

## **Combining meteorological and geomorphological expertise to provide better evidences of changes in rainfall precipitation extremes**

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Three extreme intensity precipitation events have been stricken the hilly and mountainous territory of Emilia-Romagna Region (Italy) in the last 4 years. Major effects on the ground were observed: i.e. debris flows, shallow landslides, flash floods and overbank flooding. Some of them (like debris flow) are considered unusual, on such large scale, for this region. Though a detailed meteorological and geomorphological analyses of the last and most devastating event, occurred in Val Trebbia and Nure in September 2015, we show the value of this multi-disciplinary analysis conducted in collaboration between the HydroMeteorological service of Emilia-Romagna (ARPAE-SIMC) and the Geological, Sismic and Soil service of the same region (SGSS) and Parma University. A large and stationary mesoscale convective system released more than 300 mm of rain, roughly, in 6 hours. During the first part of the storm, several rain gauges recorded rainfall peaks over 100 mm/hr. The storm caused more than 100 debris flows that were the main cause of damage on man-made structures.

A robust quantitative relation between precipitation intensity (estimated trough a combination of radar data and rain gouges) and comprehensive mapping of airborne and satellite imageries acquired by the Emergency Management Service (Copernicus), complemented by fieldwork of geologists, could be built from this event.

This accurate analysis, in a particularly rich data area, set an important reference point to search past events of similar amplitude, beyond the short chronological history of observation records of sub-daily precipitation intensity. We will describe in fact how we plan to gain further insights investigating in situ geological records to find analogous high intensity rain effects.