



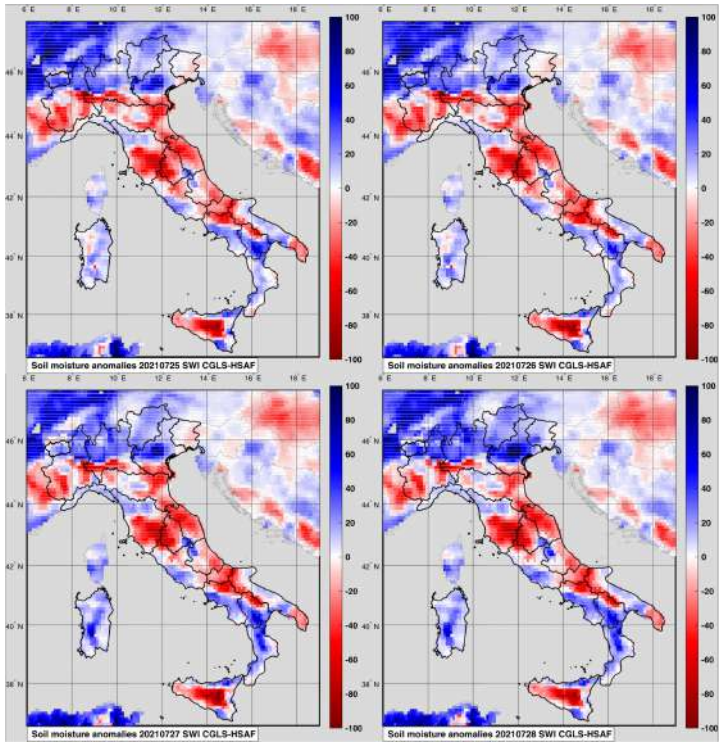


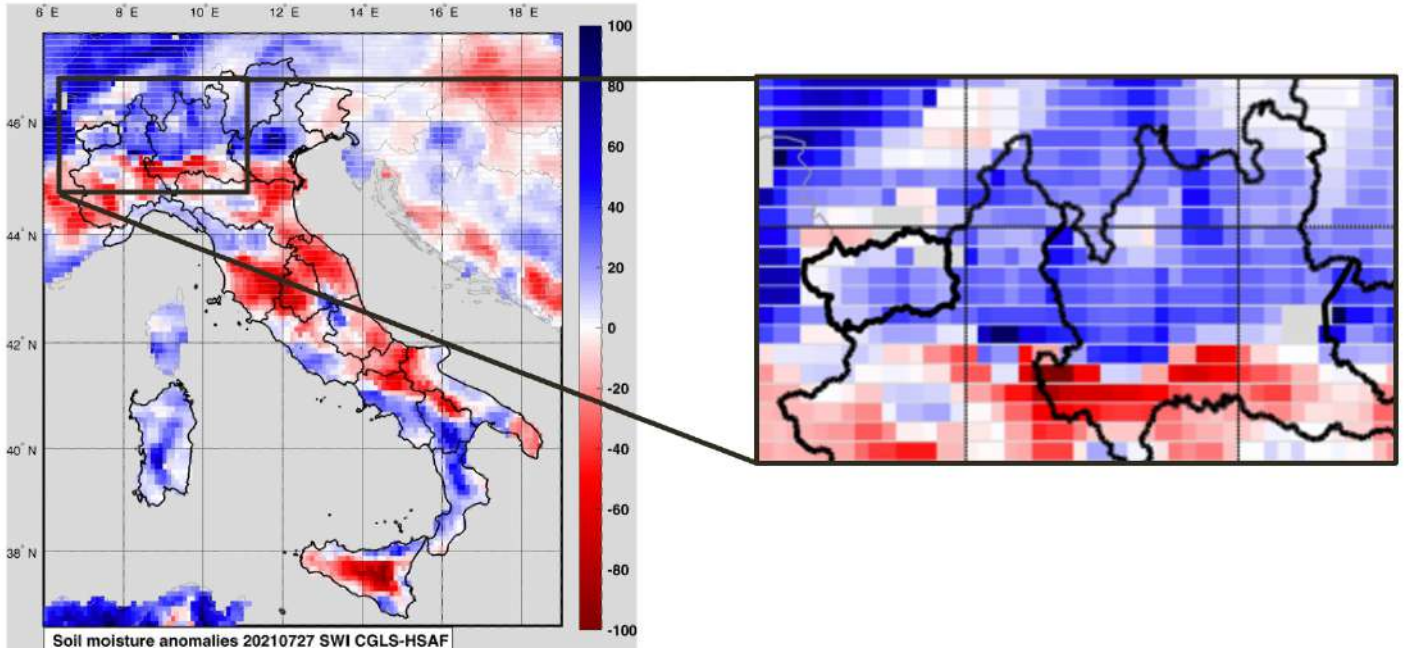


Climatology of satellite soil moisture in the area for the **period 2007-2020**, clearly indicating the **anomalous wet conditions** occurred **at the end of July 2021**.

Description of soil conditions

