



Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile

'Understanding volcanoes and society: the key for risk mitigation'



The link between volcano morphology and magmatic system properties: implications on volcano growth and future hazard assesment.

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Keywords: compound volcanoes, volcano morphology, magmatic system properties, geothermobarometry, simple model

We developed a simple model of volcano construction with the aim of provide insights into the link between the magmatic system properties and volcano morphology. We evaluated the influence of magma rheology, conduit dimensions and the depth and volume of the magma chamber on the volcano final morphology. We tested the model on compound volcanoes of the Central and Southern Volcanic Zones of the Andes with noticeable morphological differences: Lascar, Lonquimay and Llaima. We constrained the magma rheology and depth of magma chambers through petrographic, geochemical and geothermobarometric analyses of selected samples from lava flow units. Our results indicate a strong influence of the magmatic system properties and volcano dimensions. For deep magma chambers (> 9 km depth) edifices can reach >2,000 m of height with a wide basal radius (>10 km), while for shallow reservoirs (< 4 km) edifices are < 1,500 m. Our analysis suggest that Lonquimay and Llaima volcanoes reached their maximum height and volumetrically large eruptions will occur at their flanks, with only minor activity through their summit. Lascar volcano has not reached their maximum height and consequently large eruptions are expected to occur through the summit crater. Our model allows us to link the eruptive evolution with the magmatic system of a volcano, contributing to a better knowledge of the hazards areas associated to a volcano system. Acknowledgements to FONDECYT project N°11121298 and FONDAP-CONICYT project N°15090013.