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Regional debris flow susceptibility assessment using HRDEM: Example of the city area of Messina (Sicily, Italy).

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Shallow landslide and debris flows are among the most dangerous natural hazards triggered by extreme meteorological events. These phenomena have recently caused catastrophic scenarios in Italy (e.g. in Sarno-Quindici and Giampilieri) and, according to expected changes in the climate pattern, an increasing frequency of these phenomena is expected. The aim of this research is to assess the debris flow susceptibility in the Giampilieri area (Sicily) using a spatially-distributed debris flow runout model based on topographic information. The application of the model starts with the identification of the source areas from which debris flows are propagated on the basis of frictional laws and flow direction algorithms.

The area selected for this study is located in the Ionian sector of the Peloritanian area in Sicily, in the South part of Messina (Sicily) and includes the villages of Giampilieri, Briga Itala and Scaletta Zanclea. There, the 1^{st}October 2009 thousands of debris and mud flows were activated by a cumulative rainfall of about 160 mm in 6 hours, which followed two previous rainfalls events occurred on16^{th} September (76 mm in six hours) and 23^{rd} – 24^{th} September (190 mm in 10 hours).

Among the catchments hit by the 2009 event, the Giampilieri basin (10 km^2) has been chosen as sub area in order to set the algorithms for the spreading assessment and the friction parameters of the model. In this catchment, a complete inventory of the source areas and accumulation zone was created by photointerpretation of post event images. Moreover, volume and velocity estimations of the mobilized material have been carried out. The susceptibility was evaluated using the source areas of the 2009 event and its accuracy was estimated by the comparison of the results with the accumulation areas and the velocity and volume estimated.

In a second step we performed the analysis at the medium scale on the whole area hit by the 2009 event using the parameters calibrated on the Giampilieri basin. The presented approach of debris ?ow susceptibility analysis demonstrates that a simple assessment of the debris ?ow spreading calculated using defined source areas and calibrated on past events, provided good results for consequent hazard and risk studies.