



Erosion rates and erosion patterns of Neogene to Quaternary stratovolcanoes controlled by age and climate in the Altiplano plateau (Central Andes): an SRTM DEM based analysis

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Erosion patterns and rates of 33 symmetrical stratovolcanoes in the arid to hyperarid Central Andean Volcanic Zone (14°S to 27°S) have been quantified by morphometric modeling and published geochronological data. Based on reconstructed volumes and ages, typical long-term erosion rates of ~ 10 m/Ma over the last 14 Ma have been calculated. Lowest erosion rates are typical for the hyperarid Puna region around $>24^\circ\text{S}$ (7-9 m/Ma) while somewhat higher values (13-22 m/Ma) are recorded for volcanoes in less arid southern Peru ($>18^\circ\text{S}$). This suggests climatic control of erosion rates due to the gradient in precipitation along the western margin of the Altiplano-Puna Plateau from northern Chile to southern Peru.

Short-term relatively high erosion rates of 112 to 66 m/Ma, decreasing with age, are only found at Late Quaternary volcanoes, i.e. at the initial stages of erosion. Young and growing volcanoes thus erode more easily due to their unconsolidated cover, and surface denudation slows down significantly to approximately one tenth after a few Ma. A significant negative correlation is observed between the denudation ratio (defined as removed volume/original volume) and post-erosional edifice height. This relationship is independent of climate and original edifice elevation.

Dated volcanoes allow to calibrate denudation ratio to age and thus provide a morphometric tool to constrain the eruptive age of remote Andean volcanoes with an uncertainty of ~ 1 Ma.