

Erosion of a Young Volcanic Cone: A Case Study at Ahmanilix, Okmok Volcano, Alaska

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Cinder cones are a common feature at many volcanic eruptions. Their shapes and volumes can reveal information about eruption conditions, and their geomorphological evolution shapes them and their surrounding environment. It is thus important to quantify the rate and patterns of erosion of young cinder cones. In this study, we examine the Ahmanilix cone, which formed during the 2008 eruption of Okmok volcano in the Aleutian islands region of Alaska. Ahmanilix, located on the eastern side of Okmok's large caldera, is >250 meters tall and characterized by dramatic gullies formed by the harsh wind, snow and rain conditions typical of the Aleutians. We used photogrammetry to create 3D models of Ahmanilix using aerial photographic surveys taken from a helicopter in 2021, 2022, 2023 and 2024. We utilize Agisoft Metashape to build point clouds, CloudCompare to align the point clouds and build raster Digital Elevation Models (DEMs), and QGIS and Python to visualize and analyze these products. By subtracting DEM rasters we quantify year-to-year erosion. We compare our results with erosion rates estimated from satellite observations (Dai et al., 2020), identify regions dominated by erosion or deposition and correlate them with slopes and cinder lithology. Our observations can be extended to other cinder cones and help predict their geomorphological evolution.