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Update of the European Landslide Susceptibility Map (ELSUS Version 2)

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We present an update of the initial version of the European Landslide Susceptibility Map (ELSUS Version 1) that was released in 2012 through the EU Joint Research Centre (JRC) European Soil Data Centre (ESDAC). The susceptibility evaluation methodology employed for the updated map ELSUS Version 2 presented in this paper is identical to the previous approach, and comprises the differentiation of the analyzed European area into seven climate-physiographical model zones, the use of a reduced set of spatial susceptibility predictors (shallow subsurface lithology, slope angle, and land cover), and model zone-specific heuristic spatial multicriteria evaluations (SMCE) for susceptibility mapping.

The most important improvement for ELSUS version 2 is the replacement of the original "lithology" data set consisting of soil parent material information derived from the European Soil Database (ESDB) by new information derived from the digital version of the International Hydrogeological Map of Europe at scale 1 : 1.5 Million (IHME 1500). IHME lithology describes both consolidated and unconsolidated shallow geological materials over Europe and can be shown to have a higher significance for landslide susceptibility evaluation than the soil parent material derived from ESDB. Other improvements consist in the change of the mapping unit from 1 km to 200 m grid size and the incorporation of terrains not covered by ELSUS version 1 (e.g., Iceland, the Faroers, the Shetlands, and Cyprus). Additionally, the new ELSUS version 2 was calibrated and validated with an updated pan-European landslide inventory now containing more than 155,000 landslides (30% more than used for ELSUS version 1). The enhanced and updated landslide inventory and the higher quality of the "lithology" data enabled us to establish more consistent SMCE-schemes for the individual model zones.

The enhancements of ELSUS Version 2 result in an overall increase of the predictive power of the map for about 10%, as indicated by ROC curve metrics obtained with the updated landslide inventory. However, the assessment still suffers from missing landslide information in many European terrains. It can be suspected that more distributed landslides information in specific model zones will further enhance the accuracy of ELSUS in the future.