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## **Flash flood event in South Sardinia on 26-27 October 2024: preliminary case study and historic comparison**

**Pier Luigi Trudu**, Lorenzo Smorlesi, and Alessandro Delitala

ARPAS (Regional Environment Protection Agency of Sardinia), Meteorological Department, Sassari, Italy  
(pltrudu@arpa.sardegna.it)

Between the late evening of October 26<sup>th</sup> and the morning of October 27<sup>th</sup> 2024, Sardinia was affected by intense and locally persistent thunderstorms that caused numerous critical issues across the territory, including flooding in residential areas, landslides, and the overflowing of small watercourses. The overall economic losses were estimated around 6.5M€.

During the night between the 26<sup>th</sup> to 27<sup>th</sup> October, a surface cold front approached Sardinia, and its eastward progression was decelerated by the blocking action of an anticyclonic ridge over the Balkans. This dynamic fostered the development of a low-level convergence line between the moist southeasterly flow entering the Gulf of Cagliari and drier air advected from the west. This convergence acted as the primary trigger for deep convection, and the persistent synoptic setup contributed to the quasi-stationary nature of the thunderstorms that subsequently formed over the Campidano plain.

The Decimomannu (Cagliari, CA) radiosounding at 00:00 UTC on October 27<sup>th</sup> revealed a highly moist and unstable atmospheric profile with Mixed-Layer Convective Available Potential Energy (MLCAPE) values exceeding 2000 J/kg, negligible Convective Inhibition, and a Level of Free Convection (LFC) below 400 m.

In the whole event excessive rainfalls were measured by two close rain gauges: i) Vallermosa: hourly cumulative rainfall up to 60 mm, with a total event accumulation of 292.0 mm, most of it in 6 hours (mean climatic values are of 54.4 mm for October and 555.8 mm annually); ii) Siliqua: total cumulative rainfall of 409.6 mm over 48 hours from October 26<sup>th</sup> to 27<sup>th</sup> (compared to mean climatic values: 539.9 mm annually; 57.8 mm in October).

The analyzed flood event shares similarities with other significant precipitation events that have occurred in Sardinia over the past century. Given the significant impact each such event has had on the territory, it is considered particularly hazardous and warrants further in-depth study. The Meteorological Department of ARPA Sardegna has initiated research activities to improve the prediction and prevention of this type of events.