

## **Two damaging hydrogeological events in Calabria, September 2000 and November 2015. Comparative analysis of causes and effects**

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Each year, especially during winter season, some episode of intense rain affects Calabria, the southernmost Italian peninsular region, triggering flash floods and mass movements that cause damage and fatalities. This work presents a comparative analysis between two events that affected the southeast sector of the region, in 2000 and 2014, respectively.

The event occurred between 9th and 10th of September 2000 is known in Italy as Soverato event, after the name of the municipality where it reached the highest damage severity. In the Soverato area, more than 200 mm of rain that fell in 24 hours caused a disastrous flood that swept away a campsite at about 4 a.m., killing 13 people and hurting 45. Besides, the rain affected a larger area, causing damage in 89 (out of 409) municipalities of the region. Flooding was the most common process, which damaged housing and trading. Landslide mostly affected the road network, housing and cultivations.

The most recent event affected the same regional sector between 30th October and 2nd November 2015. The daily rain recorded at some of the rain gauges of the area almost reached 400 mm. Out of the 409 municipalities of Calabria, 109 suffered damage. The most frequent types of processes were both flash floods and landslides. The most heavily damaged element was the road network: the representative picture of the event is a railway bridge destroyed by the river flow. Housing was damaged too, and 486 people were temporarily evacuated from home. The event also caused a victim killed by a flood.

The event-centred study approach aims to highlight differences and similarities in both the causes and the effects of the two events that occurred at a temporal distance of 14 years. The comparative analysis focus on three main aspects: the intensity of triggering rain, the modifications of urbanised areas, and the evolution of emergency management.

The comparative analysis of rain is made by comparing the return period of both daily and cumulative rain. The modifications of urbanised sectors is obtained by comparing ISTAT (National Statistic Institute of Italy) data and google maps of the affected areas at the time of the occurrence of the events. The emergency management is analysed by comparing the types and extend of civil protection alerts diffused in the two studied cases.