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Evaluation of LIDAR derived DEM resolution to terrain stability hazard mapping

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In the last decade modeling the spatial distribution of slope potential instability was done with the introduction of Terrain Stability Models (TSMs) that combine steady-state hydrology assumptions with the infinite slope stability model. The accuracy of these approaches mainly depends on the quality of input data. The most crucial of these data is the Digital Model of Elevations (DEM) from which local gradient, and upslope drainage area are derived. In these years a new technology named Light Detection And Ranging (LIDAR) has provided to improve the quality, and the resolution of elevation data. These have been used to derive a new generation of DEMs. LIDAR technology for topographic survey was deeply investigate while minor attention was paid to analyze the real advantage of lidar-derived elevation data to terrain stability hazard analysis and mapping. A very high resolution DEM seems to be a good approach to evaluate soil roughness surface from which landslides area is detected, but this approach is sensitive to geologic conditions. A remarkable question to be explored concerns the evaluation of TSM performance using a lidar-derived DEM over a different scale. In this study we demonstrate how lidar-derived DEM over a spatial scale of 2 to 50 m affects results of a TSM. We consider a study area characterized by shallow landslides occurred in complexes, and located in northern region of Italy (Eastern Alps) where an airborne laser scan survey was conducted. The SINMAP Stability Index (SI) was applied to terrain stability hazard mapping. A transect technique to analyze the SI distribution is introduced. We select most representative complexes of shallow landslides, and we plot SI values along transects covering both the area inside and outside a landslide. Results indicate the better model performance for an intermediate grid resolution. If we consider a DEM resolution smaller than 5m the local variability of topography obscures the SI distribution. It is possible to find unsta-

ble and stable area together in the same landslide area due to local surface roughness. A DEM with a resolution of 10m seems to overcome the problem maintaining at the same time a good capability to depict the topographic characteristics relevant in terrain stability processes analysis.