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Observatoire volcanologique du Piton de la Fournaise

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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
(Since November 28, 2025)

(cf. table in the appendix)

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

- 350 shallow volcano-tectonic earthquakes (0 to 2.5 km above sea level) below the summit craters;
- 24 deep earthquakes (below sea level);
- 26 long-period earthquakes;
- 277 rockfalls.

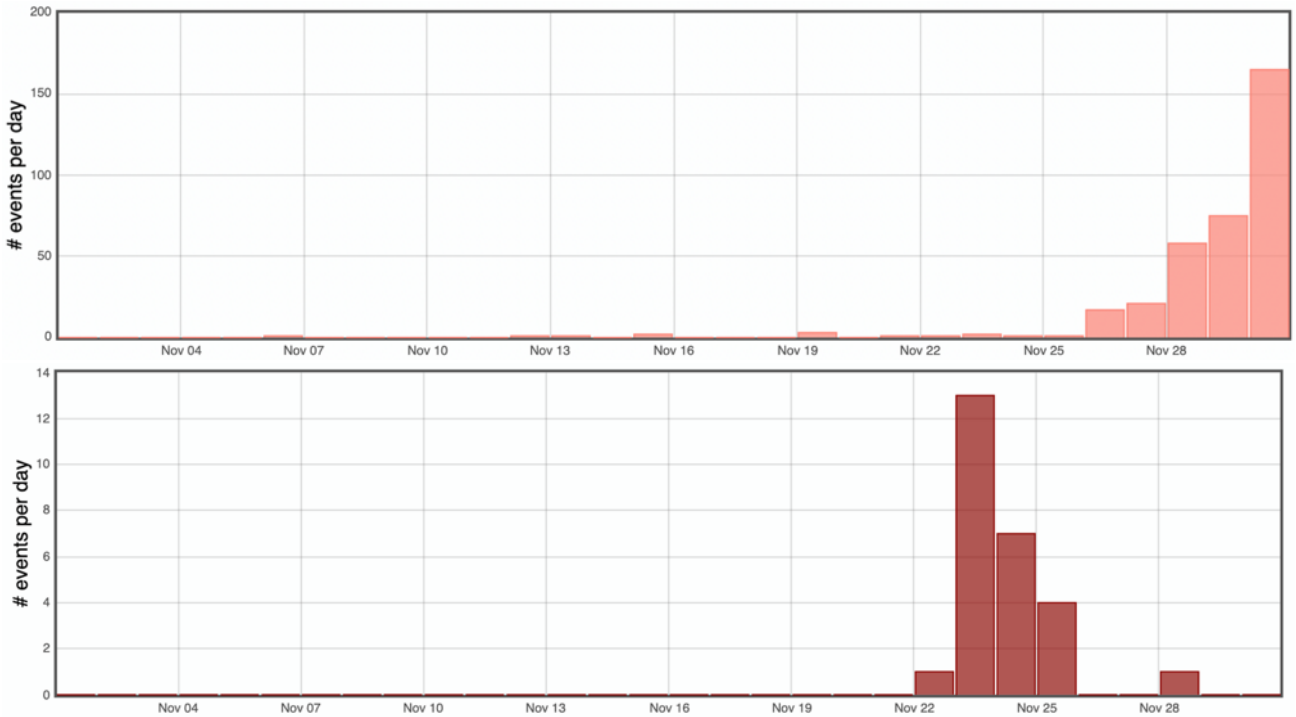

Figure 1: Number of (top) shallow and deep (bottom) volcano-tectonic earthquakes per day recorded in November 2025 (© OVPF-IPGP).

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The deep seismicity recorded beneath the *Plaines* region since mid-September 2025 continued in November (see section on local and regional seismicity for more details). These events, located at a depth of around 20 km, indicate persistent activity in the deep transfer zone, consistent with magma movements at great depth.

Between November, 22 and 26, deep seismicity also occurred at a depth of around 5 km beneath the northern edge of the Piton de la Fournaise summit (Figures 1 and 2). A total of 26 deep volcano-tectonic earthquakes were recorded during this period. The magnitudes remained very low, and the intensity of this sequence remains well below that observed during the deep reactivations of 1998 and 2015 in the same area.

