

## Geometry of shallow magmatic conduits at Piton de la Fournaise

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At Piton de la Fournaise volcano (Reunion Island), seismic swarms occur before each eruption. They typically start one hour before the eruption onset, and are located between 2500 m and a few hundred meters beneath the summit. These swarms are most probably associated with magma transfer from the source reservoir to the ground. The conduit geometry can either be a fracture (dyke) created for each eruption, or a cylindrical pipe filled with molten magma shared by several eruptions.

In most eruptions, tilt changes are detected almost simultaneously as the preeruption seismic swarms. Modelling shows that a cylindrical conduit of plausible radii cannot create such tilt changes, whereas a dyke-type conduit can. It is also observed that locations of seismic swarms slightly differ from one eruption to another. This is another argument in favor of a dyke-type conduit rather than a pipe conduit at the beginning of eruptions.

Coeruptive displacements recorded by SAR interferograms, for the period between 1998 and 2000, show laterally-elongated dykes above the seismic swarms, and do not indicate deep vertical dyke-type conduits. This suggests that (1) the vertical dyke-like conduits close when the overpressure at the reservoir is relaxed, and (2) at shallower depths, dykes propagate laterally and solidify without closing. These observations are consistent with a level of neutral buoyancy at several hundred meters beneath the ground.

An eruption localizes to a vent typically a few hours after its onset, and may continue for weeks to months. At this later stage, a pipe conduit is probably developed beneath the ground. A model of magma flow in a cylindrical pipe shows that such conduits must have radii of the order of one meter, which is too narrow to be detected by geodetic measurements and consistent with the interferograms.

### Models of dikes formed during the eruptions, determined from InSAR data

