



Eruptive SO₂-plume measurements at Piton de la Fournaise (Ile de La Réunion) by stationary NOVAC scanning MAX-DOAS instruments

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Since September 2007 stationary scanning MAX-DOAS instruments are installed on the Enclos Fouqué caldera around Piton de la Fournaise volcano (PdF), integrating the volcano monitoring network of the OVPF (Observatoire Volcanologique du Piton de la Fournaise). The instruments are about 4 km away from the summit and can measure volcanic SO₂ degassing downwind from Dolomieu crater or from a source located inside the caldera, since activity is mostly concentrated here. The instruments work during daylight between 7:00 a.m. and 6:00 p.m. local time, acquiring data on average every 7 minutes during favorable weather conditions.

During the first year, corresponding to a pause in eruptive activity, the DOAS network did not record any SO₂ as PdF shows no significant degassing except during eruptions. Since then the volcano has erupted three times recently (September 2008, November 2008 and December 2008, the latter is still ongoing).

Volcanic unrest started in August 2008 with an increase in seismicity and deformation. Numerous seismic crises were recorded beneath the summit of the volcano, but still no SO₂ emission was detected by the instruments during these events. On September 12th the DOAS network detected for the first time SO₂ degassing from the volcano. It was associated to volcanic tremor under the summit indicating the presence of magma at shallow level in the volcano edifice. Volcanic tremor and SO₂ degassing lasted only some few hours, announcing the forthcoming resumption in eruptive activity, which started nine days later.

On September 21st, after a short seismic crisis, eruptive tremor appeared at 11:38 (UT), SO₂ degassing followed immediately at 11:47 (UT). Lava emission occurred from a vent in the West wall of the Dolomieu crater, probably from a relatively shallow magma reservoir.

The eruption continued for 12 days. In the months that followed several seismic crises were recorded, the last one on November 27th that shortly preceded eruptive tremor at the volcano (07:50 UT) and signed the resumption of eruptive activity from the same vent as September 21st. SO₂ degassing was recorded by the DOAS stations but poor weather conditions prevented the detection of a well defined gas plume. The eruption lasted 26 hours, terminating with “gas piston” activity. Low seismic but higher deformation activity was recorded in the following days.

On December 14th at 22:45 (UT), after 16 hours-long seismic crisis, eruptive tremor appeared again and a glowing in the crater was detected by webcams placed at the rim of the Enclos Fouqué caldera. In the morning SO₂ degassing was recorded by the DOAS stations. In this still ongoing eruption SO₂ emissions show major variations and good correlation with tremor intensity. Further plume traverses had been performed in the field using mobile mini-DOAS instruments.

Since September 2008, high time-resolved eruptive SO₂ plume data had been acquired at Piton de la Fournaise volcano. We investigate the correlation of SO₂ data with geophysical (seismic and acoustic) data, geodetic (GPS) data and modeled dike injection events and location of magma reservoirs as well as petrological parameters to gain an integrated understanding on volcano (magmatic and degassing) dynamics during these eruptive events at Piton de la Fournaise.