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Landslide triggering-thickness susceptibility, a simple proxy for landslide hazard? A test in the Mili catchment (North-Eastern Sicily, Italy)

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This study implements a landslide triggering-thickness susceptibility approach in order to investigate the landslide scenario in the catchment of Mili, this being located in the north-easternmost sector of Sicily (Italy). From a detailed geomorphological campaign, thicknesses of mobilised materials at the triggering zone of each mass movement were collected and subsequently used as a dependent variable to be analysed in the framework of spatial predictive models. The adopted modelling methodology consisted of a presence-only learning algorithm which differently from classic presence-absence methods does not rely on stable conditions in order to derive functional relationships between dependent and independent variables. The dependent was pre-processed by reclassifying the crown thickness spectrum into a binary condition expressing thick (values equal or greater than 1m) and thin (values less than 1m) landslide crown classes. The explanatory variables were selected to express triggering-thickness dependency at different scales, these being in close proximity to the triggering point through primary and secondary attributes from a 2m-cell side Lidar HRDEM, at a medium scale through vegetation indexes from multispectral satellite images (ASTER) and a coarser scale through a geological, land use and tectonic maps. The choice of a presence-only approach allowed to effectively discriminate between the two types of landslide thicknesses at the triggering zone, producing excellent prediction skills associated with relatively low variances across a set of 50 randomly generated replicates. In addition, the role of each predictor was assessed for the two considered classes as relevant differences arose in terms of their contribution to the final models. In this regard, predictor importance, Jack-knife tests and response curves were used to assess the reliability of the models together with their geomorphological reasonability. This work attempts to capitalize on fieldwork data in order to produce an example for a landslide triggering-thickness susceptibility which differently from more common approaches, may performs as a better proxy for more complex landslide hazard assessments.