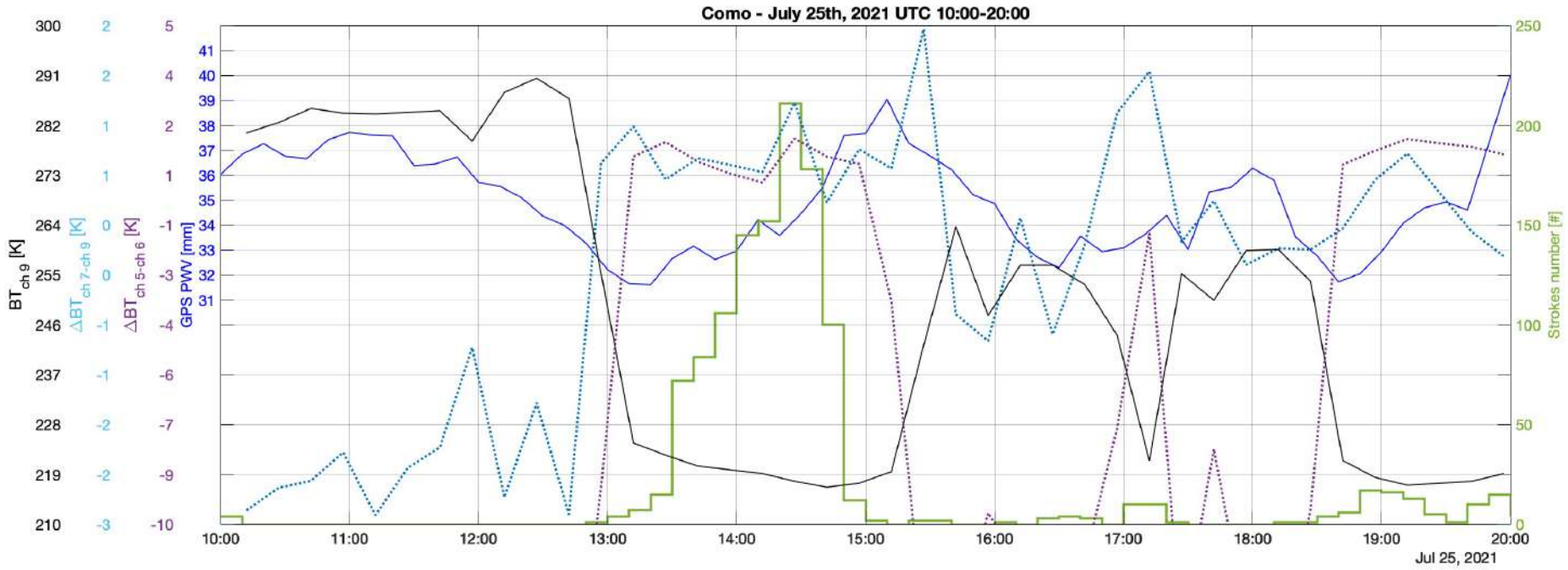
During the whole period (25th, 2021 - July 28t, 2021) the **soil moisture conditions** in the investigated area were **wetter than normal**, and in the days of July 27th and 28th very wet conditions are achieved (close to saturation).





