Link between flank slip and eruptions at Piton de la Fournaise (La Réunion)

Quentin Dumont*†[1], Valérie Cayol‡[2], and Jean-Luc Froger§[2]

[1]Laboratoire Magmas et Volcans – Université Clermont Auvergne, Laboratoire Magmas et Volcans, Campus universitaire des Cezeaux, 6 avenue Blaise Pascal, 63170 Aubière ,France. – France
[2]Laboratoire Magmas et Volcans – CNRS : UMR6524 – France

Abstract

The April 2007 eruption of the Piton de la Fournaise (PdF) was associated to a large scale Eastern Flank slip of 1.4 m to the east. Since then, InSAR and GPS data have evidenced that the Eastern Flank is continuously slipping. Inversion of InSAR data shows that slip takes place on a low angle detachment fault. For 3.8 years after the 2007 flank slip, eruptions mainly took place at the summit (6 summit eruptions versus 2 flank eruptions), and 6 intrusions failed to reach the surface, evidencing that the 2007 Eastern Flank slip had relaxed stress in the summit area. Eruptive activity then paused for 3.4 years before starting again in 2014. To analyze how eruptions affect the Eastern Flank stress and stability, the characteristics of intrusions need to be determined. Since 1998, InSAR shows that eruptions with similar displacement patterns and in similar locations often occur, with differences in the maximum amplitude. Using the OI2 InSAR database, which recorded all Piton de la Fournaise eruptions since 2003, eruptions were classified in 10 families. To be able to use the model determined for one eruption for the rest of the family, a procedure based on displacement pattern similarity was designed. This procedure is tested on a family corresponding to the October 2010, January and July 2017 eruptions localized on the SE flank. For these 3 eruptions, a sill which becomes vertical is determined, and pressures range from 0.50 to 0.62 MPa. These intrusions induce an increase of the Coulomb stress along the Eastern Flank detachment fault. They promote displacement of the Eastern Flank, and conversely, detachment slip favors emplacement of new intrusions. Such dynamic process seems to play a major role in the evolution of eruptive activity and in the structural evolution of PdF.

*Speaker
†Corresponding author: quentin.dumont@etu.uca.fr
‡Corresponding author: v.cayol@opgc.fr
§Corresponding author: froger@opgc.univ-bpclermont.fr