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# Modelling deep-seated landslide fracture scarps by topography-fitted minimal surfaces

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Deep-seated landslides post severe threats to human lives and properties. Having Learned from the landslides caused by the Morakot typhoon, the Taiwan's government authorities officially defined the deep-seated landslides by their geometric characteristics, e.g. the areas and depths, and performed extensive surveys to identify the potential sites across the island. Through these efforts, the site scarp boundaries are identified according to the surface topographic signatures of failures. There are in total more than 9000 potential deep-seated landslide sites found and, among these, 182 sites are with protection targets. Along this direction, assessments of the landslide volume and influencing area are to follow in hazard mitigation planning. With this amount of potential sites and mitigation planning, an automatized tool is needed to predict the shape and related profiles of the landslides. The method is expected to be able to provide predictions with a satisfactory precision but not necessarily with a high accuracy at a minimal operational efforts. In this regard, we propose a simple method for computing the fracture surfaces of deep-seated landslides, which is based on minimization of a smoothed surface that encloses a given landslide volume with a specified scarp boundary. Despite the stratigraphic structure is omitted, the minimal surface found in this way fulfills the scarp boundaries and can generate approximated profiles for further analysis, such as for slope stabilities, run-out simulations, etc. To illustrate the applicability of the method, we investigate 10 sites and assess their similarities to measurements with a series of assisting statistical indices. The indices reveal that the method is able to produce practically applicable predictions for deep-seated landslides.