Between November, 24 and 26, this deep activity was accompanied by the appearance of several long-period (LP) events, possibly reflecting degassing or fluid circulation processes in the magmatic system. A total of 24 LP events were detected.

From November, 26 onwards, a significant increase in shallow seismicity was recorded along the annular fault located above the shallow magma reservoir (Figure 2). The number of shallow volcano-tectonic events increased sharply over the following days: (Figure 1):
26/11: 17 events,
27/11: 21 events,
28/11: 58 events,
29/11: 75 events,
30/11: 165 events.
This increase reflects a gradual acceleration of the seismic activity beneath the summit area, consistent with possible pressurization of the shallow reservoir.

Numerous rockfalls (277) 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).

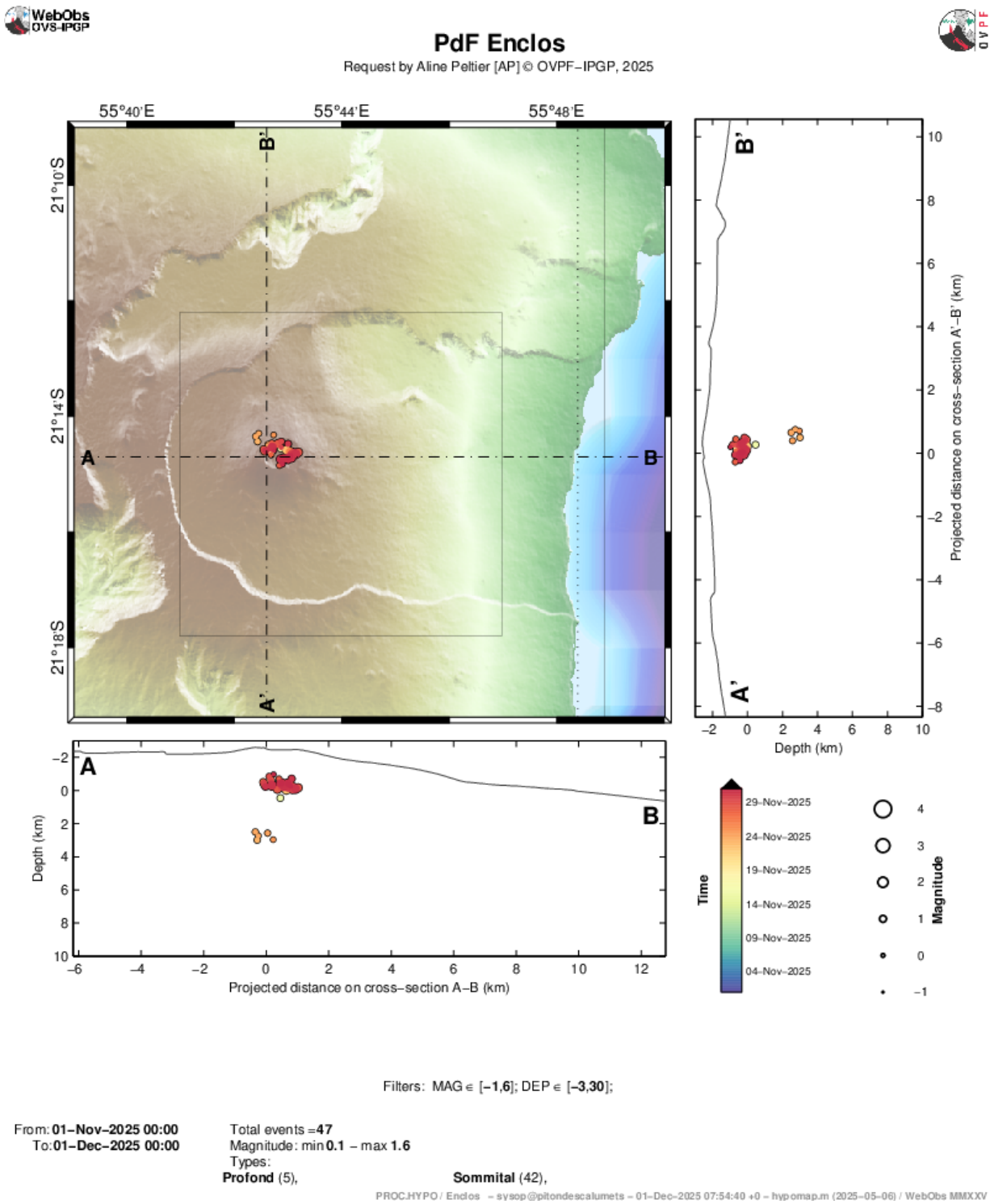

Figure 2: Seismicity below Piton de la Fournaise in November 2025. Location map (epicenters) and north-south and east-west cross-sections (hypocenters) of earthquakes as recorded by OVPF-IPGP. Only manually located earthquakes are shown on the map (© OVPF-IPGP).

