

Monthly Bulletin

Institut de physique du globe de Paris
Observatoire volcanologique du Piton de la Fournaise

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December, 2025

PITON DE LA FOURNAISE (VNUM #233020)

Latitude: 21.244°S

Longitude: 55.708°E

Summit elevation: 2632 m

Piton de la Fournaise is a basaltic hot spot volcano located in the southeastern part of La Réunion Island (Indian Ocean). The volcano first erupted about 500,000 years ago. Its volcanic activity is characterized by frequent effusive eruptions (with emissions of lava fountains and lava flows) that occur on average twice a year since 1998. More rarely, larger explosive eruptions (with blocks covering the summit area and ash emissions that can disperse over long distances) have happened in the past with a centennial recurrence rate.

Most of the current eruptive activity (97% during the last 300 years) occurs from vents inside the Enclos Fouqué caldera. A few eruptions, however, have occurred from vents outside the caldera (most recently in 1977, 1986, and 1998). Such eruptions can potentially threaten communities that live in the surrounding areas.

Since late 1979, the activity of Piton de la Fournaise is monitored by the Piton de la Fournaise Volcanological Observatory (Observatoire Volcanologique du Piton de la Fournaise - OVPF), which belongs to the Institut de Physique du Globe de Paris (IPGP).

Since August 2023, no eruptions have been reported at Piton de la Fournaise. Periods of inactivity are common in the recent history of Piton de la Fournaise. Volcanic activity is not continuous, but fluctuates significantly over decades, with eruption cycles interrupted by several years without eruptions.

Alert level: Vigilance

(from December 9, 2025 to January 1, 2026)

November 28, 2025 to December 5, 2025: Vigilance
December 5, 2025 to December 9, 2025: Alert 1

(cf. table in the appendix)



A. Piton de la Fournaise activity

Seismicity

The seismological network of the Piton de la Fournaise Volcanological Observatory consists of 41 seismological stations currently in operation, representing a total of 109 channels sampled at 100 Hz and transmitted in real time to the observatory. This network includes 32 three-component broadband stations, 2 three-component short-period stations and 7 analogue stations with one vertical component.

Earthquakes are located based on the arrival times of P and S waves, which are manually plotted in the SeisComP software (www.seiscomp.de) using automatic or visual detections. The earthquakes are then located using NonLinLoc software (Lomax et al., 2000), using a three-dimensional velocity model. This model takes into account a velocity gradient according to the topography and assumes a constant VP/VS ratio of 1.7. The P-wave velocity is 3.3 km/s at the free surface and increases linearly with depth at a gradient of 0.3 s^{-1} .

Observations

In December 2025, the OVPF-IPGP recorded at Piton de La Fournaise:

- 1564 shallow volcano-tectonic earthquakes (0 to 2.5 km above sea level) below the summit craters;
- 166 deep earthquakes (below sea level);
- 40 long-period earthquakes;
- 208 rockfalls.

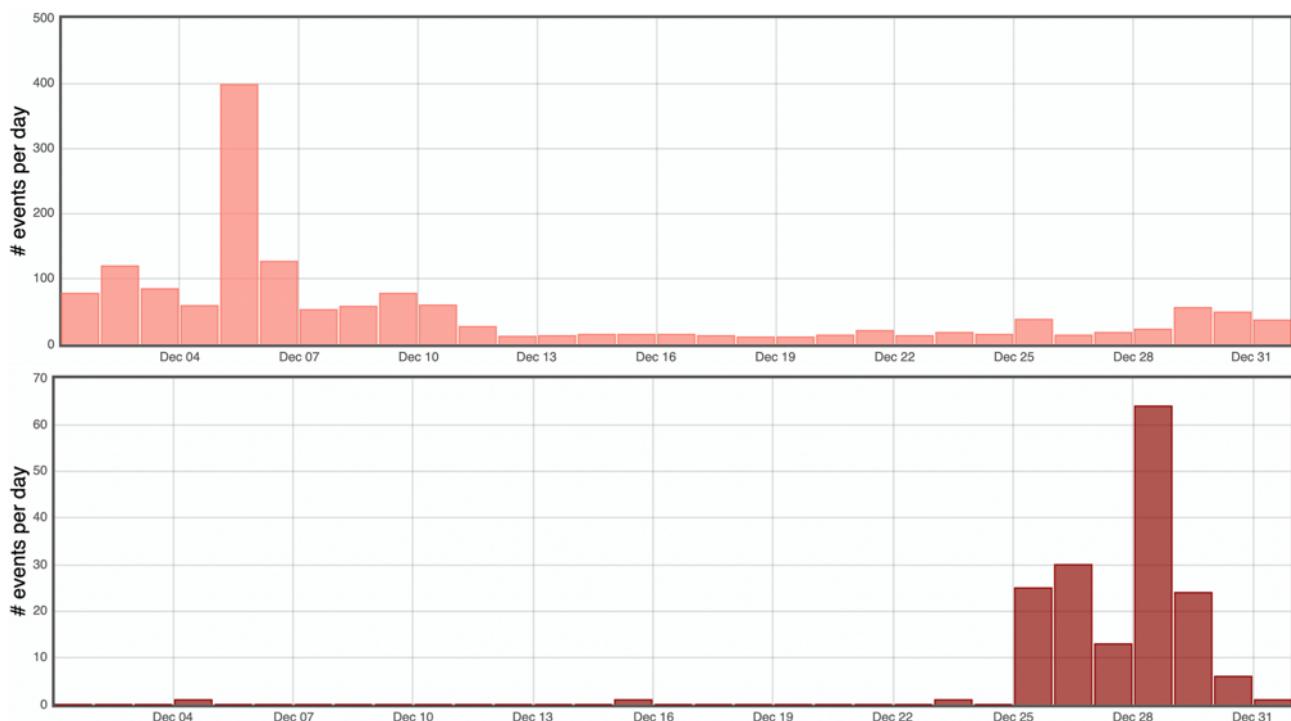


Figure 1: Number of (top) shallow and deep (bottom) volcano-tectonic earthquakes per day recorded in December 2025 (© OVPF-IPGP).



Following the resumption of seismic activity beneath the summit of Piton de la Fournaise at the end of November 2025, significant seismicity persisted in December 2025 beneath the Dolomieu crater (Figures 1 and 2).

This seismicity peaked on December 5, 2025, with a seismic swarm during which 227 shallow volcano-tectonic earthquakes were recorded between 6:25 p.m. and 7:30 p.m. UTC (10:25 p.m. and 11:30 p.m. local time). Most of these earthquakes had magnitudes < 1. Some were localized and show a migration from 300 m below the southeastern edge of the Dolomieu crater to 800 m below the northeastern edge of the Dolomieu crater (Figure 3). These locations show a vertical migration of less than 500 m below the eastern edge of the Dolomieu crater. This seismic swarm corresponds to an injection of magma from the shallow reservoir (located around sea level below the Dolomieu crater) toward the surface, but which did not reach the surface (magma intrusion).

A small jerk signal (a very low-frequency transient observed at the Rivière de l'Est seismic station, in both horizontal ground motion and tilt; *Beauducel et al.*, 2025) was emitted (only 0.1 nm/s³; Figure 4), confirming that a magma intrusion had indeed occurred.

