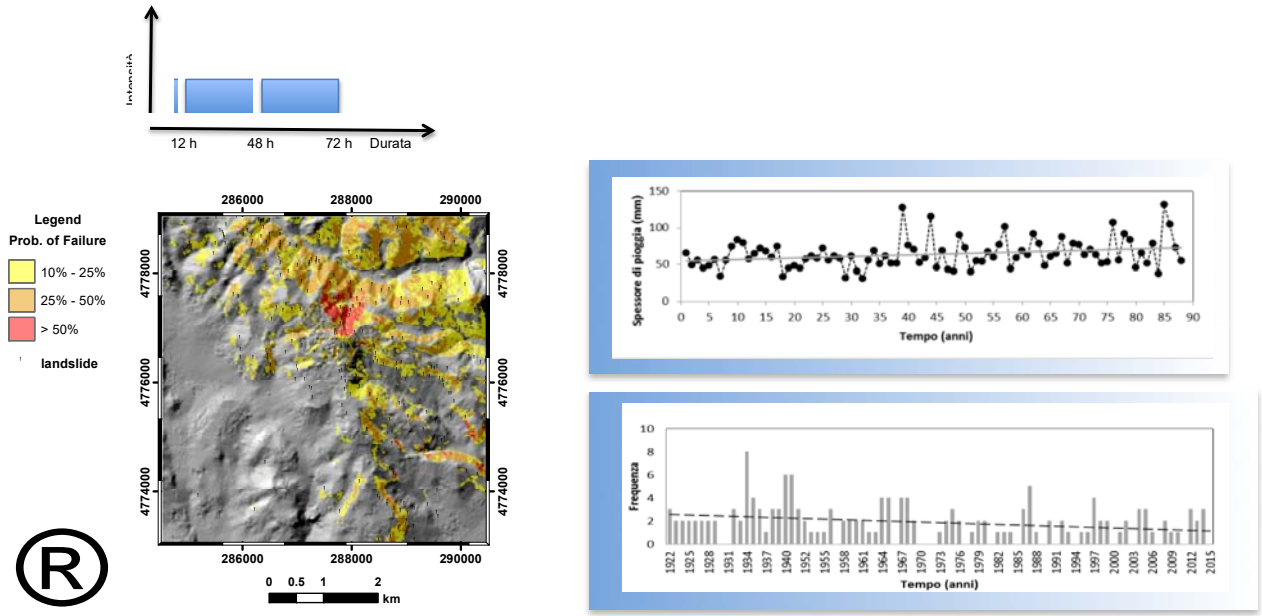
Seminar 2 - PHYSICALLY-BASED MODEL FOR RAINFALL-INDUCED LANDSLIDE PREDICTION OVER LARGE AREAS, IN A CHANGING CLIMATE



Summary.

Prediction of rainfall-induced landslide occurrence over large areas has constituted a great challenge in the last decades. Different approaches have been adopted to include in the forecasts both the geometric, mechanical and climatic factors that affect the triggering phase of the process. A quite promising one is based on the probabilistic physically–based model implemented in the code PG_TRIGRS, which takes into account the uncertainty in soil spatial variability and characterization. This is an extension of the original TRIGRS code that combines a 1–D hydrologic model with a simple slope stability computation to assess the probability of slope failure over a large area.

In a changing climate, assessing the effects that the variation of the expected rainfalls can cause to the natural environment and slope stability is of primary importance. Following the 5th Report of the IPCC, precipitations in Europe are expected to increase, and, in particular, there will be more events characterized by extreme rainfalls, which legitimates the possibility of an increase in landslide events.

Physically-based approaches to face the issue in a rational way combine the following steps:

1) *Generation of different scenarios of expected rainfalls*. Downscaled rainfall time series provided by Regional Circulation Models (RCMs) are created and weather generators are used for obtaining hourly rainfall time series. For each RCM, different time horizons can be considered.
2) *Application of the Kriging geostatistical technique*. This is used to assess the spatially distributed soil properties for the study areas, starting from measurements at known locations. Kriging is also used to define the synthetic indicators of the Probability Distribution Functions (PDFs) for the selected random variables (for example: cohesion c', friction angle φ', permeability k_s).
3) Application of the Point Estimate Method (PEM). This method can be adopted to evaluate the Probability of Failure (PoF) within the study area, where PoF is defined as the probability that the Factor of Safety (Fs) is less or equal than 1.

Although many uncertainties in the analyses of the climatic trends and in their related effects at the ground still exist, the presented approach shows that the current available physically based method can be used to support quantitative projections of the expected impacts.