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 3 and 4).

Since late November, a change in trend has been visible on the summit baselines, with the onset of an increase of the distance reflecting inflation of the summit area. This inflation, whose source is shallow (towards sea level, i.e. about 2.5 km below the summit, Figure 6), corresponds to the pressurization of the volcano's shallow feeding system.

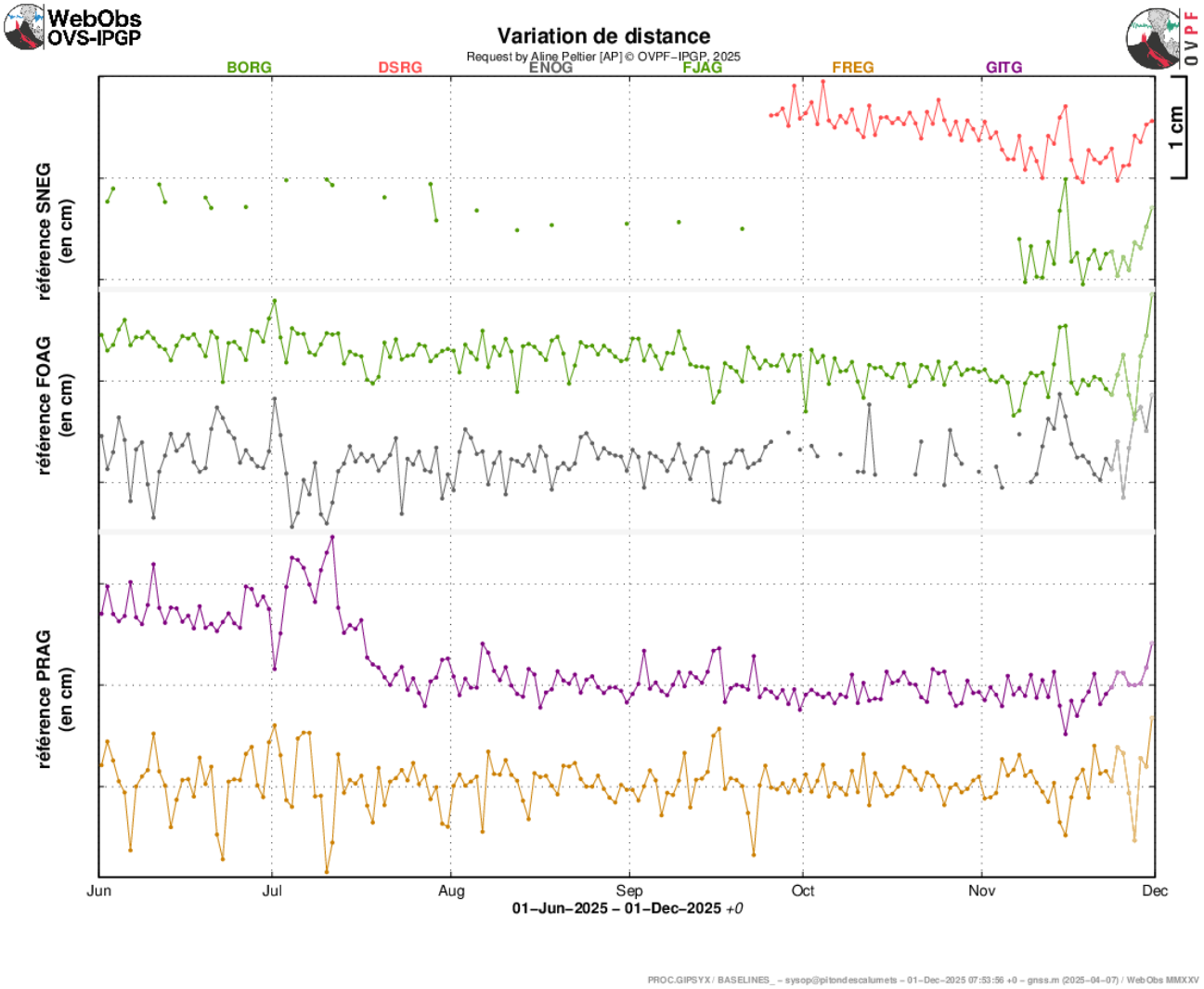

Figure 3: Ground deformation records over the past six months (in case of eruptive or intrusive periods, red and green bars represent eruptions and intrusions, respectively). The time series plots show the changes in distance between pairs of GPS stations located around the Dolomieu summit crater (reference: 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 in Figure 5). Increasing distances (or baseline elongation) indicate volcano inflation, while decreasing distances (or baseline contraction) reflect edifice deflation (© OVPF-IPGP).