Following this intrusion, shallow seismicity continued at a fluctuating rate of 13 to 78 earthquakes per day between December 7 and 31, 2025 (Figure 1). The locations of these earthquakes are similar to that observed before the intrusion, namely along the entire annular fault - a large circular structure surrounding the summit - located between the magma reservoir and the surface (Figure 2). This seismicity reflects pressure variations within the shallow magma reservoir.

Starting on December 25, 2025, a marked increase in deep volcano-tectonic seismicity was recorded (Figure 1), with a peak of 64 deep earthquakes on December 28. These earthquakes were located at a depth of approximately 9 km beneath the northwestern sector of the summit (Figure 2). The resumption of deep seismicity, although consisting mainly of low-magnitude events, suggests a reactivation that may reflect a new influx of deep magma into the volcano's shallow feeding system.

Numerous rockfalls (208) also occurred inside the *Dolomieu* crater, along the cliffs of the *Enclos Fouqué* caldera and *Rivière de l'Est*, as observed during the previous months (Figure 1).

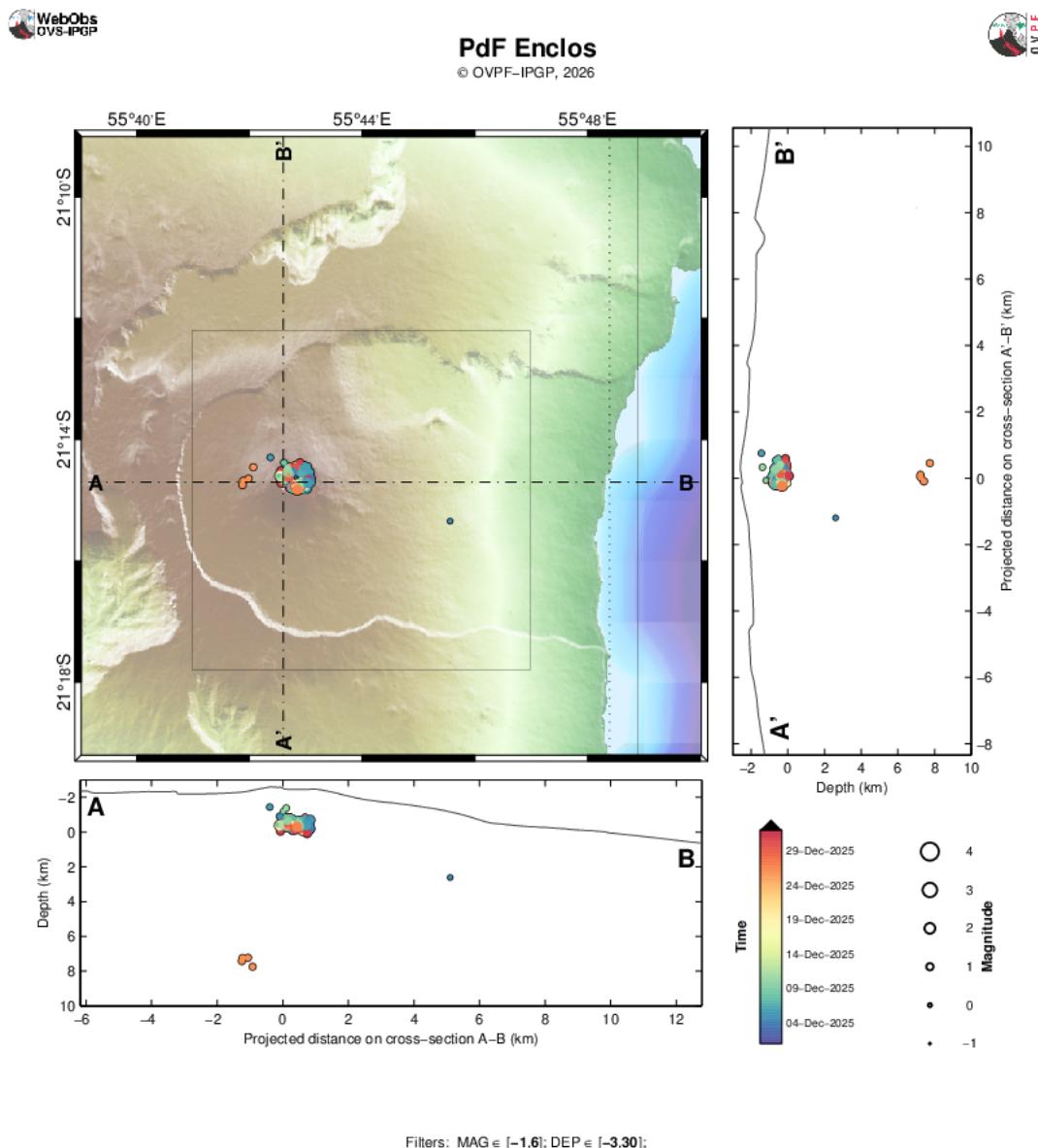


Figure 2: Seismicity below Piton de la Fournaise in December 2025. Location map (epicenters) and north-south and east-west cross-sections (hypocenters) of earthquakes as recorded by OVPF-IPGP. Only manually located earthquakes are shown on the map (© OVPF-IPGP).



Monthly Bulletin - December, 2025
Observatoire volcanologique du Piton de la Fournaise - IPGP

