Geophysical Research Abstracts
Vol. 19, EGU2017-4668-2, 2017
EGU General Assembly 2017

Tectonic triggers of silicic caldera-forming eruptions

Joan Martí (1) and Carmen López (2)

(1) Institute of Earth Sciences Jaume Almera, CSIC, Geohazards, Barcelona, Spain (joan.marti@ictja.csic.es), (2) Instituto Geográfico Nacional (IGN), C/Alfonso XII, 3, 28014 Madrid, Spain.

Silicic caldera-forming eruptions require the combination of specific thermo-dynamic, mechanical and tectonic conditions to allow the gravitational collapse of the roof of the magma chamber during the eruption. Some silicic collapse calderas represent the culmination of the evolution of long-lived volcanic systems, while others form as response to a unique volcanic episode. The triggering mechanisms of caldera-forming eruptions are still not fully understood. In any case, it is generally assumed that collapse calderas form under very specific stress conditions that will be regulated by the regional stress field, size, shape, and depth of the magma chamber, magma rheology and gas content, and previous state of deformation of the host rock, and that will determine the formation of the set of normal faults (ring fault) along which the crustal block will subside into the magma chamber. A caldera-forming eruption may have magmatic triggers, when it is initiated by an increase of the internal pressure of the magma chamber, due to injection of new magma and/or oversaturation of volatiles due to crystallization, or a combination of both, or may have external triggers such a tectonic event (e.g., earthquake) that reduces the confining stresses around the magma chamber. While magmatic triggers have been well investigated and are widely accepted, tectonic triggers are still not well constrained. We develop a simple mechanical model to demonstrate how a change in tectonic stresses around a sallow magma chamber may trigger a caldera eruption if the required mechanical conditions to develop a ring fault were previously defined.