Event analysis - Tropospheric condition analysis

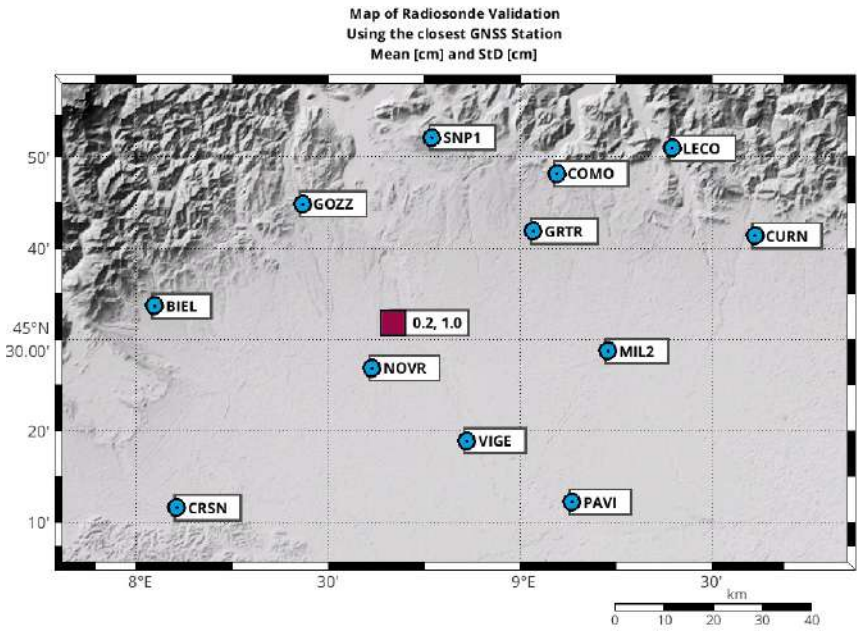
The water vapor trend analysis was performed focusing on the **most intense part of the event, between 10 a.m. and 8 p.m. on July 25, 2021**.
The data involved are: SEVIRI (Ch9, Ch5-Ch6, Ch7-Ch9), GPS and Lightning.

