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# A satellite-based distributed model for landslide risk assessment

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Landslides are one of the most dangerous natural hazards, causing every year fatalities, considerable damage and relevant economic losses. Early warning systems (EWS) for rainfall-induced landslides represent an useful tool for mitigating the impact of such hazard. Traditionally, EWS are based on physically-based models or on empirical relationships between rainfall (or sometimes other hydrological variables, i.e. soil moisture) and landslide occurrence. Notwithstanding the differences in the two kind of models, both approaches need very high quality rainfall data to assess landslide hazard. Usually, these data are obtained through a ground monitoring network, not always sufficiently dense. A way to overcome this issue is to use real time satellite-based products. Despite their increased accuracy and their relatively high spatial/temporal resolution, the use of such data are still poor. In this study a physically-based coupled hydrological-slope stability model is driven with observed and satellite-based rainfall data in order to evaluate the capabilities of remotely sensed variables to be used as input for hydrological and geotechnical applications over a study area in Central Italy. Specifically, the model estimates Factor of Safety (FS) over the study area by taking the soil saturation conditions into account. The Tropical Rainfall Measurement Mission (TRMM) Multi-satellite Precipitation Analysis (TMPA) real time product 3B42RT is used to simulate soil moisture conditions over the study area. The stability module is then driven with the simulated soil moisture. On the other hand, the ASCAT soil moisture product is used to assess the quality of the simulated soil saturation conditions. Results show good agreement between the simulated soil moisture patterns, despite the differences in spatial/temporal resolution. A limited number of landslide events occurred within the area is used to evaluate the capabilities of the model to identify unstable conditions. The use of satellite rainfall products to the model provided very promising results, both in terms of soil moisture simulation and landslide identification. The obtained results will increase encourage the use of remotely sensed variables for landslide risk assessment over larger areas.