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3D attenuation structure of Long Valley caldera: looking for the driver of the current uplift

Janire Prudencio (1) and Michael Manga (2,3)

(1) Dep. Fisica Teorica y del Cosmos, University of Granada, Granada, Spain (janire@ugr.es), (2) Earth and Planetary Science Department, University of California at Berkeley, 307 McCone Hall, 94720 Berkeley, USA , (3) Berkeley Seismological Laboratory, University of California-Berkeley, 215 McCone Hall, 94720 Berkeley, USA

Unrest at Long Valley caldera, California has been attributed to magma recharge or the ascent of hydrothermal fluids. The difference is critical for assessing volcanic hazard. To better constrain subsurface structures in the upper crust and to help distinguish between these two competing hypotheses for the origin of unrest, we model the 3D seismic attenuation structure by analyzing more than 47000 vertical waveforms with the coda normalization method. We identify high attenuation anomalies in the center-south of the caldera. Low attenuation anomalies are imaged in the fluid-rich western and eastern areas of the caldera, one of which corresponds to the location of an earthquake swarm in 2014. From a comparison with other geophysical images (magnetotellurics, seismic tomography) we attribute high attenuation anomalies to hydrothermal systems. Average to high attenuation values are also observed at Mammoth Mountain (south-west of the caldera), and may also have a hydrothermal origin. The attenuation images, however, are not able to image the deeper crust where the magma bodies might exist.