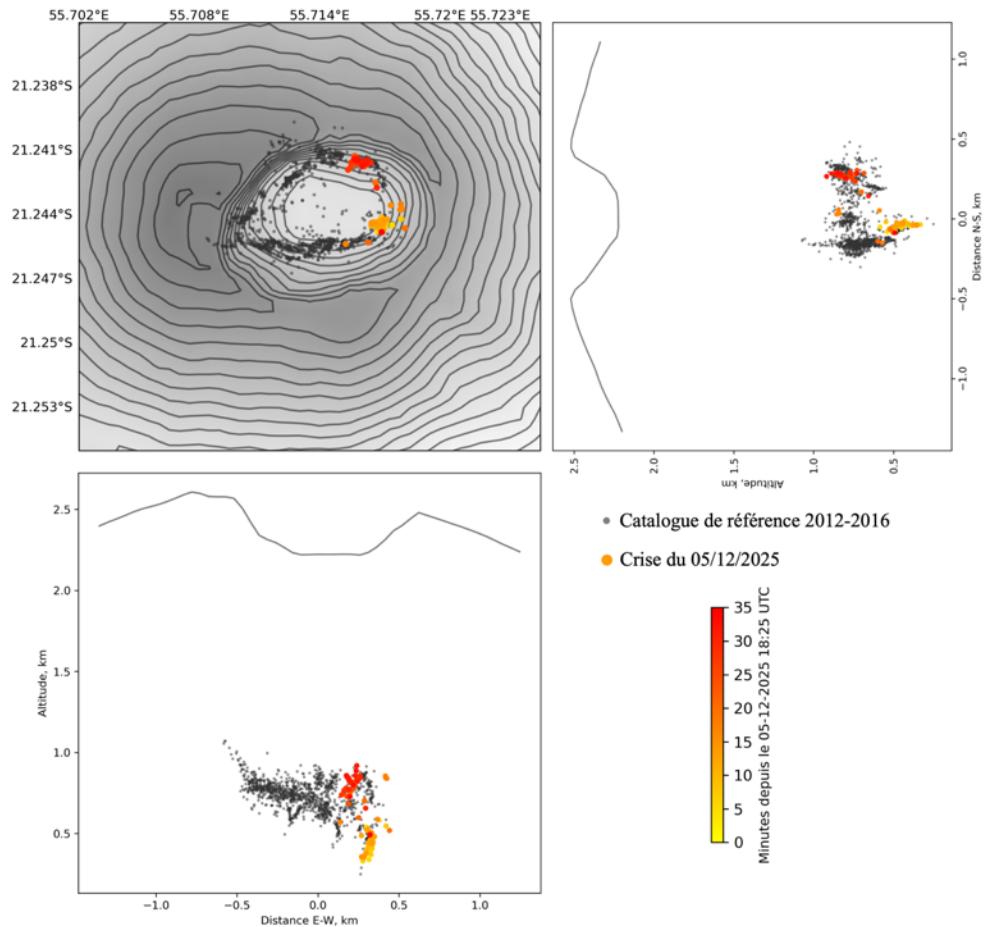


Figure 3: Seismicity recorded on December 5, 2025 (in color) below Piton de La Fournaise. Location map (epicenters) and north-south and east-west cross-sections (hypocenters) of earthquakes as recorded by OVPF-IPGP. Only manually located earthquakes are shown on the map. The earthquakes in black are the events from the 2012-2016 catalog (© OVPF-IPGP).

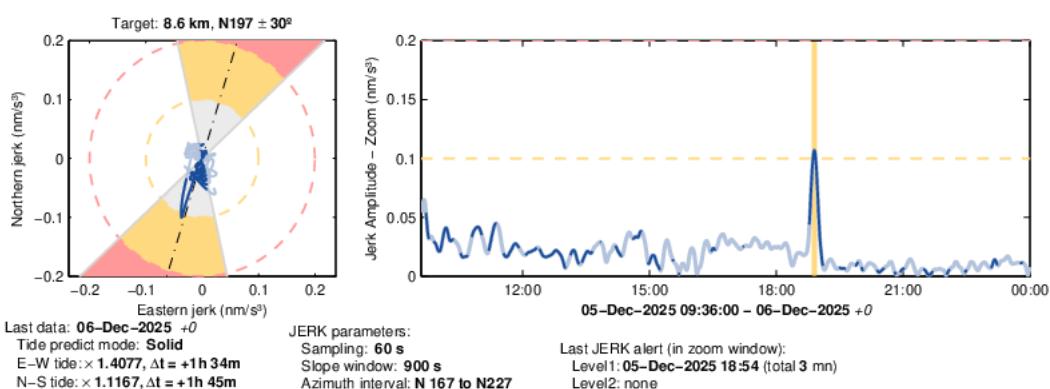


Figure 4: "Jerk" signal associated with the December 5, 2025 intrusion, derived from a combination of horizontal acceleration and tilt recorded at the Rivière de l'Est seismic station, triggered at 6:53 p.m. and with an amplitude of 0.1 nm/s³, which is the lower limit of the alert threshold. Left: particle motion showing the trajectory of the transient signal directed towards the summit of the volcano (dotted black line). Right: time signal indicating the peak exceeding the threshold (dotted orange line) (© OVPF-IPGP).



Deformation

The permanent network for monitoring deformation at Piton de la Fournaise currently comprises:

- 27 GNSS (Global Navigation Satellite System) stations,
- 11 pairs of tiltmeters at 10 different sites,
- 3 three-component extensometers.

Once the data have been retrieved (every 15 min to every day depending on the stations), they are automatically processed by two software programs (GAMIT/GLOBK and GipsyX, which replaced Gipsy in mid-2019). The GAMIT/GLOBK (Herring et al., 2010) and GipsyX (Bertiger et al., 2020) calculation chains, which complement each other (GipsyX is faster and GAMIT/GLOBK is more accurate), run in parallel.

It should be noted that all GNSS time series were updated in June 2025. They consist of a homogeneous reprocessing of all GNSS data, now available in RINEX3 format for the most recent data (since the end of May 2025 and retrospectively from January, 1 2019). The calculation is performed using the GipsyX software in version 2.3 (Murphy et al., 2024). These calculations incorporate the new JPL products in ITRF2020 (Altamimi et al., 2023, Rebischung et al., 2024) released since August, 25 2024 and made available retrospectively from January, 1 2002 (Murphy et al., 2024). The calculated coordinates are expressed relative to the Figure Centre (FC). The Figure Centre/Centre of Mass (CM) dichotomy is a concept introduced by ITRF2020, and GipsyX 2.3 works by default in CM, so we chose to perform a CM > FC transformation, which is more suitable for projects in small areas.

Observations

Between April 2024 and November 2025, GNSS data recorded deflation of the edifice visible both at the summit zone and in the far field (Figures 5 and 6).

Since late November, a change in trend has been visible on all baselines, with the onset of an increase of the distance reflecting inflation of the edifice. This inflation, whose source is shallow (above sea level) and located below the summit (Figure 7), corresponds to the pressurization of the volcano's shallow feeding system, which led to the December 5, 2025 intrusion.

The December 5, 2025 intrusion generated only slight ground deformation, which were not visible in the GNSS data but only in the more sensitive tiltmeter data (of the order of 8 microradians; Figure 8).

Following this intrusion, inflation slowed before ceasing on December 14, then resuming at the end of December 2025. This resumption of inflation is only visible at the summit stations and at the base of the terminal cone (Figures 5 and 6).



