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Forecasting of landslides induced by rainfall - F.La.I.R. hydrological model application on Piemonte Region (NW Italy)

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Landslides induced by rainfall could be foreseen modelling the relationship existing between rainfalls and landslides. The *FLaIR Hydrological Model* (*Sirangelo & Versace,1992*) allows the forecast through the joined employing of two modules: *RL* (Rainfall-Landslide) and *RF* (Rainfall-Forecasting). The first module identifies the relationship between rainfalls and landslides identifying a mobility function $Y(t)$, obtained through the convolution of infiltrated rainfalls and a transfer function $\psi(t)$. The second module analyses stochastic models of precipitation for rainfall forecasting. The model, applicable to a landslide with multiple activity or homogenous areas subject to a single activity phenomena, does not analyze the hydrogeological and geotechnical aspects, but it works on the empirical relations between rainfall and landslide movements, indirectly considering the water amount infiltrated in the ground before the trigger and the landslide typology. Defined the mobility function it's possible to identify critical values which overcoming indicates the probability of movement. As a result of the necessity to improve the *Piemonte Warning System* and to realize a forewarning system for landslide triggered by rainfall, this model has been applied to landslides occurred in the *Piemonte* territory, tanks to a collaboration plan between the *Arpa Piemonte* and the *Soil Department of the University of Calabria*. It aims to predict the landslide movements based on the recorded or forecasted rainfall levels. The *FLaIR* has been applied to two sample areas of *Piemonte* in which there are very different landslide types, but both connected to rainfall events: the *Lanzo Valley* (Graie Alps) for the rapid earth-debris flows and the *Langa Hills* (South *Piemonte*) for the translational slides. The study has carried to the realization of an operative software, called *MoniFLaIR*, for real time screening of slopes hazard monitoring and

forecasting.