

Floods, landslides and erosion from severe meteorological events in the Benevento Province, southern Italy.

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As effect of the ongoing climate change, heavy meteorological events are increasing in frequency all over the world. The Campania Region in southern Italy is among the areas mostly affected by severe rainstorms and is periodically hit by their effect like floods and landslides.

In October 2015, two intense rainfall events hit the central and southern regions of Italy but the most destructive effects occurred in the Benevento province (Campania region). The first storm, a self-healing V-shaped storm, began around at 7 p.m. of 14th October and stopped around at 3:00 a.m. of 15th October and was originated by the development of a cyclogenesis. The rain gages recorded a maximum cumulative value of 415.6 mm of rain in Paupisi (BN) and a strong increase in temperature; the maxima for the Benevento province was 24°C. The second storm began around at 12 a.m. of 19th October and stopped around at 7 p.m. of 20th October with a maximum cumulative value of 146.8 mm of rain in Colle Sannita(BN).

These storms triggered a set of different effects that devastated more than 60 municipalities of the Sannio Province and were responsible for two casualties, €00 million of damage to infrastructures (estimates from Campania region) and about € billion damages to agriculture (Italian farmer Confederation). The the Calore river of the Benevento province and some of its tributaries overflowed destroying the surrounding area; major damages were recorded in the industrial area of the Benevento town. In the central and in the eastern sectors of the Benevento Province characterized by the outcropping of flyschoid units, the heavy rain triggered shallow earth flows, debris flows induced by rilling and soil slides. Debris avalanches and runoff-initiated debris flows reshaped the creeks of the Taburno-Camposauro massif and damaged a lot of infrastructure of the surrounding area. Flood events from the Calore river in the Benevento district have significant historical precedents. The most important events recorded in the past are: 1) the flood of the 2nd of October, 1949, that caused 20 fatalities, and 2) the flooding of May 1729.

As first step of our study we reconstructed the spatial pattern and the temporal evolution of the storms affecting the Sannio area using the rainfall data recorded by the meteorological stations distributed across the Benevento Province. Subsequently we mapped all the effects to the landscape caused by the storms as: earth flows, soil slides, flooded area, runoff initiated debris flows and debris avalanches, debris flows initiated by rilling and soil erosion (using mainly Google earth images and field survey). We compered the location of these phenomena with the geological and topographic characteristics to understand likely controls in promote the triggering and the development of this unusual combination of different hazardous effects.