Monthly Bulletin - December, 2025

Observatoire volcanologique du Piton de la Fournaise - IPGP

WebObs
OVS-IPGP

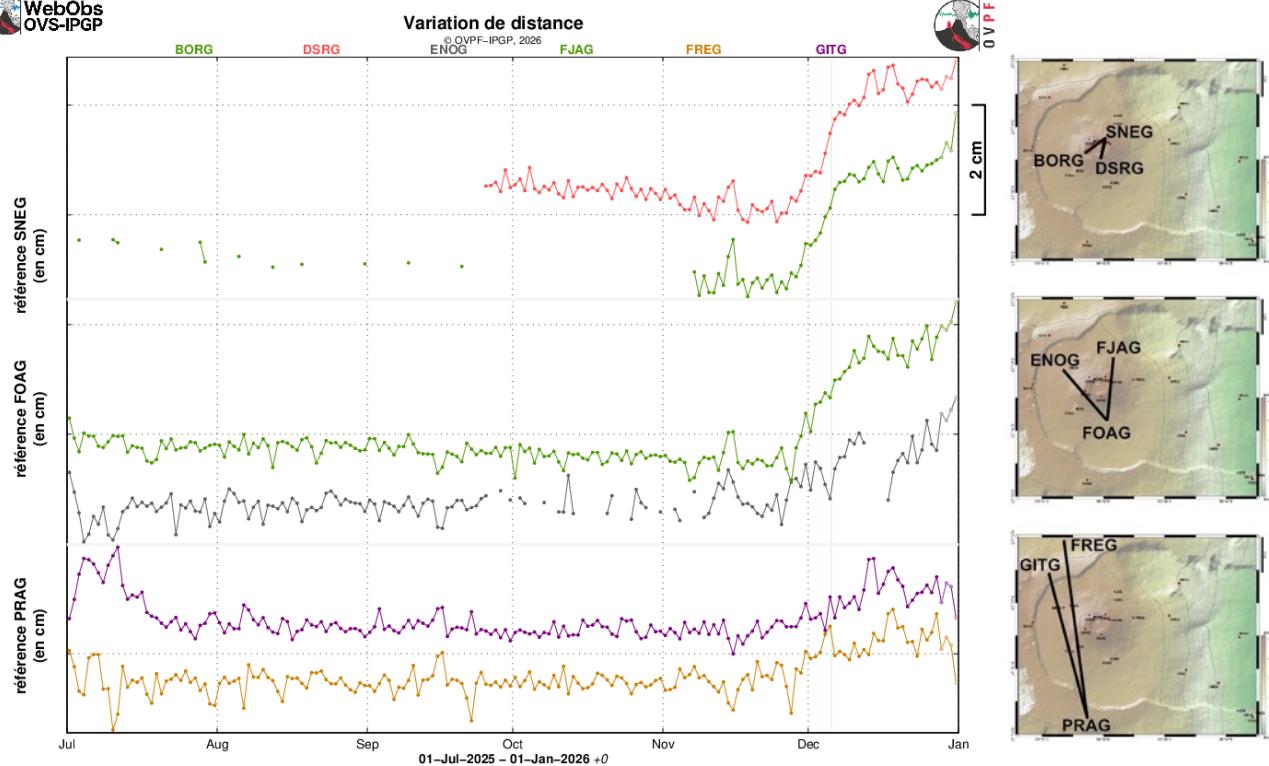


Figure 5: Ground deformation records over the past six months (in case of eruptive or intrusive periods, red and green bars represent eruptions and intrusions, respectively). The time series plots show the changes in distance between pairs of GPS stations located around the Dolomieu summit crater (reference: SNEG; top graph), the terminal cone (reference: FOAG; middle graph) and the Enclos Fouqué caldera (reference: PRAG; bottom graph), from north to south (see location on the right). Increasing distances (or baseline elongation) indicate volcano inflation, while decreasing distances (or baseline contraction) reflect edifice deflation (© OVPF-IPGP).



Monthly Bulletin - December, 2025

Observatoire volcanologique du Piton de la Fournaise - IPGP

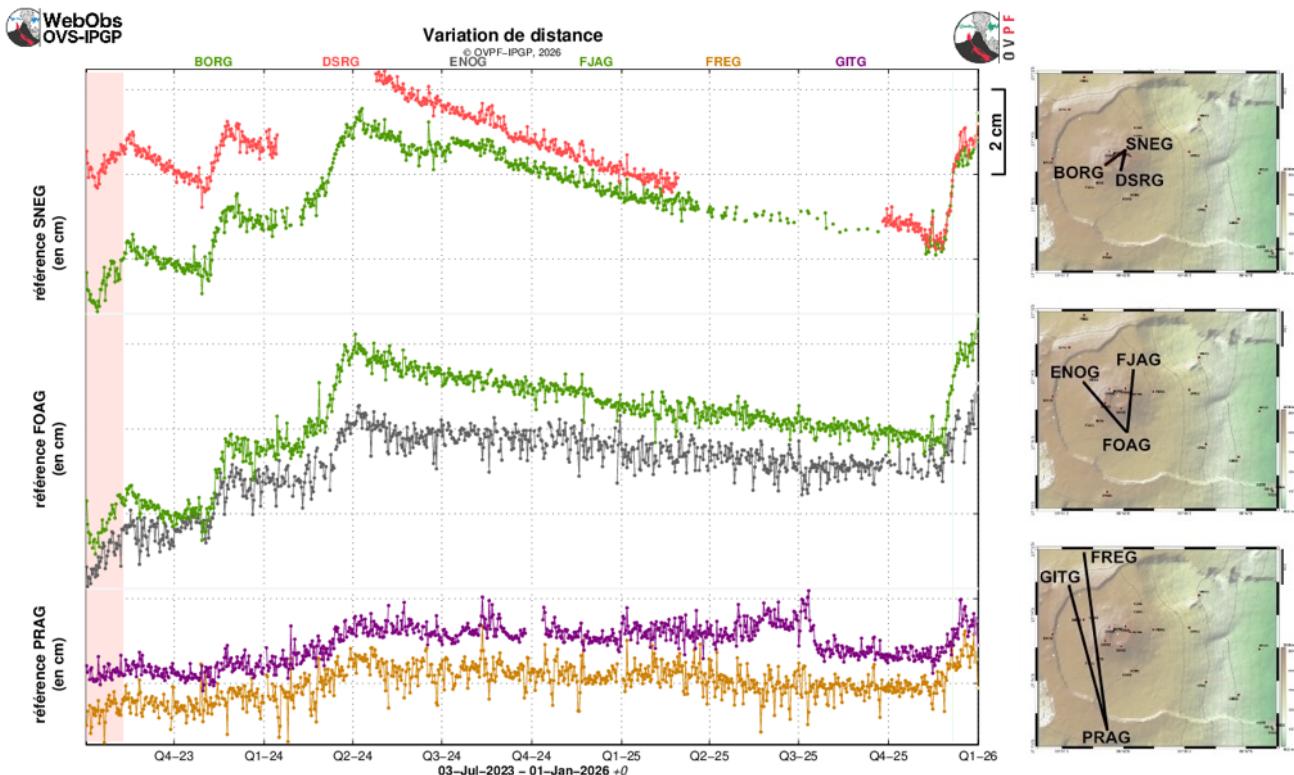


Figure 6: Ground deformation records since the last eruption in July-August 2023 (the eruptive period of July-August 2023 is shown in red). The time series plots show the changes in distance between pairs of GPS stations located around the Dolomieu summit crater (reference: SNEG; top graph), the terminal cone (reference: FOAG; middle graph) and the Enclos Fouqué caldera (reference: PRAG; bottom graph), from north to south (see location on the right). Increasing distances (or baseline elongation) indicate volcano inflation, while decreasing distances (or baseline contraction) reflect edifice deflation (© OVVF-IPGP).



