



## **Extreme rainfall events in karst environments: the case study of September 2014 in the Gargano area (southern Italy)**

Maria Elena Martinotti (1), Luca Pisano (1), Maria Trabace (2), Ivan Marchesini (1), Silvia Peruccacci (1), Mauro Rossi (1), Giuseppe Amoroso (2), Pierluigi Loiacono (2), Carmela Vennari (1), Giovanna Vessia (1,3), Mario Parise (1), and Maria Teresa Brunetti (1)

(1) Institute of Research for Hydrogeological Protection, National Research Council, Italy (m.parise@ba.irpi.cnr.it), (2) Servizio Protezione Civile, Regione Puglia, Bari, Italy, (3) Università "G. D'Annunzio", Chieti, Italy

In the first week of September 2014, the Gargano Promontory (Apulia, SE Italy) was hit by an extreme rainfall event that caused several landslides, floods and sinkholes. As a consequence of the floods, two people lost their lives and severe socio-economic damages were reported. The highest peaks of rainfall were recorded between September 3rd and 6th at the Cagnano Varano and San Marco in Lamis rain gauges with a maximum daily rainfall (over 230 mm) that is about 30% the mean annual rainfall.

The Gargano Promontory is characterized by complex orographic conditions, with the highest elevation of about 1000 m a.s.l. The geological setting consists of different types of carbonate deposits affected by intensive development of karst processes. The morphological and climatic settings of the area, associated with frequent extreme rainfall events can cause various types of geohazards (e.g., landslides, floods, sinkholes). A further element enhancing the natural predisposition of the area to the occurrence of landslides, floods and sinkholes is an intense human activity, characterized by an inappropriate land use and management.

In order to obtain consistent and reliable data on the effects produced by the storm, a systematic collection of information through field observations, a critical analysis of newspaper articles and web-news, and a co-operation with the Regional Civil Protection and local geologists started immediately after the event. The information collected has been organized in a database including the location, the occurrence time and the type of geohazard documented with photographs.

The September 2014 extreme rainfall event in the Gargano Promontory was also analyzed to validate the forecasts issued by the Italian national early-warning system for rainfall-induced landslides (SANF), developed by the Research Institute for Geo-Hydrological Protection (IRPI) for the Italian national Department for Civil Protection (DPC). SANF compares rainfall measurements and forecasts with empirical rainfall thresholds for the prediction of landslide occurrence. SANF forecasts were compared to the documented landslides and discussed.