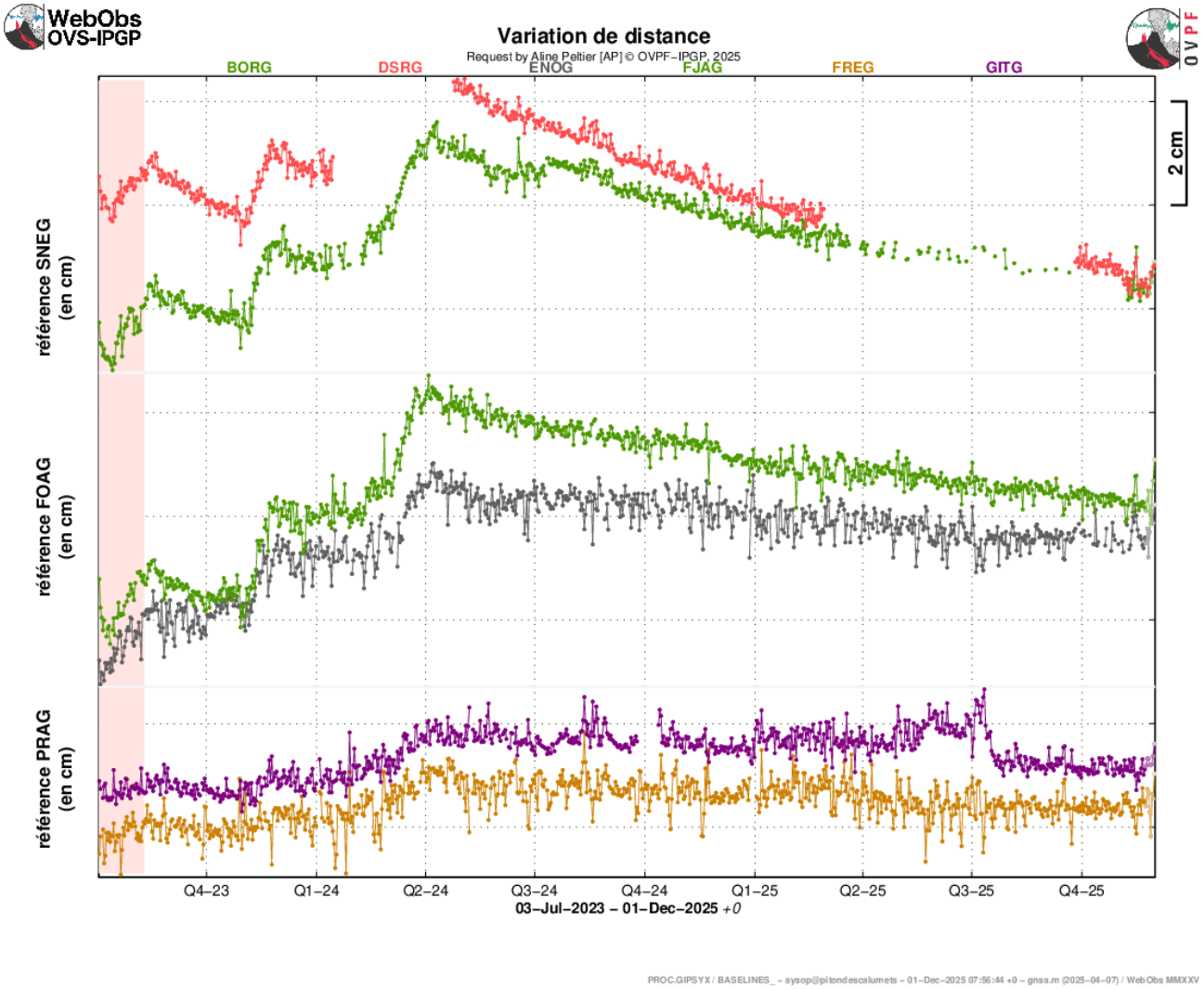

Figure 4: Ground deformation records since the last eruption in July-August 2023 (the eruptive period of July-August 2023 is shown in red). The time series plots show the changes in distance between pairs of GPS stations located around the Dolomieu summit crater (reference: SNEG; top graph), the terminal cone (reference: FOAG; middle graph) and the Enclos Fouqué caldera (reference: PRAG; bottom graph), from north to south (see location in Figure 5). Increasing distances (or baseline elongation) indicate volcano inflation, while decreasing distances (or baseline contraction) reflect edifice deflation (© OVPF-IPGP).

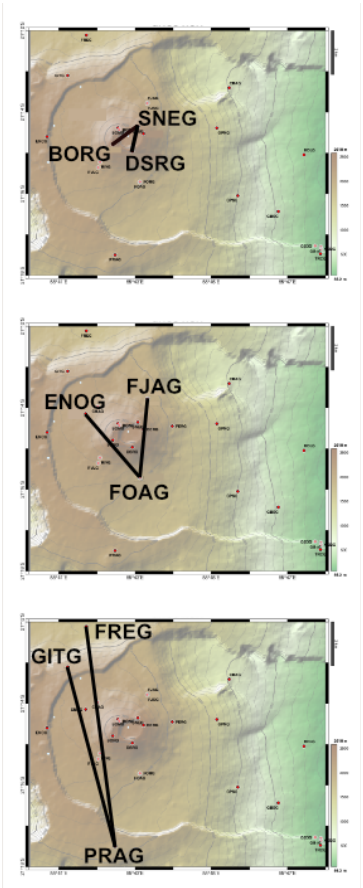

Figure 5: Location map of GPS stations and baselines as discussed in the text and shown in Figures 3 and 4 (© OVPF-IPGP).

