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Evaluating the effect of the DEM's resolution on landslide run-out models, using some Norwegian case studies

Martin A. Michalsen (1), Graziella Devoli (1,2), and Byron Quan Luna (3)

(1) Department of Geosciences, University of Oslo, Oslo, Norway, (2) Norwegian Water Resources and Energy Directorate (NVE), Forecast of flood and landslide hazard, Oslo, Norway (gde@nve.no), (3) Digital Solutions, DNV GL, Høvik, Norway

Dynamical runout models are essential tools in landslide hazard and risk assessment, because they allow us to simulate the motion of past landslides and to predict the motion of future landslides. Runout distances obtained from these models, combined with expert-knowledge, are used to delineate the landslide hazards zones and consequently create hazard maps. Digital Elevation Models (DEM) are widely used in landslide run-out models. The accuracy of the models depends on the source and resolution of the DEM data. The main object of this study is to investigate how the resolution of different DEMs influence the runout analyses and to understand which DEMs and landslide runout model will perform optimally.

In order to investigate the effects of the DEMs on the behavior of landslide run-out models, two dynamical models, DAN3D (Hunger and McDougall/UBC) and RAMMS (SLF) have been used. The analysis focus mainly on DEMs with a resolution of 10 m and 1 m, based on photogrammetry, and LiDAR data, with the possibility to add more data with different resolution and from other sources, if necessary.

The evaluation of the different DEMs and runout models was performed using different case studies with distinct slope typologies (i.e. regular open slopes and channelized slopes). In addition, the analysis focused on two main landslide types: debris avalanches and debris flows. The case studies were selected based on the availability of DEMs and field observations. The possible case studies are located in the southern part of Norway: i) open slope in Aurdal; ii) two cases in channelized slopes (highly hierarchized drainage basin) located in Vangsmjøsa and Mjåland; iii) a fourth case in slope with no hierarchized drainage basin like Nesbyen.