

The empirical model SMART - Shallow landslides Movements Announced through Rainfall Thresholds

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The Arpa Piemonte Regional Warning System Service is based on an advanced meteorological and hydrological automatic monitoring system and it is integrated with forecasting activities of severe weather related natural hazards. At present, a hydro-meteorological chain is operationally run to provide flood forecasting on the main river network. The development of a forecasting tool for shallow landslides triggered by heavy rainfall is here presented. Due to the difficulties in modelling shallow landslides triggered in a large and complex area like Piemonte region, an empirical model is developed on the basis of the correlation between rainfall and landslide movements in historical information. The research focused on establishing rainfall thresholds for landslides triggered, differentiating the critical rainfall values through an 'a priori' geological characterisation of the different territories. The rainfall events responsible for widespread shallow landslide movements that involved the Piemonte region in a period between 1990 and 2004 are considered. A total number of 20 rainfall events and 200 landslides with precise information about triggering time are used to calibrate the system. As a first outcome, two different zones have been identified: 1) includes zones that require higher values of critical rainfall and are principally characterized by a bedrock composed of metamorphic rocks, igneous rocks, dolostones or limestones in alpine environment; 2) includes zones that require lower values of critical rainfall and are principally characterized by sedimentary bedrock in hilly environment. Verification has been performed on the whole 15 years rainfall data set. The results show a good reliability of the model with no missed alarms and a very little number of false alarms, thus suggesting an effective operational implementation.