



Multiple effects of intense meteorological events in the Benevento Province, southern Italy

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In October 2015, two intense rainfall events hit the central and southern regions of Italy triggering a combination of different site effects, such as floods, landslides and soil erosion, that devastated about 68 municipalities of the Benevento province (Campania region), killed two peoples and caused millions of euro worth of damage to structures, infrastructures and agriculture. The town of Benevento was one of the sectors most affected by overflowing; many factories of its industrial were damaged or destroyed. Extensive areas characterized by the outcropping of flyschoid units, experienced widespread soil erosion and landslide occurrences. Destructive high-velocity debris flow occurred were the heavy rainfall had the higher intensity. A description of characteristics of rainfall events and related geomorphological processes was provided by (i) analyzing the spatial pattern and distribution of the two storms, using available rainfall data, and (ii) mapping all the storm effects, such as flooded area, landslide types and soil erosion. The site effects were related with spatial distribution of the storms and local geological and geomorphologic setting which controlled their initiation and triggering. Our analysis indicates that rainfall of 14th and 15th October 2015, could be considered as exceptional because of its intensity, cumulative amount and large spatial extent. Due to hilly morphology of catchment, a limited orographic effect took place, and rainfall was intense on a wide area; rainfall accumulated up 6-12 hours were very intense at two distinct rain gauges and reached the maximum deviation from the mean for 3 hourly rainfall. The exceptionality of the storm is also underlined by its effects on the slopes. Most of debris flows, flooding and erosional processes were triggered by the event of 14-15 October. The second event (18-19 October 2015) mostly amplified the effects of the first storm. Comparing the cumulative rainfall map of the first event with the hydrological effect distribution, a good agreement between the maxima amount of rain value and the location of runoff generated debris flows can be observed. Conversely, it seems that debris flows initiated by rilling and the accelerated soil erosion are mostly controlled by the geological nature of outcropping sequence and by land use.