Monthly Bulletin - December, 2025
Observatoire volcanologique du Piton de la Fournaise - IPGP

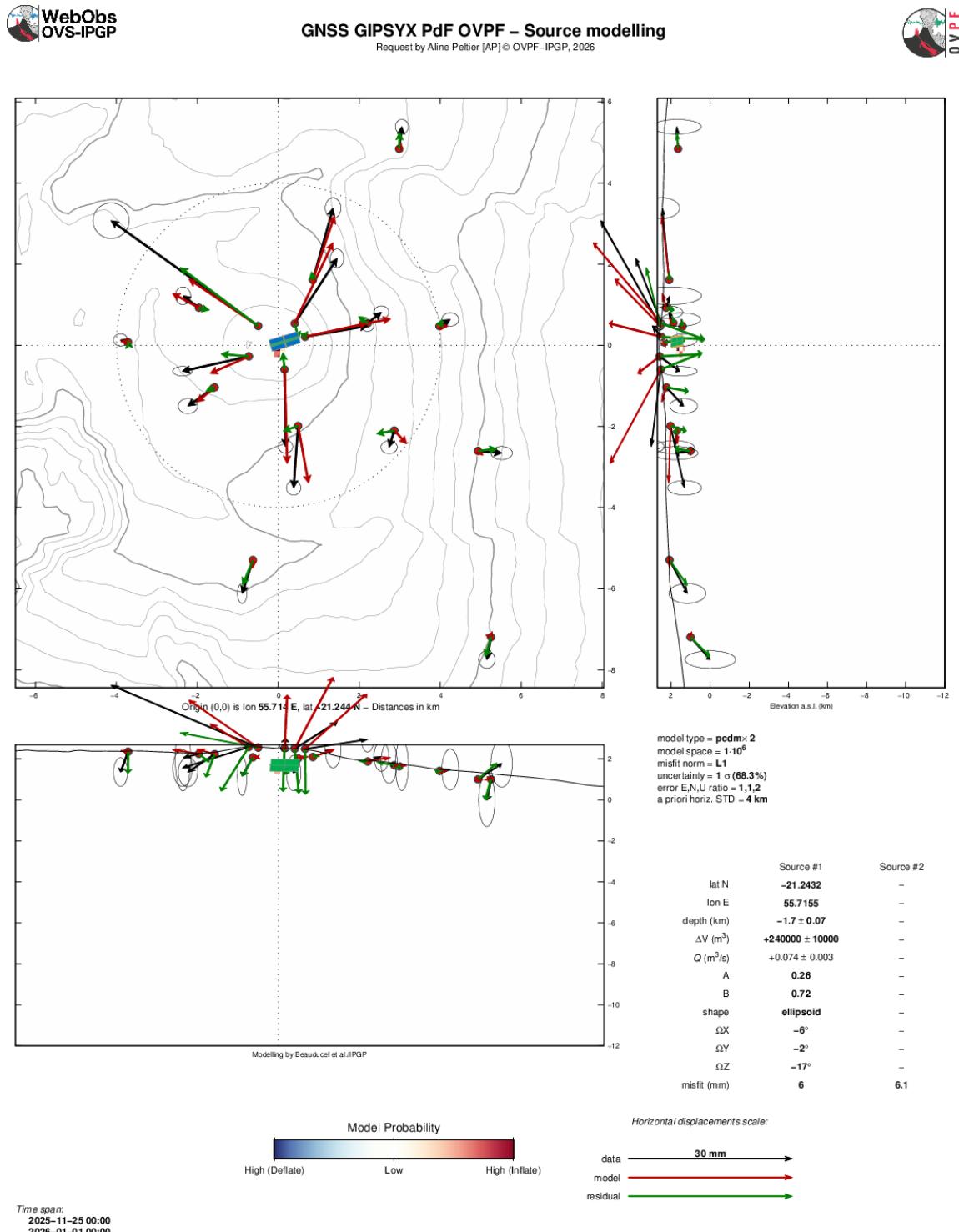


Figure 7: Modelling of the pressure source responsible of ground displacements between November, 25 and December, 31 2025 (pCDM model). The black vectors represent observed data, the red vectors represent modelled vectors, and the green vectors represent the residuals between observed and modelled vectors (© OVPF-IPGP).



Monthly Bulletin - December, 2025

Observatoire volcanologique du Piton de la Fournaise - IPGP

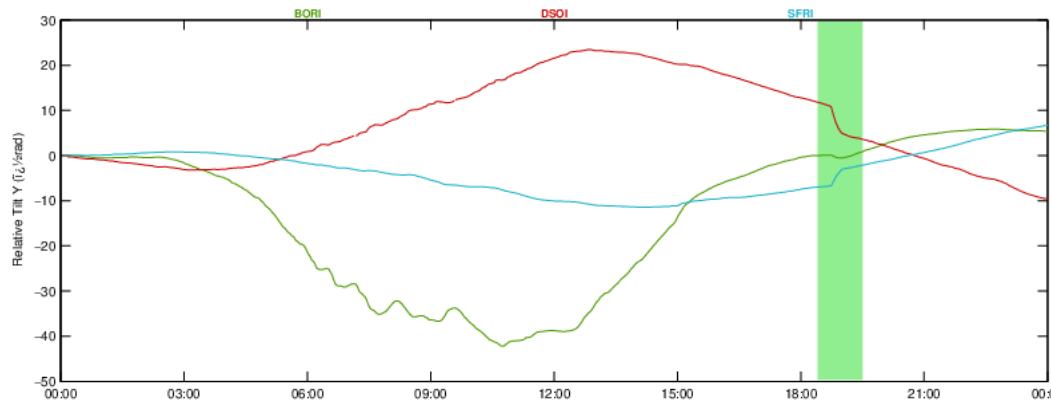


Figure 8: Evolution of the tilt variation recorded at the tiltmeter stations (radial component) at the summit of Piton de la Fournaise on December 5, 2025 (BORI: southwest of the Bory crater, DSOI: south of the Dolomieu crater, SFRI: north of the Dolomieu crater). The vertical bar represents the duration of the intrusion.

* Glossary: The summit GPS signals indicate the influence of a shallow pressure source below the volcano, while distant GPS signals indicate the influence of a deep pressure source below the volcano. Inflation usually means pressurization; and conversely deflation usually means depressurization.



Gas geochemistry

The permanent geochemical network for monitoring gas emissions from Piton de la Fournaise currently comprises:

- 3 MAX-DOAS stations measuring the optical thickness of SO₂ (ppm.m) in the atmosphere. Measurements are taken every 10 to 15 minutes during the day when weather conditions are favorable (Arellano et al., 2020).
- 1 MultiGaS station measuring excess H₂O, CO₂, SO₂ and H₂S relative to the atmosphere, with measurements taken every 6 hours.
- 4 stations measuring CO₂ flux through the soil. At these stations, meteorological parameters (temperature, pressure, humidity, wind speed and direction) are also recorded in order to correct signals from environmental disturbances (Boudoire, 2017; Bénard et al., 2023). Measurements are taken every hour.

Observations

CO₂ concentration in the soil

Since the last eruption of Piton de la Fournaise (July, 2 - August, 10 2025), an overall trend of decrease in soil CO₂ emissions is recorded on most stations, associated with moderate positive pulses having minor-moderate intensity (Figure 9). The PCRN station (located on the OVPF site at Bourg Murat) currently shows a trend of increase.

