



## **Hydrological models for early warning of landslides induced by rainfall**

Davide Luciano De Luca, Giovanna Capparelli, Pasquale Versace, and Daniela Biondi  
Università della Calabria, Dipartimento di Difesa del Suolo, Cosenza, Italy (davidedeluca@libero.it)

Landslide risk reduction is a societal pressing need in for counties; monitoring, prediction, early warning system are the most economical landslide risk reduction measures which are applicable for developed countries and also developing countries. Rainfall is accepted as a major factor in many types of slope movement, including rapid, shallow soil slips and, episodically, deeper landslides. To prevent injury to humans, developing useful early warning system, we must be able to identify the relationships existing between rainfall and landslides and determine rainfall thresholds, i.e. critical rainfall conditions beyond which there is a high probability of landslide occurrence. Rainfall thresholds can be defined on an empirical or a physical basis.

The empirical thresholds are defined by simple relationships which are easily obtained by using the hydrological models which analyse the rainfall which triggered a landslide; the physically-based thresholds are identified by complete models that take into account specific site conditions, mechanical hydraulic and physical properties of soils, local seepage conditions and their contribution to soil strength. This paper analyses both methodologies, discussing an application both of an hydrological and a complete model.