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Post flash flood field investigations and analysis: the event of 22 November 2011 in the Longano catchment, Italy

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On 22 November 2011, an exceptional rainstorm hit the North-East part of Sicily (Italy) producing local heavy rainfall, mud-debris flow and flash flooding. The storm was concentrated on the Tyrrhenian Sea coast, near the city of Barcellona within the Longano catchment (26 km2). It started at 5.00 am and lasted for approximately 11 hours, with a return period greater than 100 years yet for 2 hours duration and greater than 300 years yet for 3 hours'. The aim of this work is to investigate the flood response in order to document the rainfall and flood properties and to analyze the characteristics of the event water balance.
Fine resolution distributed rainfall estimates were obtained by combining observations from the Monte Lauro Doppler C-band weather radar, satellite data and the raingauge network. Satellite data were used to correct for the severe beam blocking due to the effect of orography on the radar beam propagation. A detailed study of the hydrological response of the catchment was performed by means of a rainfall-runoff modeling and flood frequency analysis. To ensure model simulation accuracy, the model results were compared with peak discharges obtained from post flood field estimates based on high water marks and cross section surveying. Peak flood timing from the model were contrasted with data gathered from witnesses interviews and video recordings. The estimated flood peak discharge of the Longano river in the city of Barcellona is around 230 m3/s, indicating a very intense response which is in the range of the extreme events for similar size catchments in Sicily. Flood inundation and propagation in the city were modeled using a 2D hydraulic model based on De Saint Venant equations previously calibrated using the observations concerning water depths and flow velocities. A geomorphological survey was also conducted to document erosion and sedimentation processes associated to the extreme flood.