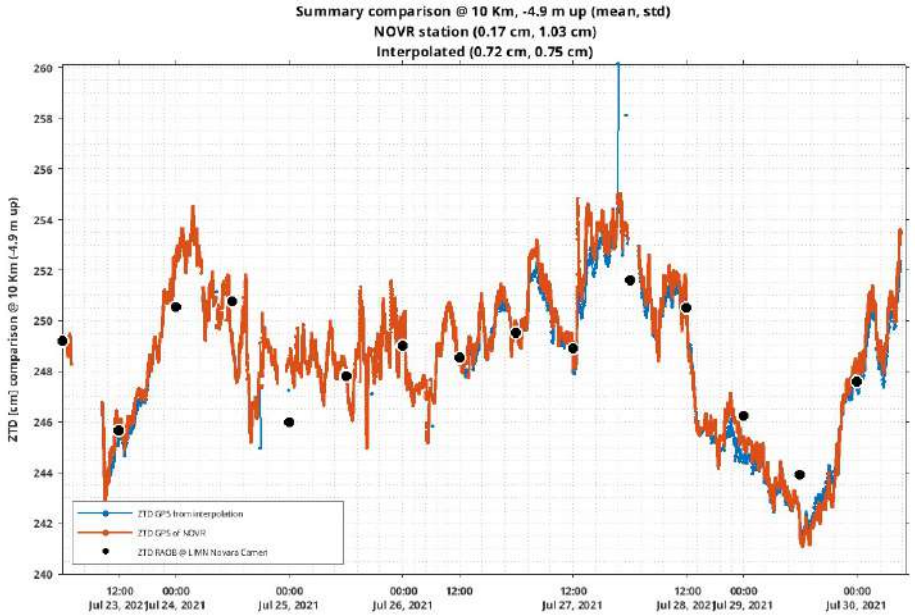


Event analysis - Tropospheric condition analysis

Short focus on GNSS-NRT

The area of interest is covered by **12 dual-frequency GNSS receivers** and, in order to demonstrate the validity of the data obtained from them, **validation was carried out by Radiosonde**, using a procedure already used in the past for post-processed data.

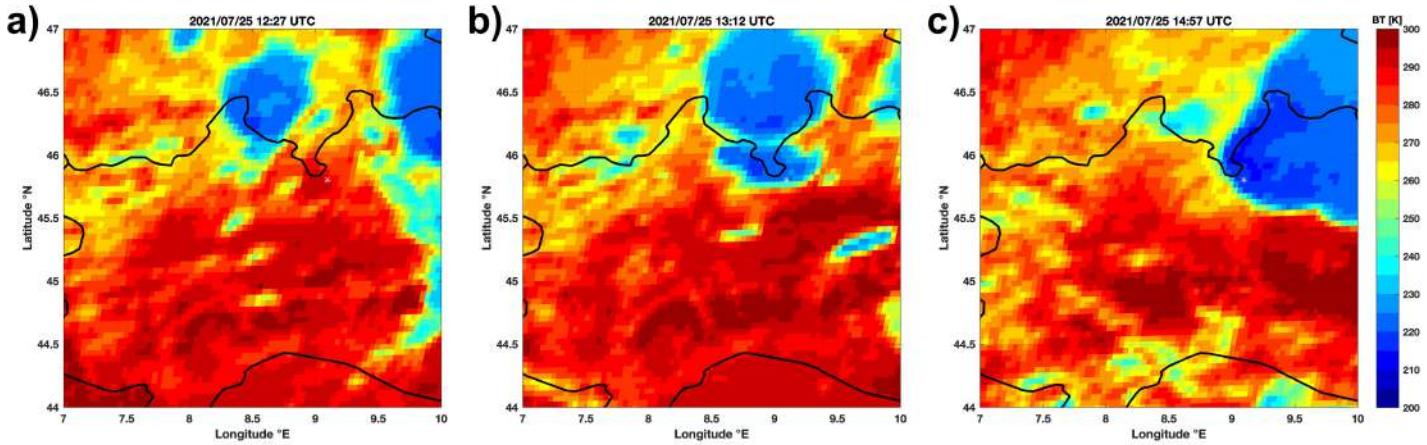




Event analysis - Tropospheric condition analysis

Short focus on Satellite-based Earth observation products

Data representing acquisitions in different channels from the SEVIRI sensor on board MSG cropped over the area of interest were used.

