Geophysical Research Abstracts
Vol. 20, EGU2018-14215, 2018
EGU General Assembly 2018

From ten years of data on the Piton de la Fournaise volcano, La Réunion: What can we learn on the forcing mechanisms of rockfalls.

Virginie Durand (1), Anne Mangeney (1), Clément Hibert (2), Aline Peltier (3), Philippe Kowalski (3), Frédéric Lauret (3), Christophe Brunet (3), Claudio Satriano (1), Fabian Bonilla (1,4), Madani Aissaoui (1), Jean-Marie Saurel (1), Valérie Ferrazzini (3), and Antoine Protin (1)

(1) IPGP, Sismologie, PARIS, France (vdurand@ipgp.fr), (2) IPGS, Strasbourg, France, (3) OVPF, La Réunion, (4) IFSTTAR, Paris, France

The seismic and photogrammetric networks of the Piton de la Fournaise volcano (La Réunion Island) are very well appropriate to study seismic signals generated by rockfalls in the Dolomieu crater. In particular, seismic data make it possible to precisely locate the rockfalls and recover the volume of each rockfall. In April 2007, an eruption caused the collapse of the crater floor. We processed ten years of data, from after the collapse to June 2017, ending up with a catalog of precise time, location and volume of rockfalls. These ten years show three different periods, in term of volcanic activity. From April 2007 to December 2010, four eruptions occurred. They are followed by a quiet period, with four years with no eruption. Then, the eruptive activity started again in June 2014, with eight eruptions in three years. It allows us to study three regimes of rockfall activity. First, the activity linked to the rearrangement of the crater slopes following the collapse. Then, the activity during a quiet period, with only climatic excitation. Finally, the activity linked to the recovery of the eruptive activity, on stable slopes. Comparing the spatio-temporal evolution of rockfalls during these three periods enables us to have an insight into the influence of the seismicity and the deformation associated to the eruptive activity on the slope stability. We observe that the slopes respond differently to excitation, depending on their stability. Around eruption times, stable slopes will exhibit a change in rockfall volumes, but not in their frequency, whereas unstable slopes will show a change in both volume and frequency. This study also suggests that pre-eruptive seismicity is the main triggering factor for the largest volumes, with a delay of one to several days. We infer that repetitive vibrations from the many seismic events induce crack (or slip) growth in highly fractured (or granular) materials, leading to the collapse of large volumes.