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Improved knowledge of landslide hazard

"Safeland" is the acronym of the 3-year FP7 European collaborative project "Living with landslide risk in Europe: assessment, effects of global change, and risk management strategies," funded by the European Community.

Coordinated by the Stiftelsen Norges Geotekniskeinstitutt, the project started in May, 2009 and involved 25 research teams from 13 countries. It was articulated into the following research areas:

Area 1: Improved knowledge of landslide hazard (triggering and run-out models)
Area 2: Quantitative risk assessment
Area 3: Global change scenarios and their impact on landslide hazard and risk patterns
Area 4: Monitoring technology development for prediction of behavior of sample sites
Area 5: Risk management

All reports delivered within the five research areas can be found at the site www.safeland.fp7.eu.

The basic goals of Area 1, coordinated by AMRA, Napoli, were the identification of landslide mechanisms and triggers, with a special focus on weather-induced landslides and the development of models for quantitative risk analysis. Some ideas and results born from the activity carried out by teams working in this area are reported in the five papers included in this special issue.

The first paper, "Description of soils based on geomechanical criteria for improved landslide classification" by Rocchi et al., focuses on the strict relationship existing between some mechanical soil features (such as void ratio and structure) and landslide triggering and evolution. This relationship is demonstrated through some numerical examples. According to the authors, key soil features should be accounted for and possibly integrated into landslide classification criteria for more efficient and rational landslide modeling.

The paper "Chasing a complete understanding of the triggering mechanisms of a large rapidly evolving rockslide" by Crosta et al. describes an active rockslide in the Alpine environment, whose evolution, governed by snowmelting and precipitation, possesses severe problems to the integrity of elements at risk. Based on a wide investigation campaign, a kinematic landslide analysis was carried out using a simple 1-D viscoplastic model. Data calibration enables assessment of the landslide behavior and prediction of its future evolution.

Based on a rich database, including results of laboratory tests and of field monitoring, the paper "Seasonal effects of rainfall on the shallow pyroclastic deposits of the Campania region (southern Italy)" by Cascini et al. examines the role of the main factors that govern the stability of slopes in unsaturated pyroclastic soils. A careful data analysis highlights the dependence of landslide style and mechanisms on seasonal weather conditions.

The paper "A simulation chain for early prediction of rainfall-induced landslides" by Olivares et al. describes a new procedure for timely forecasting of landslides in unsaturated soils triggered by extreme rainfalls. The procedure is based on a simulation chain that couples precipitation forecasts, at a regional scale, 24 h in advance, with a hydro-mechanical code for infiltration and slope stability analysis. A statistical downscaling interface module brings the data provided by the first module to a basin/slope scale. An example shows the applicability of the procedure for civil protection.

The last paper, "Application of a SPH depth-integrated model to landslide run-out analysis" by Pastor et al. deals with the fundamental problem of quantitative risk analyses, i.e., the assessment of the kinematic landslide features and run-out. This problem is often disregarded due to difficulties in implementing reliable and easy-to-use mathematical models. To this aim, the authors illustrate the smoothed particle hydrodynamics (SPH) model, presenting some useful examples.

As mentioned, the papers included in this issue do not cover the entire activity carried out in Area 1 of the project, but represent a significant sampling of the useful advances made by some of the coordinated teams around a topic relevant to the European community.

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