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Analysis of shallow landslides by morphometry parameters derived from terrestrial laser scanning point clouds

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Erosion by shallow landslides is a widespread and growing phenomenon in mountainous areas. The major consequences are loss of soil and regolith as well as damages on infrastructure and provision of unconsolidated material for secondary processes such as mudflows. In this study we present a concept for extracting morphometry parameters from terrestrial laser scanning (TLS) point clouds in order to investigate the relation between slope surface structure and regolith depth. TLS is used to collect high-resolution point cloud data of an affected slope in the Schmirn Valley (Tyrol, Austria). Regolith depth is considered to be one of the important factors for the development of shallow landslides. However, direct field measurements are labour- and time-consuming. In this study we developed an approach, to investigate the relation between regolith depth and surface morphometry parameters. The reference regolith depth information is derived from lightweight dynamic cone penetrometer tests (DCPT) within the test site. The suggested approach integrates spatial analysis of Geographic Information Systems and point cloud processing algorithms. It will help to enhance the prediction of shallow landslide occurrence by (i) deriving high resolution 3D morphometric parameters and (ii) determining regolith depth with a reasonable effort due to automation. In future we want to be able to contribute with this concept to the detailed modelling of shallow landslide susceptibility on alpine slopes.