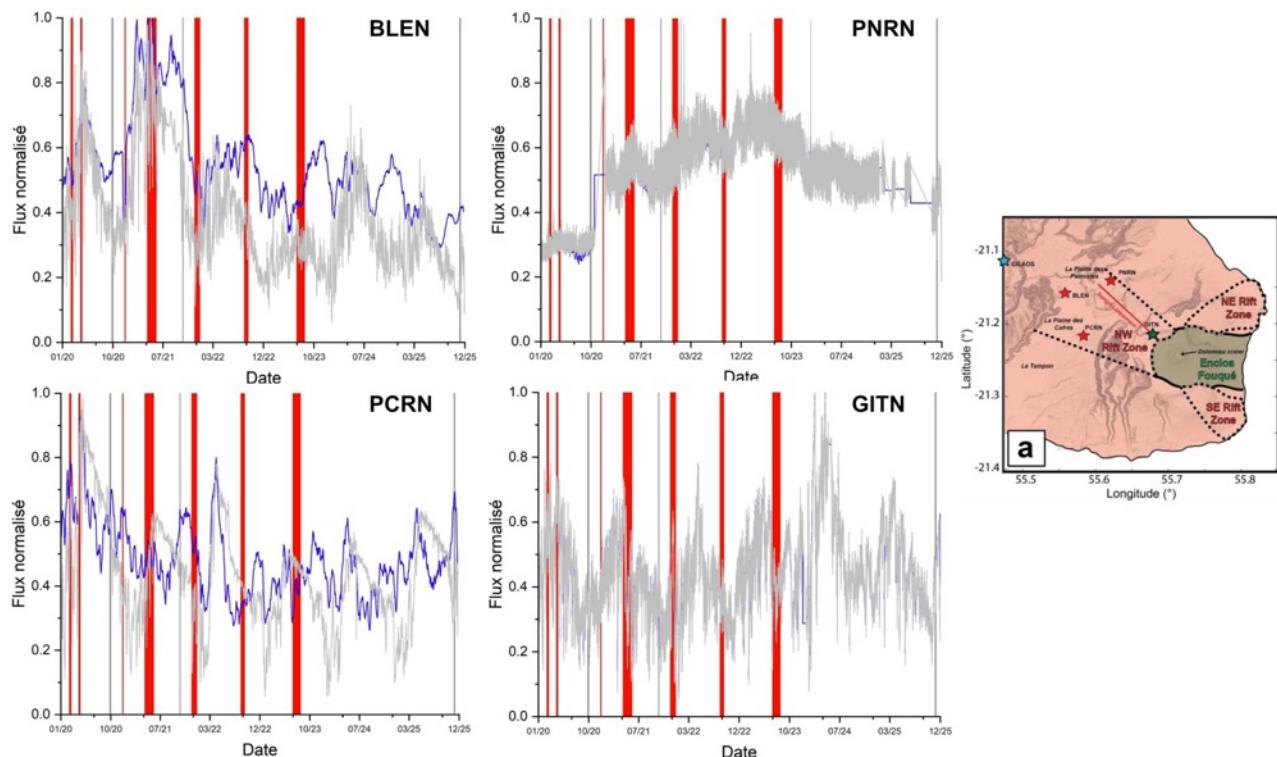


Figure 9: Normalized CO₂ soil emissions (grey: raw data) corrected for short period influence of environmental parameters (OVPF-correction model; 15 days moving average; in blue) of all CO₂ stations (see location on the map on the right). Red bars: eruptions; Gray bars: intrusions (© OVPF-IPGP).



* Glossary: *CO₂ is the first gas to be released from deep magma (rising from the mantle), so its detection in the far field often means a deep rise of magma. Its near-field evolution may be related to magmatic transfer in the shallowest part of the feeding system (< 2-4 km below the surface).*

Summit fumaroles composition obtained by the MultiGas method

- Since the installation of the new MultiGaS station at the summit in June 2024, SO₂ and H₂S concentrations at the volcano summit remain close to the detection levels.

Weak concentrations of SO₂ and H₂S (<0.3 ppmv, Figure 10) are associated with H₂O pulses and reveal a slight regain in activity of the hydrothermal system. A new phase of detection of weak sulfur concentration in the atmosphere at the volcano summit is recorded since November 10 and it is still ongoing.

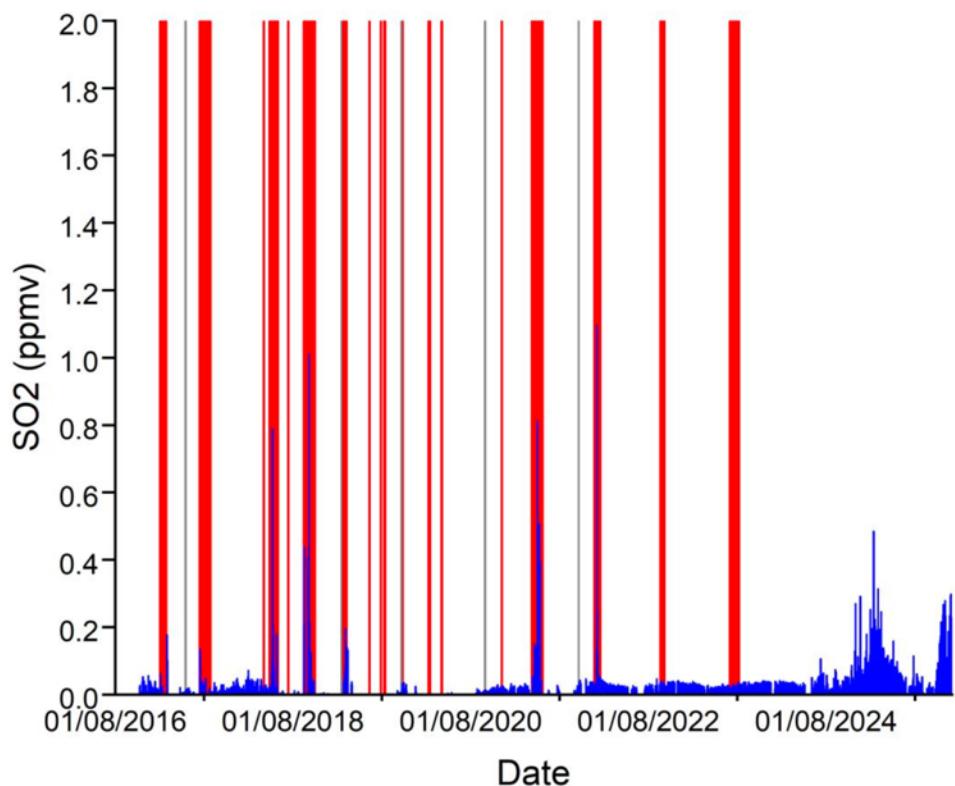


Figure 10: Raw (in blue) concentrations of SO₂ in the atmosphere at the summit of Piton de la Fournaise (MultiGaS station) Red bars: eruptions; Gray bars: intrusions.

* Glossary: *The MultiGaS method allows measuring the concentrations of H₂O, H₂S, SO₂ and CO₂ in the atmosphere at the summit of the Piton de la Fournaise volcano. Magmatic transfer in the Piton de la Fournaise feeding system can result in an increase in SO₂ concentrations and in the C/S ratio (carbon/sulfur).*



SO₂ flux in the air obtained by DOAS method

The SO₂ fluxes in the air were low; close or below the detection threshold.

* Glossary: During rest periods, SO₂ flux at Piton de la Fournaise is below the detection threshold. The SO₂ flux may increase during magma transfer in the shallowest part of the feeding system. During eruptions, it is directly proportional to the amount of lava emitted at the surface.

Phenomenology

One intrusion, not reaching the surface, occurred in December 5, 2025, between 18h50 and 19h30 (UTC time). The locations of the earthquakes show that the magma propagated vertically less than 500 m and remained deep beneath the eastern edge of the Dolomieu crater (Figures 3 and 11).

