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Test and calibration of rainfall thresholds for use in a regional civil defense emergency management system

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With regard to the evaluation of hydrogeological risk in Italy, the Italian Civil Defence Emergency Management System has a national hydrometeorological alert office (called Chief Functional Center) and a network of 21 Regional Centers (Decentrate Functional Centers, CFD) whose main purpose is the monitoring and evaluation of critical hydraulic and hydrogeological events, mainly caused by heavy rainfall. The national alert procedure, in use at the CFD in Umbria , is based on a 3-level scale, and the main instrument for the choice of landslide hazard level is the rainfall thresholds, as heavy rainfall is the most important factor in the triggering of landslides. The current thresholds have been established by a wide rainfall dataset for a large area of Central Italy; up to now they have been seen to work well with regard to the hydraulic risk, but in order to cope with the hydrogeological risk we need more investigation. Therefore a statistical and comparative study between the rainfall thresholds and the landslide datasets occurring in past rainfall events was performed, in order to measure their performance in terms of false and missed alarms; the main goal of this goal was to try to tune the thresholds to the complex and varying geomorphologic conditions in Umbria. In fact subsequent compressive and extensional tectonic phases produced in this area chains, lakes, intermontane valleys and river grabens, with complex lithostratigraphy. Moreover, due to its importance in the triggering of landslides, a method to evaluate moisture content in soil was implemented. About 20 temporal windows (5-10days wide), apparent (in terms of events recorded with several landslides) in the historical landslide datasets available from 1991 to 2001 were analyzed, plus a severe hydrometeorological event which occurred in December 2008. IDW spatial estimate of cumulative rainfall, moisture content, and local rainfall threshold for every landslide site, using the data from the regional real time hydrometeorological network operating since 1982, was performed. The results of this statistical and comparative analysis are shown, together with details of the real-time system that is to be implemented for the estimation of critical rainfall levels used in the alert system, supported by soil moisture probes and a double-polarization meteorological radar of new generation that will be used to calibrate rainfall thresholds also with areal data.