

Can seismicity rates recorded on a volcano be used as a stress gauge ?

Aurore L CARRIER¹, Jean-Luc GOT², David MARSAN³, Virginie PINEL⁴

¹Laboratoire ISTERRE, Universite de Savoie, 73376 Le Bourget du Lac, France, ²Laboratoire ISTERRE, Universite de Savoie, 73376 Le Bourget du Lac, France, ³Laboratoire ISTERRE, Universite de Savoie, 73376 Le Bourget du Lac, France, ⁴Laboratoire ISTERRE, Universite de Savoie, 73376 Le Bourget du Lac, France

E-mail: aurore.carrier@ens-lyon.fr

Dieterich and Cayol (2003) have related seismicity rate and stress changes in the Kilauea south flank (Hawaii), where most earthquakes are nucleated on a large décollement plane. In this case, the rate and state formulation (describing friction on large faults, Dieterich, 1992) can be used, and the seismicity may be thought as a stress gauge of the volcano. However, in most volcanoes, Volcano-Tectonic (VT) earthquakes do not nucleate on such large faults and the use of a rate-and-state formulation may be questioned, this is the case on Piton de la Fournaise volcano where the seismicity (36000 earthquakes recorded between 1999 and 2009) occurs in a large number of swarms occupying a 1 km³ volume. Using these data, we therefore explore the various ways to relate VT earthquake rate and stress changes in a volcano and the resolution we can get for the stress changes and the various parameters that control each of these relations. We finally explore the joint inversion of surface deformation and earthquake rate as a mean to better constrain stress changes.