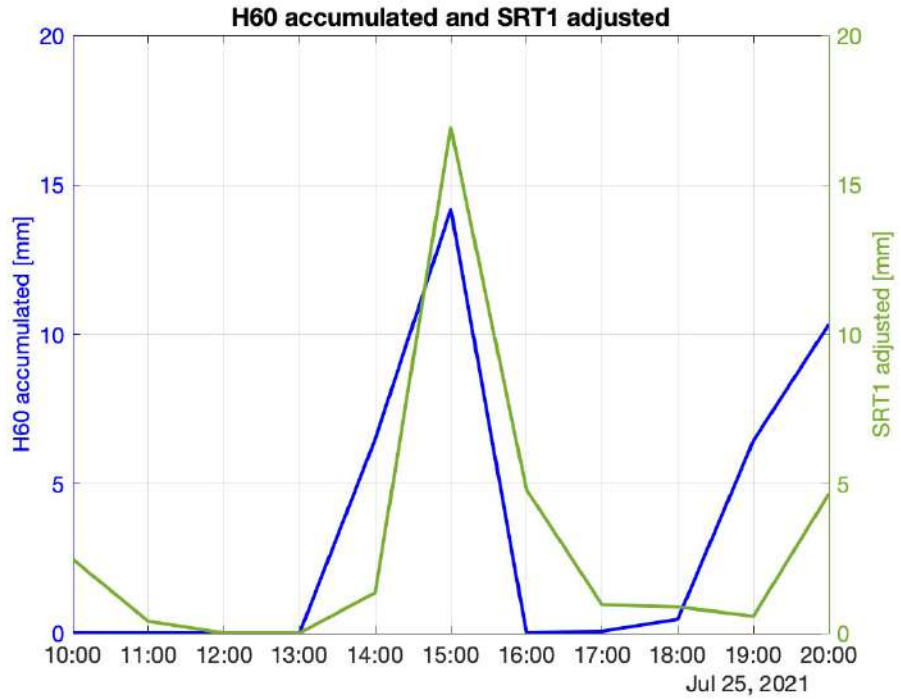


Short focus on Lightning data

Lightning data used in this paper are provided by the **Lightning Detection Network (LINET)**.
In this work, lightning data over the Italian territory are used, and **all discharges recorded in 1 second and in a 10km radius are considered as a single flash**.

Event analysis – Precipitation analysis

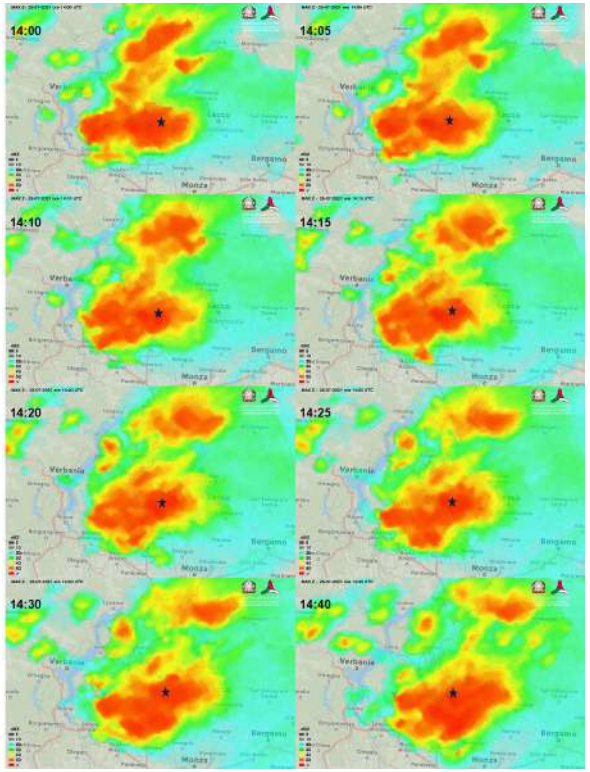
Comparison between **Precipitation rate at ground by GEO/IR supported by LEO/MW** (H60 product of H SAF) accumulated and hourly **cumulative precipitation of the National Radar Network** corrected by observed precipitation (SRT1 adjusted).

