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Evaluating performances of simplified physically based landslide susceptibility models.

Giovanna Capparelli, Giuseppe Formetta, and Pasquale Versace
University of Calabria, Rende, Italy (giovanna.capparelli@unical.it)

Rainfall induced shallow landslides cause significant damages involving loss of life and properties. Prediction of shallow landslides susceptible locations is a complex task that involves many disciplines: hydrology, geotechnical science, geomorphology, and statistics. Usually to accomplish this task two main approaches are used: statistical or physically based model.

This paper presents a package of GIS based models for landslide susceptibility analysis. It was integrated in the NewAge-JGrass hydrological model using the Object Modeling System (OMS) modeling framework. The package includes three simplified physically based models for landslides susceptibility analysis (M1, M2, and M3) and a component for models verifications. It computes eight goodness of fit indices (GOF) by comparing pixel-by-pixel model results and measurements data. Moreover, the package integration in NewAge-JGrass allows the use of other components such as geographic information system tools to manage inputs-output processes, and automatic calibration algorithms to estimate model parameters.
The system offers the possibility to investigate and fairly compare the quality and the robustness of models and models parameters, according a procedure that includes: i) model parameters estimation by optimizing each of the GOF index separately, ii) models evaluation in the ROC plane by using each of the optimal parameter set, and iii) GOF robustness evaluation by assessing their sensitivity to the input parameter variation. This procedure was repeated for all three models.
The system was applied for a case study in Calabria (Italy) along the Salerno-Reggio Calabria highway, between Cosenza and Altilia municipality. The analysis provided that among all the optimized indices and all the three models, Average Index (AI) optimization coupled with model M3 is the best modeling solution for our test case.
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