



MONSTER: a landslide prediction model for the Arno river basin, Italy

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Monster (acronym of MONitoraggio della Stabilità dei versanti in TEmpo Reale, Real Time Monitoring of Slope Stability) is a joint project between the Arno River Basin Authority and the Earth Sciences Department of the University of Florence. The project objective is to create a landslide prediction model for the whole Arno basin, to be used as an alert system.

A bi-modal approach - hydrological modelling and statistical analysis - is followed to find hydrological thresholds for landslides. Research strategy can be explained as follows:

- selection of some catchments (about 100 km² each) as test areas and data collection on landslide, rainfall and flow time series;
- establishment of a certain number of Unique Condition Units (UCU);
- hydrological characterisation of test catchments and related UCUs;
- hydrological modelling of two series of rainfall events: with or without consequent landslide;
- statistical analysis of the two series of hydrological data, to calculate thresholds for each UCU.

Bisenzio, Era and Pesa basins are the model test areas and a large archive work was carried out to get temporal data-bases on landslides, as suitable time series are necessary to perform statistical analyses. Rainfall, flow and geological data were also collected.

Hydrological characterisation of test areas is performed by mean of Curve Number method. A CN is assigned to the whole test basin by comparing runoff data against the results provided by the hydrograph separation digital recursive filter. Different CN values are calculated for three classes of antecedent moisture condition, evaluated by

an Antecedent Precipitation Index (API). UCUs' CN values are obtained from the comprehensive basin CN, on the base of different soils characteristics (land use and hydro-geological group).

For each UCU, two groups of major hydrological events are then analysed: rainfall events originating landslides and events not originating landslides. The CN method is used to calculate water retention values from rainfall inputs. Retention is assumed, in fact, as the most important factor related to the pore pressure increase causing slope instability.

Statistical analysis of retention data related to landslides or not could supply threshold values useful to predict dangerous conditions.