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Flash flood event in South Sardinia on 26-27 October 2024:

preliminary case study and historic comparison

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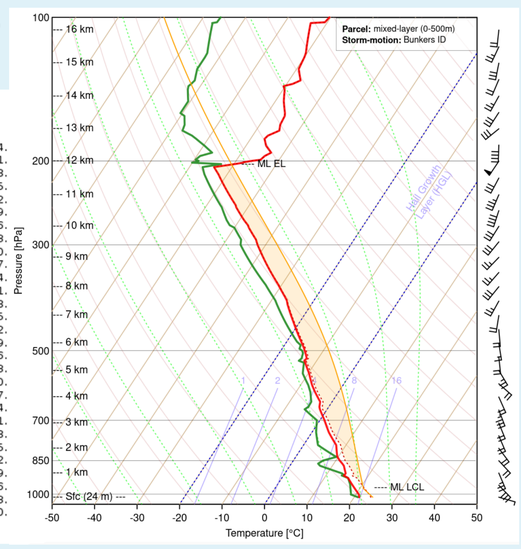
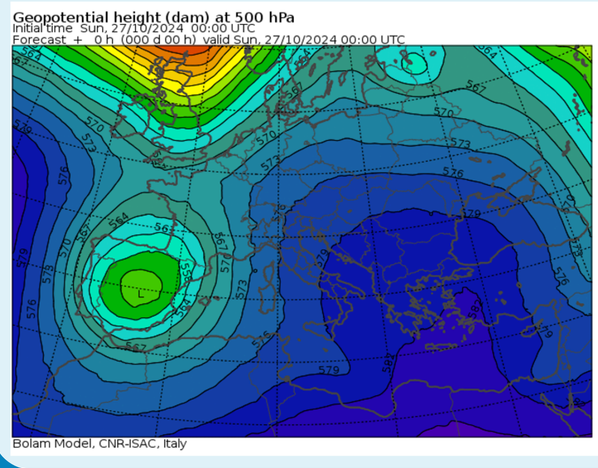
Introduction

Between the evening of October 26th and the morning of October 27th, 2024, Sardinia was affected by intense, locally persistent thunderstorms that caused numerous critical issues across the territory. These issues included flooding in residential areas, landslides, overflowing of small watercourses, and also a fatality. The overall economic losses were estimated at around 6.5 M€.

Synoptic

An upper-level trough over Spain favored SW humid fluxes toward Sardinia. Unstable air masses flowed ahead of a cold front over the Sardinian Sea, approaching the island on the night between October 26th and 27th. The trough was blocked from eastern evolution by a strong HP field in Eastern Europe.
A humid and unstable profile was observed on October 27th at 00:00 UTC, with MLCAPE > 2000 J/kg, PWAT of 38 mm, and bulk wind shear sfc-6 km of 9.3 m/s.



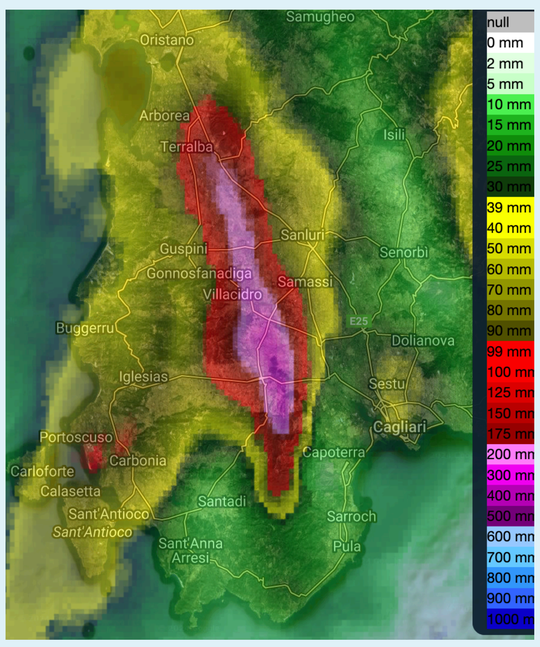


Observed surface data

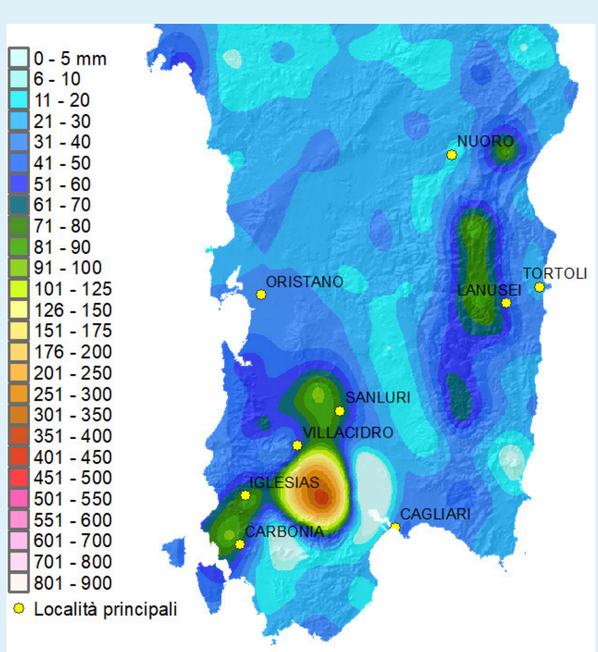
High precipitation rates, up to 80 mm/h, were measured on the night between October 26th and 27th. The persistence of precipitation led to high totals at the surface. Radar estimates indicated rates of about 50 mm/h and maximum cumulative totals of about 400 mm/6h in a 40 km by 10 km area in southwestern Sardinia

Max rain gauge cumulates were:

- **292 mm** (most of it in 6h) in Vallermosa - 6x Oct climate average;
- **410 mm** in Siliqua (7x Oct climate average)



Radar - R. Gauges merging



Rain Gauges only

Many thanks go to the Geo Department of ARPAS for the hydrological data and scientific support.

