Geophysical Research Abstracts
Vol. 19, EGU2017-11792, 2017
EGU General Assembly 2017

Contemporaneous ring fault activity and surface deformation at subsiding calderas studied using analogue experiments

Yuan-Kai Liu, Joël Ruch, Hannes Vasyura-Bathke, and Sigurjón Jónsson
King Abdullah University of Science and Technology, Saudi Arabia (yuankai.liu@kaust.edu.sa)

Ground deformation analyses of several subsiding calderas have shown complex and overlapping deformation signals, with a broad deflation signal that affects the entire volcanic edifice and localized subsidence focused within the caldera. However, the relation between deep processes at subsiding calderas, including magmatic sources and faulting, and the observed surface deformation is still debated. Several recent examples of subsiding calderas in the Galápagos archipelago and at the Axial seamount in the Pacific Ocean indicate that ring fault activity plays an important role not only during caldera collapse, but also during initial stages of caldera subsidence. Nevertheless, ring fault activity has rarely been integrated into numerical models of subsiding calderas.

Here we report on sandbox analogue experiments that we use to study the processes involved from an initial subsidence to a later collapse of calderas. The apparatus is composed of a subsiding half piston section connected to the bottom of a glass box and driven by a motor to control its subsidence. We analyze at the same time during the subsidence the 3D displacement at the model surface with a laser scanner and the 2D ring fault evolution on the side of the model (cross-section) with a side-view digital camera. We further use PIVLab, a time-resolved digital image correlation software tool, to extract strain and velocity fields at both the surface and in cross-section. This setup allows to track processes acting at depth and assess their relative importance as the collapse evolves. We further compare our results with the examples observed in nature as well as with numerical models that integrate ring faults.