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Effect of spatial soil depth distribution model on shallow landslide prediction: a case study from Korean Mountain

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Shallow landslides usually occur during heavy rainfall and result in casualties and property losses. Thus, it is always important to identify the potential locations where landslides are likely to occur in order to avoid the harm they cause. Soil depth is one of the most important and well-known factors controlling shallow landslide, therefore attention should be paid in choosing the right criterion to enter this parameter. This study intends to predict the spatial distribution of soil depth in Korean mountain and its application in shallow landslide modeling. In this study, a digital elevation model (DEM) based internal relief (IR) model was developed to estimate soil depth at high resolution over a mountainous area and validated with results that obtained from a seismic refraction method, traditional drilling and excavation methods. Three different spatial soil-depth distributions (i.e. IR–model, elevation model (Z–model) and gradient model (S–model)) linear soil depth models were applied to perform a slope-instability analysis. Results show that the spatial distribution of soil thickness related to internal relief provides a reasonable estimation of stability of hillslope. Results confirmed that the factor of safety is very sensitive to soil thickness and that in general a more reliable soil depth map, combined with infinite slope based models, improves spatial distribution of factor of safety.