



A new comprehensive classification of the Piton de la Fournaise activity spanning the 1985-2010 period. Search and analysis of short-term precursors from a broad-band seismological station.

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Piton de la Fournaise volcano (La Réunion Island) is one of the most active basaltic volcanoes, with an average of one eruption every 10 months during the last century. This study is first of all a compilation of information and establishes a comprehensive database of all volcanic events at Piton de la Fournaise in the 1985-2010 period range. The analysis of the records from the very broad-band seismological RER station (Geoscope network), located 8.3 km north from the summit, allowed us to identify short-term precursors for eruptions. After a signal filtering process that consists in removing the instrumental response and the theoretical horizontal Earth tides, these precursors can be distributed into 4 classes that depend on their waveform. The shapes and characteristics of these transient phenomena (time delay, duration or class) exhibit particular features that we have tried to link to other eruption or intrusion parameters (location, altitude, volume). Statistical analyses of all events (intrusions and eruptions) are then derived. The correlation with the initial seismic crisis marking the opening of magma ascent path is investigated, revealing that the delay between the RER transient phenomenon and the start of the seismic crisis increased after the major caldera forming event in 2007. This longer delay may be due to drastic changes in the internal structure of the edifice and a concomitant decrease in volumes of magma batches.

A possible effect of the Earth tides on the triggering of magma propagation may be identified when the magmatic system is near critical conditions.

Estimates of acceleration rates at the RER station have been retrieved for eruptions and intrusions, with the challenge of providing a way to differentiate one from the other while the process is ongoing. Acceleration rates seem to depend on the eruptive lava flux and a threshold value can be determined to discriminate between intrusions and eruptions, illustrating the interest of their analysis for real time monitoring.