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# Evaluation of debris flow susceptibility by means of a transferability procedure: a study case in Messina area

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Debris flows can be described as rapid mass movements, gravity induced able to transport large quantities of material downslope. This type of landslides is strongly controlled by the topography and usually occur in region characterized by steep slopes and at least seasonal heavy rainfall.
One of the problem when dealing with debris flow susceptible areas is that the eroded surface is usually very shallow and it can be masked by the vegetation already few years after a landslide event. Therefore, debris flow prone areas very often suffer from lack of reliable landslide inventories necessary to calibrate and validate susceptibility models. In order to deal with this problem, transferability procedure (spatial partition) have already proved to be efficient in areas which show analogous topographic, lithological and climatic characteristics.
A procedure to evaluate whether it is possible to apply model transferability is here proposed. This approach is based on the assumption that debris flow trigger in different locations under similar topographic conditions and includes: i) a test of similarity between training and test areas aimed at identifying thresholds in catchment similarity which allow to successfully perform the transferability; ii) the calibration of the susceptibility model in the training area; iii) the validation of the model on the test area. The debris flow susceptibility is here evaluated using a stochastic approach and the all procedure is implemented in a R script which can be easily used to test the procedure in other catchments.
The study areas chosen to perform this study are located in the Messina province (southern Italy) respectively on the Ionian sector (Itala catchment) and on the Tyrrhenian sector (Saponara catchment). Itala catchment was hit by the sadly known debris flow event of the 1st October 2009 (37 fatalities and huge damages) while Saponara catchment on the 22nd November 2011 (only two years after the 2009 event) experienced a very similar situation which caused 3 fatalities.
The results show that even in areas showing different lithological characteristics, it is possible to select a number of similar spatial variables which optimize the results of transferability procedures and, although a transferred model cannot be used as single information on debris flow prediction, it can be very useful for planning purposes and risk assessment when a historical landslide database is unavailable.