EGU2020-18101
https://doi.org/10.5194/egusphere-egu2020-18101
EGU General Assembly 2020

Assessment of slope deposits depth at regional scale by means of morphometric clustering and multi-linear regression: a comparison

Leonardo Disperati[1], Enrico D'Addario[1], Michele Pio Papasidero[1], Marco Pignatiello[1], Lorenzo Marzini[1], Michele Amaddii[1,2], and Nazariy Broda[1]

[1]University of Siena, Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, Siena, Italy (leonardo.disperati@unisi.it)

[2]University of Firenze, Dipartimento di Scienze della Terra, Firenze, Italy

Apart high elevation and arid regions, bedrock is generally covered by unconsolidated materials that result from recent or actual bedrock weathering and fracturing, consequent transport along the hillslope mainly by un-channelized flux or gravity-dominated processes and deposition. These slope deposits (SD) are largely affected by shallow landslides triggered during intense rainfall events, hence mapping SD spatial distribution and properties is a challenging task to perform accurate regionalized analysis of landslide hazard.

Nevertheless, geological and geomorphological maps typically represent the spatial distribution of SD following a 0/1 approach, instead of attempting to describe, in a more realistic perspective, the spatial variation of SD depth, even though this latter is a fundamental input parameter for landslide hazard estimation by physically based models.

In this work we present two different approaches to assess SD depth at regional scale, coupling field SD depth measurements, statistical analysis and then topographic-based regionalization: unsupervised clustering and multilinear regression analysis. Geo-environmental variables such as geology, land use and morphometric parameters, have been considered. The unsupervised clustering analysis has been based on some morphometric variables (eg. flow accumulation, slope and hillslope curvatures), derived from a digital elevation model with cell size of 10 m. These variables allowed us to extract, for homogeneous regions obtained by considering bedrock lithology, a set of morphometric units where the distribution of SD depth was assessed. The same variables were processed in the multilinear regression analysis in order to obtain equations estimating the spatial distribution of SD depth. The results of this work were then compared each other, as well as to the outputs obtained by implementing other methods of SD depth estimation known in the literature. Finally, the proposed methods were applied to evaluate SD depth in a test area, where field survey measurements were used as a check to assess the prediction capability. The results are analyzed and discussed in order to identify best solutions to evaluate and represent SD depth at regional scale.