Submitted Abstract

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Title	Improving Spatial Transferability Of Physically-Based Shallow Landslide Models Using Parameter Ensembles.
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Abstract

For the hazard and risk assessment of landslides in mountainous regions, it is important that the underlying models are reliable. Current methods of landslide susceptibility assessment, especially dynamic physically-based slope stability modelling approaches, still face the problem of time-consuming calibration for new study areas and new hydro-meteorological scenarios. Calibration is necessary with each new assessment, as the geotechnical and hydrological parameters of the soil and bedrock are usually not available in full detail and vary significantly over different locations. In addition to this, the model has to be calibrated to account for generalizations, as most physically-based models can only approximate the actual processes behind slope stability. Recent studies on physically-based landslide modelling investigated the use of input parameter ensembles for their models to account for the naturally occurring variability of soil properties within a study area and reduce the time needed to calibrate the models. Comparison of these approaches with calibrated single input combination approaches showed a significant increase in the performance of such models. Current research activities focus on the question whether the use of parameter ensembles improves the spatial transferability of a model and how a well-performing ensemble could be found in a computationally efficient way. This study, framed within the PROSLIDE project, aims to answer these questions by comparing the performance of a model and a parameter ensemble from an existing study in Vorarlberg, Austria with a new spatial slope stability assessment using this ensemble in the Passeier Valley, Italy. The main goal is to find a robust parameter ensemble that can be used to accurately predict landslide susceptibility under different hydro-meteorological scenarios and at different locations. A secondary goal is to elaborate a method that reduces the time needed for defining such an ensemble. The study builds upon the model TRIGRS (Transient Rainfall Infiltration and Grid-Based Regional Slope-Stability Analysis), which is one of the most commonly used physically-based models for dynamic slope stability assessments. The implementation of the method developed in this study enables faster assessment of landslide susceptibility in new areas and under different hydro-meteorological scenarios. Further research on improving the performance of physically-based landslide models, should investigate how this method can be used in combination with geotechnical or soil maps to implement ensembles with spatially varying input parameters. Additionally, future research should investigate how these new methods can be applied to more complex landslide models that better approximate the processes behind landslides, e.g., STARWARS/Probstab.