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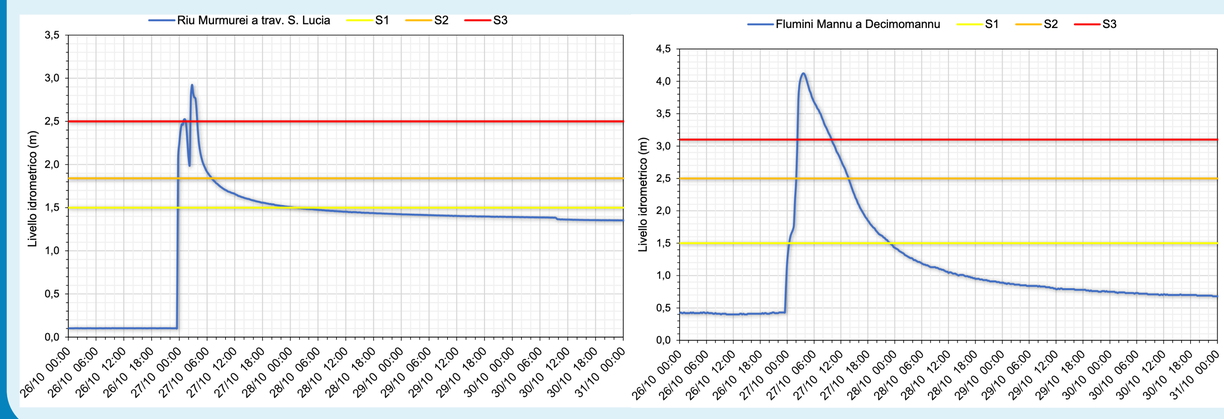
Effects on small watercourses

The high cumulative totals caused flood waves on small watercourses in SW Sardinia. The water levels exceeded the alarm threshold (S3) in 2 to 4h time intervals, leading to overflowing.



Historic comparison

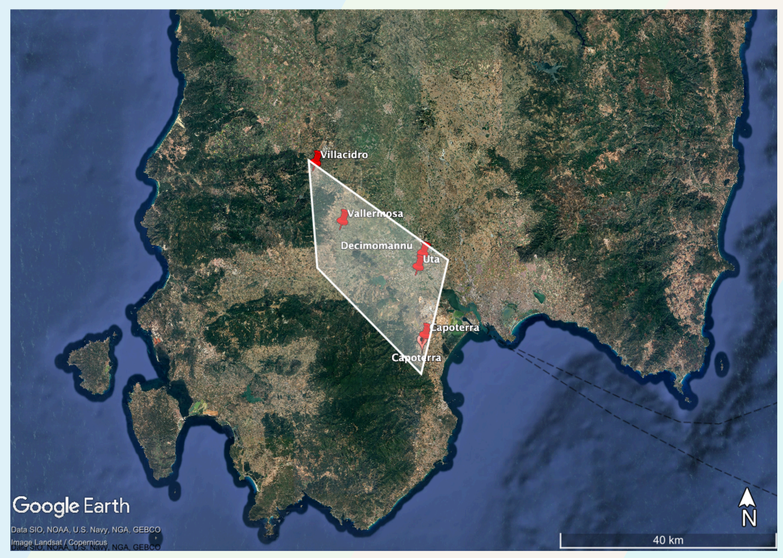
The analysed event shows analogies with other events occurred in Sardinia in the last hundred years. Main features are:

1. occurrence during **autumn**, mainly in October and November;
2. maximum precipitation cumulates observed W to the city of Cagliari due to severe and persistent convective precipitation fueled by **SE wet flows at the surface**;
3. minor precipitation cumulates in E Sardinia due to a **dominant E flow** in the late event phase.

The most recent events occurred in South Sardinia during the last 30 years were the following:

- November 13th, **1999** (max in Decimomannu: **293,2 mm/8h**);
- October 22nd, **2008** (max in Capoterra: **372 mm/5h**);
- October 10th, **2018** (max in Uta-Santa Lucia: **464,4 mm/24h**);

Three older events occurred in the same area in 1929, 1961 and 1983 with data collected mechanically from weather observers



Future Perspectives

Flash flooding events have become more frequent and hazardous in recent years, mainly due to the growing population and urbanization in southern Sardinia. The investigation of flash floods is one of the many activities of the Interreg Marittimo-IT FR-Maritime 21-27 project, PROTERINA4Future. A better understanding of these events is crucial for improving forecasting and alerting the population to reduce major damages and prevent fatalities. The MC Dep. of ARPAS is planning to run the last four case studies with WRF-ARW based on ERA5 reanalysis to investigate the main meteorological forcings, with the goal of improving operational forecast skills.