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Morphometric characterization of a calanchi inventory in Sicily, Italy

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Calanchi are a frequent type of badland landscape of Sicily (Italy), usually located in the middle of crops or forests. They are characterized by heavily dissected terrains with unvegetated slopes, knife ridge edges, V-shaped valleys and channels with a dendritic pattern, which incise and extend headwards. Calanchi exhibit, in smaller temporal and spatial scales, many of the geomorphic processes and landforms that may be observed in a fluvial landscape, hence, this type of badland may be considered as micro-watersheds where geomorphic dynamics can be related to their geometric features. The aim of this investigation was to evaluate the morphometric characteristics of calanchi landforms in Sicily (Italy). For this aim, DEMs obtained by LiDAR technology, with a horizontal and vertical resolutions of 2 m and 0.1-0.2 m, respectively, were used. In addition, orthophotographs with a pixel resolution of 0.25 m were exploited as a visual reference of the areas, as well as the images available on Google Earth. The morphometric characteristics were used to test two functional relationships: 1) an empirical relationship linking the volume of sediments eroded on a calanchi hydrographic unit to the total length of its main channel, and 2) a power relationship, established between two dimensionless groups of morphometric variables, that attests for a unique geometrical similarity condition between calanchi and smaller linear erosion landforms. Finally, the Hack's law was tested demonstrating that the shape of calanchi units becomes wider with the increasing their drainage area. This result was also proved by the analysis of the maximum length and width of each landform, which showed that width increments slightly faster than length when increasing their size.