Representation of landslide events and DEM sensitivity in relation to landslide susceptibility analysis

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Landslides are naturally occurring complex geological phenomena that cause significant damages in mountainous regions receiving heavy rainfall. Landslide susceptibility mapping is an important approach to mitigating such disasters. This study highlights two important issues related to landslide susceptibility modelling. The first issue concerns the scale of a DEM. We found that a single scale of topographic data does not correctly represent all the landslide conditioning factors making a landslide susceptibility model very sensitive to the scale in terms of DEM resolution. The second issue is related to the representation of landslide events for a susceptibility study. We found this important because all the raster cells in a landslide are not equally responsible for its occurrence; neither can any single cell be representative. This consideration is often ignored in the studies of landslide susceptibility. We analyzed five different approaches of landslide representation concerning seed-cells, landslide-polygons and landslide-points and found that the seed cells around the landslide perimeter best represent the landslide characteristics. The inferences were made from landslide susceptibility studies at Niigata and Shikoku in Japan using a Random Forest model, together with the landslide inventory collected by the National Research Institute for Earth Science and Disaster Prevention (NIED) and the 10 m DEM from the Geospatial Information Authority of Japan (GSI).

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