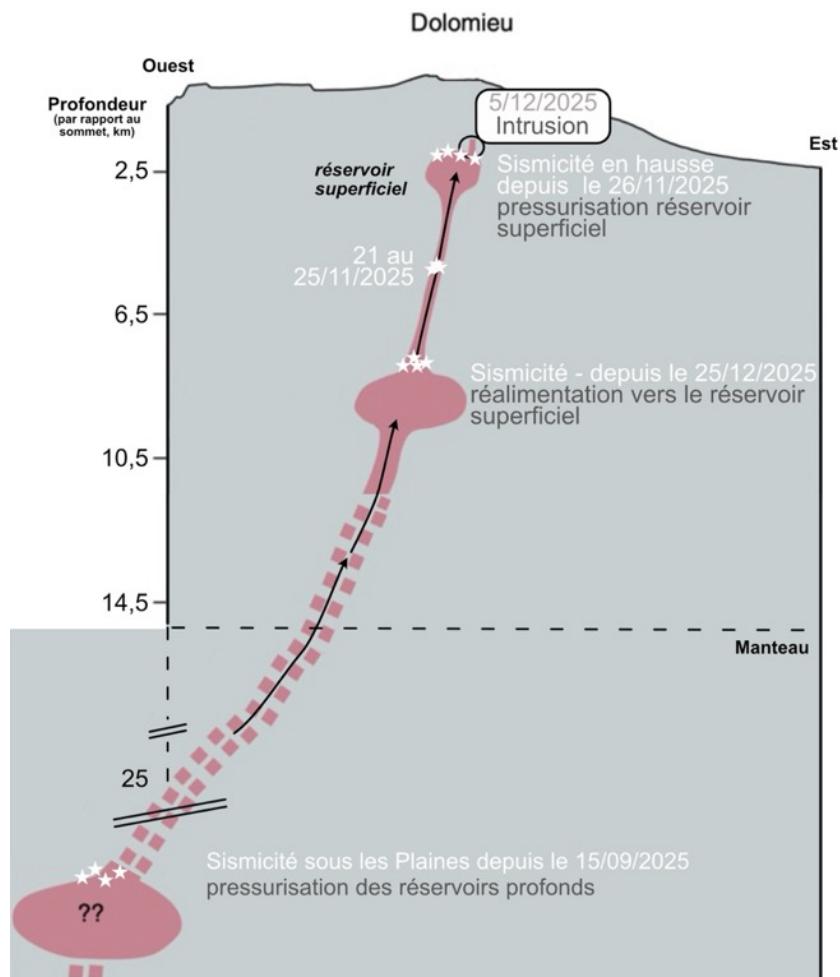


Figure 11: Schematic view of the magma feeding system of Piton de la Fournaise with the main phases of reactivation observed since mid-September 2025. Since most earthquakes are very low in magnitude, most of them cannot be located. The white stars represent the schematic locations of the earthquakes (© OVPF-IPGP).



Summary

The reactivation of the shallow magma plumbing system observed since November 2025 continued in December 2025. This pressurization caused the seismic swarm of December 5, 2025, linked to a magma injection from the shallow reservoir towards the surface but which did not reach the surface (magma intrusion, Figure 11).

Following this intrusion, seismic activity continued and inflation persisted until December 14 before ceasing and then resuming at the end of December. The process of the reactivation of the feeding system, with pressurization of the shallow reservoir (located near sea level beneath the Dolomieu crater), therefore continued throughout December 2025, and with a likely new influx of deep magma observed from December 25, 2025 onwards, evidenced by the resumption of the deep seismicity (Figure 11).

It should be noted that this process of pressurization of the shallow reservoir can last from several days to several weeks - even several months - before the roof of the reservoir ruptures, resulting in magma injection towards the surface and potentially causing an eruption, but it can also stop without causing an eruption in the short term.



B. Seismic activity on La Réunion and in the Indian Ocean basin

Local and regional seismicity

In December 2025, the OVPF-IPGP recorded:

- 63 local earthquakes (below the island, within a radius of 200 km around the island, Figures 12 and 13);
- 1 regional earthquake (in the Indian Ocean basin).

In December 2025, the OVPF-IPGP recorded 63 local earthquakes located mainly below the *Plaines* and *Roche Ecrte* areas (Figure 13). Most of these earthquakes have magnitude less than 1 and are difficult to locate.

These earthquakes were located between 10 km and 25 km depth in oceanic lithosphere on which was built the volcanic edifice at the origin of La Réunion island.

Deep seismicity located beneath the *Plaines* areas decreased over the month of December 2025, with activity dropping below an average of one earthquake per day. This decrease follows a period of increased activity in this deep part of the magma feeding system, during which 1 to 3 earthquakes per day had been detected since mid-September 2025.

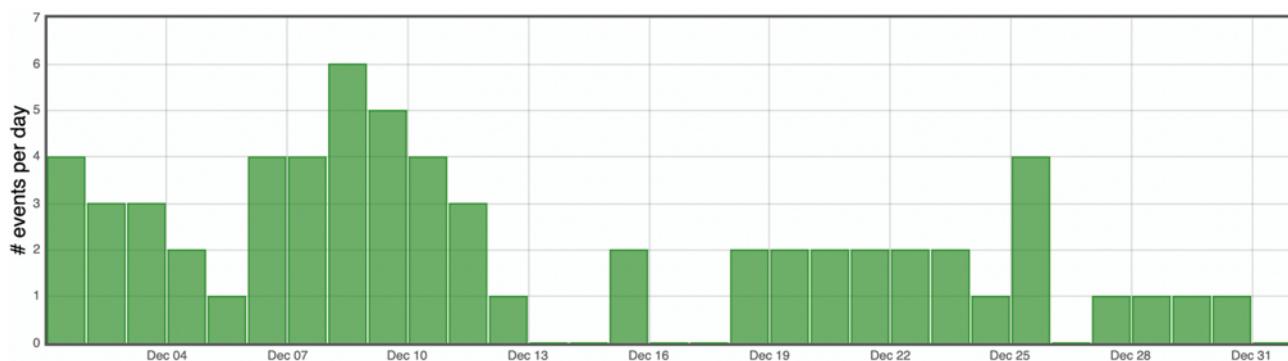


Figure 12: Number of local earthquakes (La Réunion island) per day recorded in December 2025 (© OVPF-IPGP).