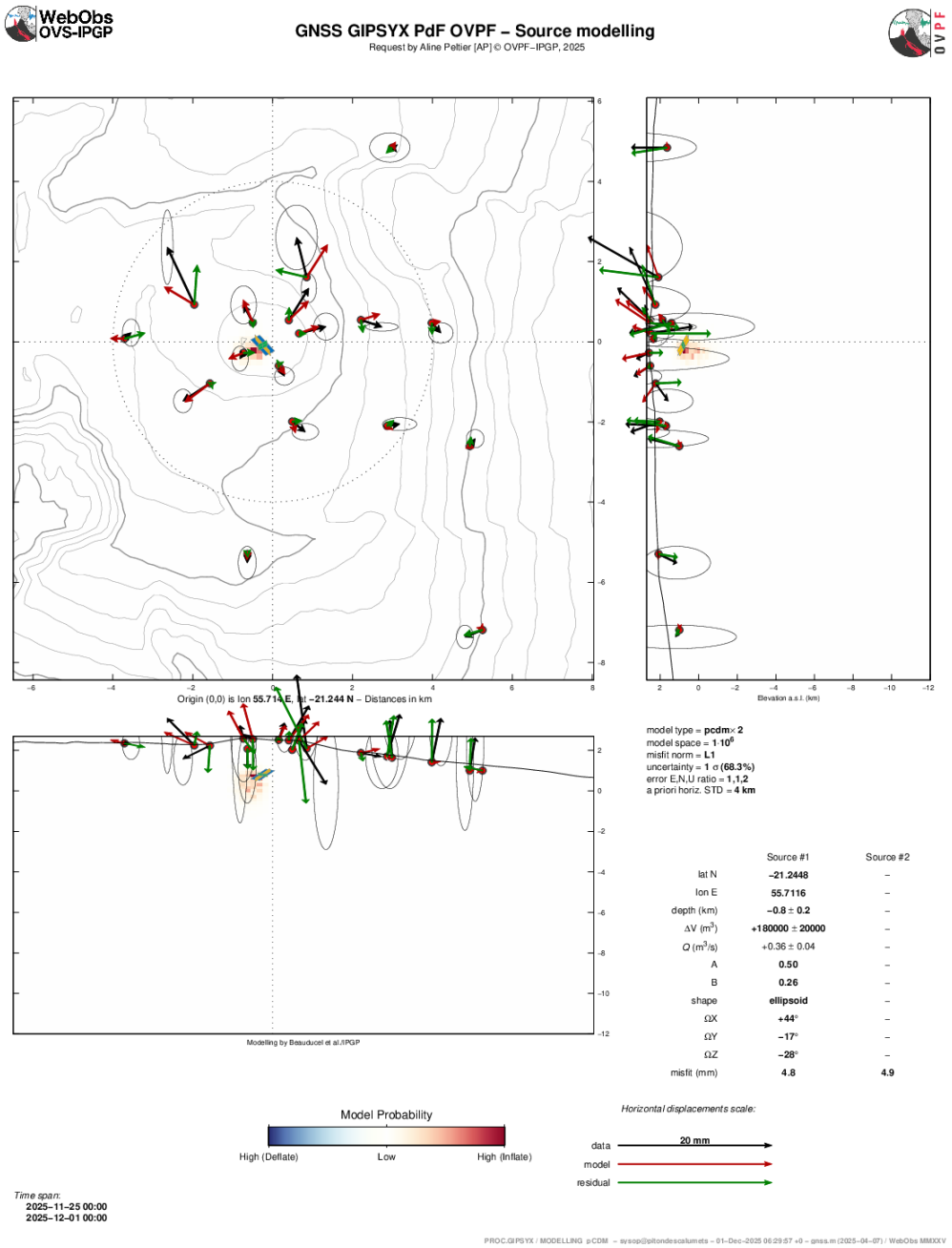

Figure 6: Modelling of the pressure source responsible of ground displacements between November, 25 and 30 2025 (pCDM model). The black vectors represent observed data, the red vectors represent modelled vectors, and the green vectors represent the residuals between observed and modelled vectors (© OVPF-IPGP).

** 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

CO_2 concentration in the soil

Since the last Piton de la Fournaise eruption (July, 2 – August 10, 2023), an overall trend of decrease in soil CO_2 emissions is recorded, associated by moderate positive pulses (Figure 7).

