



## Warning system for hydrogeological hazards in Campania (Southern Italy)

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Campania is the Italian region with the highest population density (419 inhabitants/km<sup>2</sup>). Almost 20% of its territory (13669 km<sup>2</sup>) is affected by significant hydrogeological hazards, with related loss scenarios in almost 12% of it. The most critical hydrogeological hazard scenarios are those triggered by extreme rainfall events with duration ranging from a few tens of minutes up 72 hours: flood loss scenarios are expected in catchments with spatial extent from a few Km<sup>2</sup> up to 5000 km<sup>2</sup>; shallow landslides and mudflows are also triggered by rainfall events within a broad range of time scales.

This study presents a warning system for hydrogeological hazards, which has been operating in Campania since 2005, designed for mitigating losses due to extreme rainfall events.

The warning system is structured into two stages: the meteorological forecasting stage and the hydrological monitoring stage.

In the first stage, after evaluating rainfall forecasts provided by numerical weather prediction models (with a forecasting time up to 48 hours), warning messages are issued to the local municipalities grouped in 8 warning zones. Critical rainfall events are identified by three different alert levels, according to their forecasted spatial and temporal extents, each corresponding to a category of expected hazard scenarios at regional level.

During the second stage, the dynamic evolution of the hydrological events is monitored by a real-time network of river stage and rain gauges, which are employed to compute one or more precursors for each loss scenario. Loss scenarios have been classified according to the temporal and spatial scales of the corresponding precursors, in order to deal with the difficulties related to the occurrence of significantly different hazard scenarios during the same rainfall event. Three threshold values have been identified for each precursor, corresponding to given hazard and alert levels. As a precursor exceeds a threshold value, warning messages are issued to local municipalities whose territory might be affected by the corresponding loss scenario.