



Volcanic morphology shaped by mass wasting processes: especially debris avalanches

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Volcanoes are different from other mountains because they grow by eruption and intrusion, creating edifices that are loosely built and gravitationally unstable. The edifices are therefore prone to gravitational deformation, mass wasting and especially large-scale collapse. Gravitational deformation and tectonic deformation changes the edifice shape and conditions the volcano for landslides. We present some typical volcano morphologies with their internal structures and describe a way to characterize volcano morphology through quantitative DEM-based morphometry. Then, considering the particular case of large volcanic landslides, we show how these develop in the context of gravitational spreading and regional fault movement, and how the edifice changes shape as landslide conditions slowly develop. There are typical morphometric signatures related to deformation that can potentially be used to predict landslides. Moving onto slope failure we follow, using modeling, field evidence and morphologic data, how rock-slide debris avalanches modify edifice and piedmont shape. We also illustrate how rock-slide debris avalanche topography is a result of the structural processes and conditions within the original edifice. Importantly, most rock-slide debris avalanche deposits are dominantly brittle slides, but a full continuum could exist between dry rock-slides and water saturated flows within a single deposit. This overview links the growth and structuring processes of a volcano to the resulting geomorphic expression created by mass wasting.