Monthly Bulletin - December, 2025
Observatoire volcanologique du Piton de la Fournaise - IPGP

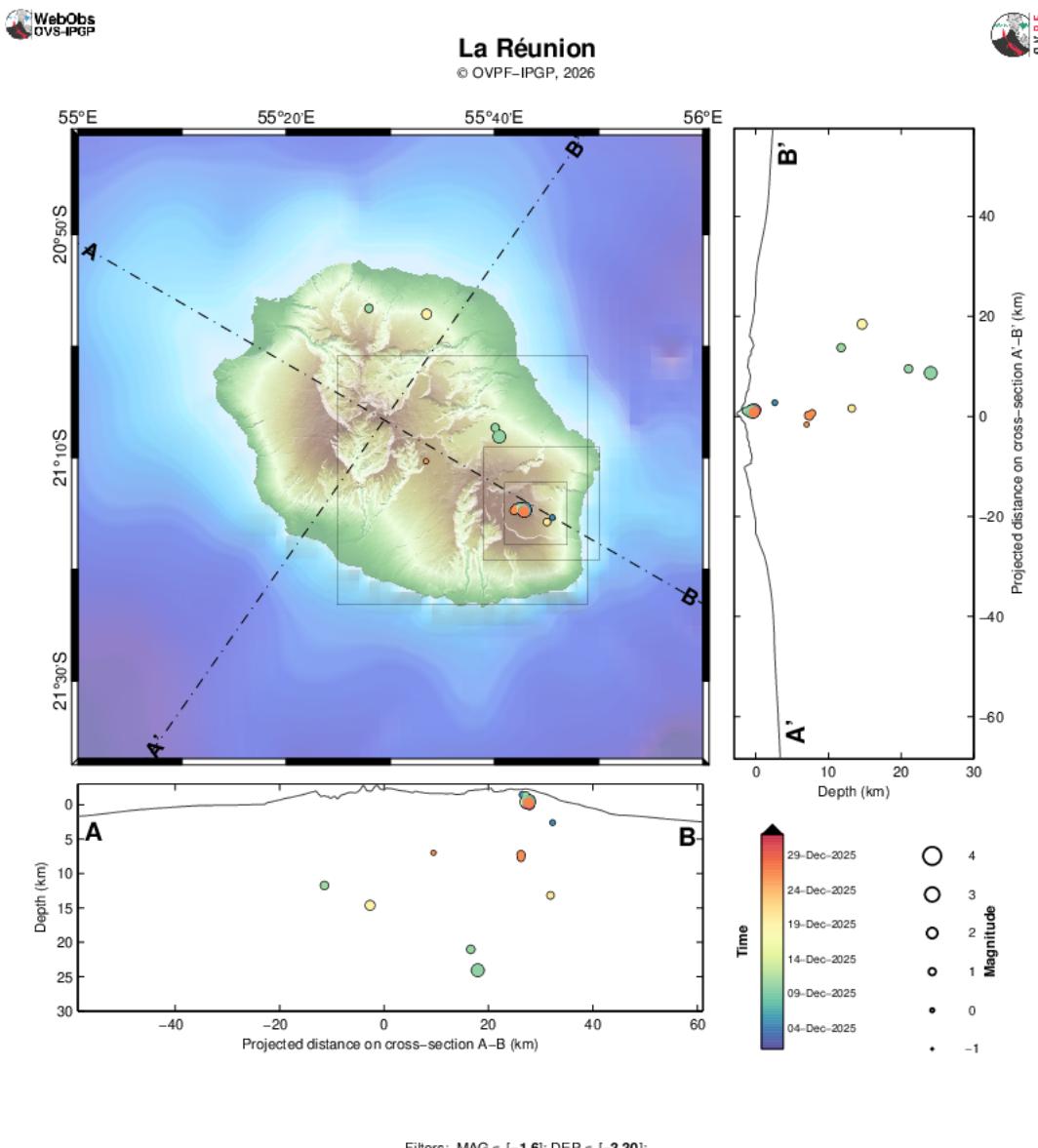


Figure 13: Seismicity below La Réunion in December 2025. Location map (epicenters) and north-west – south-east and south-west – north-east cross-sections (hypocenters) of earthquakes as recorded by OVPF-IPGP. Only localizable earthquakes are shown on the map (© OVPF-IPGP).



Monthly Bulletin - December, 2025

Observatoire volcanologique du Piton de la Fournaise - IPGP

Seismic-volcano activity in Mayotte

The « REseau de surveillance VOlcanologique et Sismologique de MAyotte (REVOSIMA) » is the structure in charge of the volcano and seismic monitoring of Mayotte. IPGP and BRGM coordinate and manage REVOSIMA. Operational monitoring of seismo-volcanic activity is carried out by IPGP (OVPF), under the joint responsibility of BRGM and in close association with IFREMER and CNRS. REVOSIMA is supported by a scientific and technical partnership. The REVOSIMA consortium: IPGP and Université Paris Cité, BRGM, IFREMER, CNRS, BCSF-RéNaSS, ITES and Université de Strasbourg, IGN, ENS, SHOM, TAAF, Météo France, CNES, Université Grenoble Alpes and ISTerre, Université Clermont Auvergne, LMV and OPGC, Université de La Réunion, Université Paul Sabatier, Toulouse and GET-OMP, Université de la Rochelle, Université de Bretagne Occidentale, IRD and collaborators.

All information on the REVOSIMA and the activity in Mayotte can be found on the dedicated webpages:

- <https://www.ipgp.fr/observation/infrastructures-nationales-hebergees/revosima/>
- <https://www.ipgp.fr/actualites-du-revosima/>
- <https://www.facebook.com/ReseauVolcanoSismoMayotte/>
- <https://bsky.app/profile/revosima.bsky.social>

January, 3 2025
OVPF-IPGP Director



C. Appendix

Definition of Volcanic Alert Levels for Piton de la Fournaise

from *disposition spécifique « Volcan Piton de la Fournaise » - arrêté n°2242*- Emergency plan set up by the department responsible for the protection of the population in the event of unrest or activity of the Piton de la Fournaise

- “**Vigilance**”: possible eruption in medium term (a few days or weeks) **or** presence of risks on the sector (rockfalls, increase of gas emissions, still hot lava flows...).

Access to the Enclos Fouqué caldera and to the summit volcano are allowed with restrictions.

- “**Alert 1**”: probable or imminent.

Access to the Enclos Fouqué caldera and to the summit are closed and prohibited.

- “**Alert 2**”: ongoing eruption.

Alert 2-1: ongoing eruption inside the Enclos Fouqué caldera without threat to the safety of people, property or the environment

Alert 2-2: ongoing eruption inside the Enclos Fouqué caldera with direct or indirect threat to the safety of people, property or the environment.

Access to the Enclos Fouqué caldera and to the summit are closed and prohibited. For Alert 2-2, evacuation of the people and vehicles depending on the issues.

- “**Alert 2-3**”: ongoing eruption outside the Enclos Fouqué caldera with threat to the safety of people, property or the environment.

Access to the Enclos Fouqué caldera and to the summit are closed and prohibited. Evacuation of the people and vehicles depending on the issues.

- “**Sauvegarde**”: end of eruption.

Evaluation of a partial reopening of the Enclos Fouqué caldera access.



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Acknowledgments

Thank you to organizations, communities and associations for publicly posting this report for the widest dissemination

Information

All information on the Piton de la Fournaise activity can be found on the OVPF-IPGP media:

- Internet website : ipgp.fr/fr/ovpf/actualites-ovpf
- Bluesky : @ovpf.bsky.social
- Facebook : facebook.com/ObsVolcanoPitonFournaise

A preliminary automatic daily bulletin of the OVPF-IPGP, relating to the activities of the day before, validated by an analyst, is published daily. It can be accessed directly at this link:

http://volcano.ipgp.fr/reunion/Bulletin_quotidien/bulletin.html

The seismicity validated in continuous by OVPF-IPGP can also be followed on the RENASS portal: <https://renass.unistra.fr/fr/zones/la-reunion>

The OVPF-IPGP data are distributed by the IPGP data centre - Volobsis - and are also available on the EPOS and Epos-France websites (doi:10.18715/REUNION.OVPF).

The information in this document may not be used without explicit reference.