Geophysical Research Abstracts
Vol. 19, EGU2017-9459, 2017
EGU General Assembly 2017

Assessing potential modifications of landslide triggering probability based on hydromechanical modelling and regional climate model projections

David Johnny Peres and Antonino Cancelliere
University of Catania, Department of Civil Engineering and Architecture, Catania, Italy (djperes@dica.unict.it)

Climate change related to uncontrolled greenhouse gas emissions is expected to modify climate characteristics in a harmful way, increasing the frequency of many precipitation-triggered natural hazards, landslides included.

In our study we analyse regional climate model (RCM) projections with the aim of assessing the potential future modifications of rainfall event characteristics linked to shallow landslide triggering, such as: event duration, total depth, and inter-arrival time. Factor of changes of the mean and the variance of these rainfall-event characteristics are exploited to adjust a stochastic rainfall generator aimed at simulating precipitation series likely to occur in the future. Then Monte Carlo simulations – where the stochastic rainfall generator and a physically based hydromechanical model are coupled – are carried out to estimate the probability of landslide triggering for future time horizons, and its changes respect to the current climate conditions.

The proposed methodology is applied to the Peloritani region in Sicily, Italy, an area that in the past two decades has experienced several catastrophic shallow and rapidly moving landslide events. Different RCM simulations from the Coordinated regional Climate Downscaling Experiment (CORDEX) initiative are considered in the application, as well as two different emission scenarios, known as Representative Concentration Pathways: intermediate (RCP 4.5) and high-emissions (RCP 8.5).

The estimated rainfall event characteristics modifications differ significantly both in magnitude and in direction (increase/decrease) from one model to another. RCMs are concordant only in predicting an increase of the mean of inter-event dry intervals. The variance of rainfall depth exhibits maximum changes (increase or decrease depending on the RCM), and it is the characteristic to which landslide triggering seems to be more sensitive. Some RCMs indicate significant variations of landslide probability due to climate change (up to a factor of 10), while for other climate models variations are small. The variability of the indications resulting from different RCMs is a sign of the significant degree of uncertainty involved in climate change impact assessments for landslides.