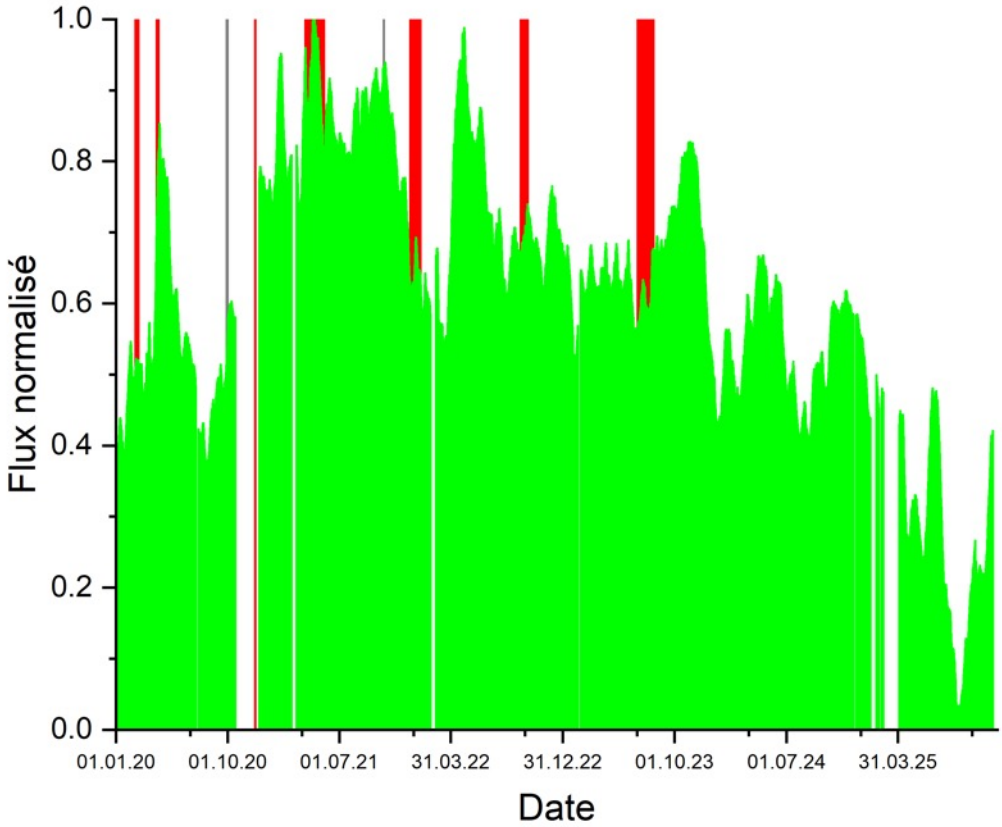

Figure 7: Normalized average of soil CO_2 flux corrected for short influence of environmental parameters (OVPF-model; 15 days moving average; in green) from all distal stations. Red bars: eruptions; Gray bars: intrusions.

A first positive pulse was recorded from mid-October 2023 and it stopped in mid-November 2023.

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Following the cyclonic event of January 15th 2024, a rapid increase in soil CO_2 fluxes was observed from January 19th in both proximal and distal locations on the western flank of Piton de la Fournaise. This second phase of slow progressive increase lasted till May 2024 and attained unusually high values in the proximal GITN site. Isotopic fluid compositions did not show an increase of the magmatic component in the fluids during this phase (Figure 8).

