Geophysical Research Abstracts
Vol. 21, EGU2019-16376-1, 2019
EGU General Assembly 2019
© Author(s) 2019. CC Attribution 4.0 license.

Understanding the top-down controls of surface loading on magma reservoir formation

Jeane Anne Dagoy (1,2), Eleonora Rivalta (1), and Francesco Maccaferri (1)

(1) GFZ German Research Centre for Geosciences, Section 2.1Physics of Earthquake and Volcanoes, Germany (dagoy@gfz-potsdam.de), (2) Universität Potsdam, Germany (dagoy@uni-potsdam.de)

Loading due to the growth of volcanic edifices generates stresses in the crust comparable to the order of magnitude of tectonic stresses. Crustal stresses control the pathways and velocity of magma-filled dikes and thus may affect the geometry and location of magma storage zones. We mainly investigate how the loading stress provided by a growing volcanic edifice sets a top-down control on the shape of a magma reservoir. Data on the shape and depth of magma storage of deforming volcanoes from available databases (i.e. COMET, Smithsonian) reveal that calderas in general are associated to sills or top-flatted reservoirs, while stratovolcanoes are related to vertically developed reservoirs such as ellipsoids. We explain this observation with 2D numerical simulation of ascent pathways of magma in the crust considering dike-dike interaction. Topographic load plays the main role in our models. Taking into account stresses induced by the previous intrusions introduces complexity to the system thereby facilitating accumulations of dikes resulting in the formation of magma storage zones. Our results are consistent with the observation and suggest that the shape of the volcanic edifice may control, beside being controlled by, that of magma reservoirs.