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Characterization of volcanic geology by DEM-derived parameters

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The use of DEMs for deriving morphometric parameters for geological applications is less common. In this research, we calculated slope and topographic openness for every geological unit of Iwate Volcano to evaluate statistical differences in the morphometric parameters of the geological units. We categorized the geological units according to their ages and their formation processes. The categorization based on formation processes was as follows: lava-flow/lava, central cone/stratocone, air fall deposit, pyroclastic flow deposit, volcanic fan deposit, and debris avalanche deposit. Principal component analysis was used to select geological units suitable for analysis, while stepwise discriminant analysis to select some morphometric parameters, which could explain the differences in the formation processes and ages of the geological units. We found that the formation processes correspond well to mean slope, and that the geological ages that control the degree of surface dissection correspond well to the standard deviations of slope and negative topographic openness.

Keywords: Volcanic geology, Morphometric parameter, Formation process, Geological age