A third phase of moderate increase in soil CO_2 emissions, recorded mostly by the distal stations, was detected between November and December 2024, when concentrations started to decrease again (Figure 7). A new minor pulse in soil CO_2 emissions in the distal sites has been recorded between June and July 2025.

Since the last eruption of Piton de la Fournaise in July-August 2023, an overall trend of decrease in soil CO_2 emissions is recorded on all stations, associated with moderate positive pulses having minor-moderate intensity. The last positive pulse has started in September 2025 and is still ongoing.

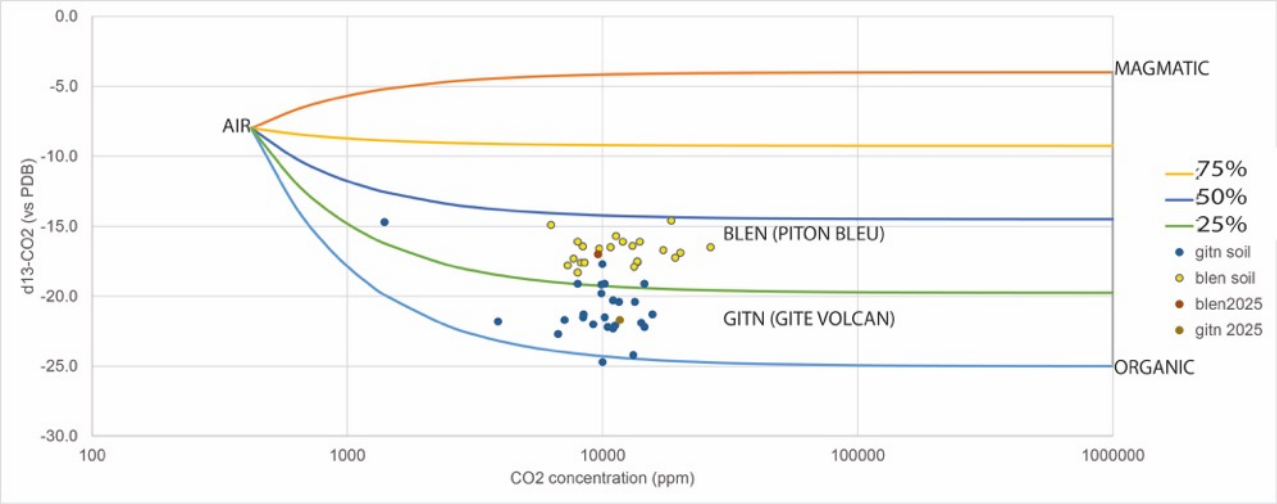

Figure 8: Carbon isotope (δ13C) variations in CO_2 from soil gas emitted from a proximal (GITN) and distal (BLEN) station. Measurements performed at the beginning (March 2024) of the peak phase in CO_2 emissions do not show a strong increase in the percentage of magmatic contribution.