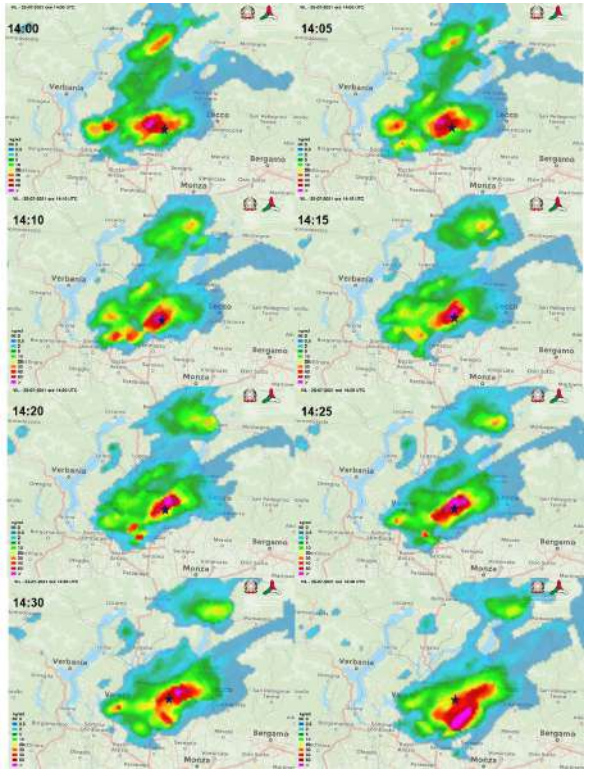


Event analysis – Precipitation analysis

Short focus on RADAR

Based on the observations provided by the **dual-polarization weather radar** sited in Turin, far by about 145 km from the storm core, **the most intense phase was observed between 14:00 and 15:00 UTC**.

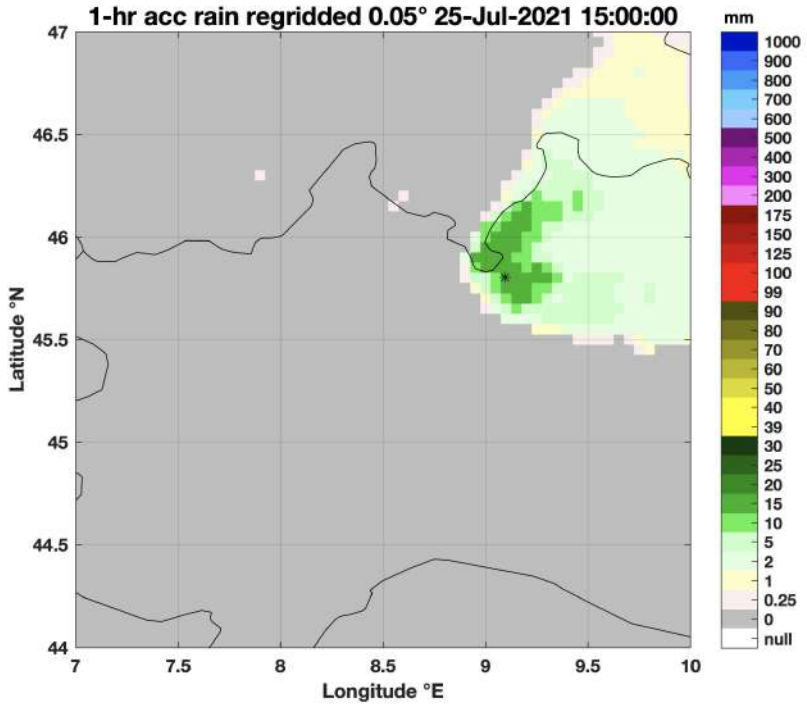




Event analysis – Precipitation analysis

Short focus on Precipitation rate at ground by GEO/IR supported by LEO/MW (H60)

P-IN-SEVIRI-PMW product is **based on infrared (IR) images** from the SEVIRI instrument on-board MSG satellites **blended with all the available Precipitation Micro-Wave estimates** (PMW).



Conclusions

- ✓ A comprehensive analysis of **the July 2021 event that occurred over Como Lake** (Italy) was performed
- ✓ The **most intense phase** was observed between **14:00 and 15:00 UTC on July 25, 2021**
- ✓ Both **conventional** and **innovative** approaches for hydro-meteorological analysis were employed:
  - Models [ERA5]
  - Atmospheric sounding
  - GPS
  - Rain gauges
  - Radar
  - Lightning detection network [LINET]
  - Satellite-based Earth observation products
- ✓ The event analysis is **still in progress** but **preliminary results show good agreement between** the different **techniques** and **appropriateness in the overall description** of the case study.

Thank you for your kind interest

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