** Glossary: CO_2 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, SO_2 and H_2S concentrations at the volcano summit remain close to the detection levels.

Weak concentrations of SO_2 and H_2S (<0.3 ppmv, Figure 9) are associated with H_2O 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.

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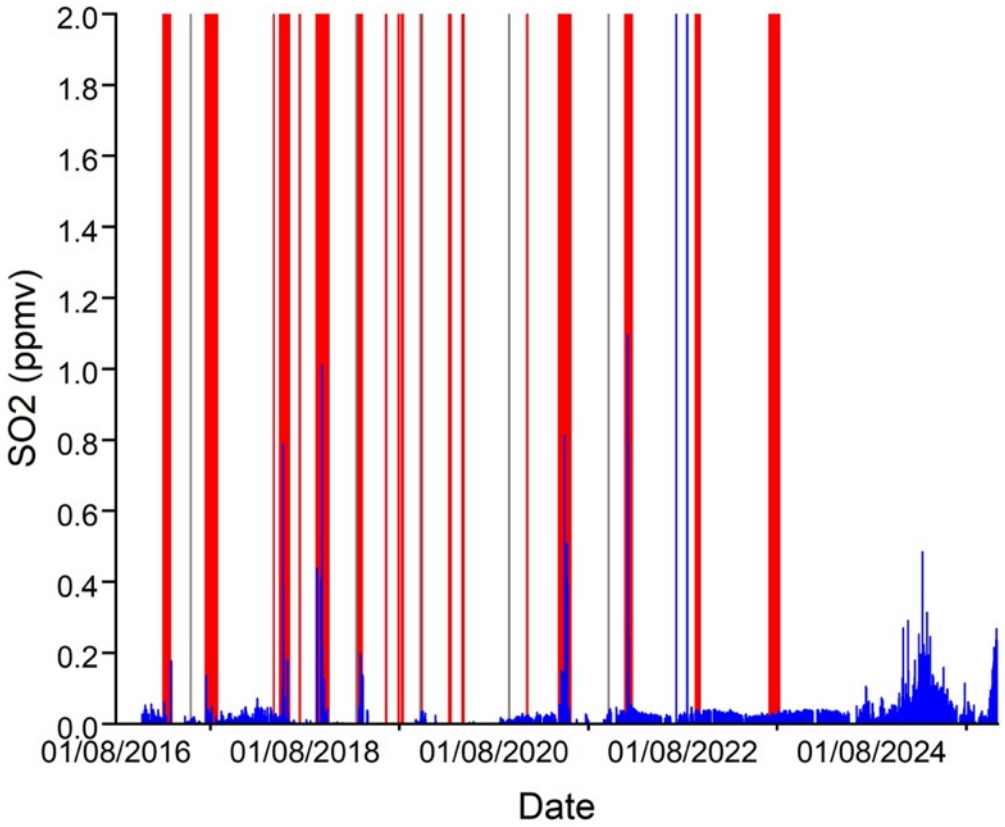

Figure 9: Raw (in blue) concentrations of SO_2 in the atmosphere at the summit of Piton de la Fournaise (MultiGaS station) Red bars: eruptions; Gray bars: intrusions.

** Glossary: The MultiGaS method allows measuring the concentrations of H_2O, H_2S, SO_2 and CO_2 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 SO_2 concentrations and in the C/S ratio (carbon/sulfur).*

SO_2 flux in the air obtained by DOAS method

The SO_2 fluxes in the air were low; close or below the detection threshold.

** Glossary: During rest periods, SO_2 flux at Piton de la Fournaise is below the detection threshold. The SO_2 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.*

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Phenomenology

No eruptive activity reported in November 2025.

Summary

Between April 2024 and November 2025, magma recharge and pressurization of the shallow magma reservoir stopped.

In November 2025, a reactivation of the shallow magma plumbing system was observed. Since November, 22 2025, an increase in seismicity beneath the summit area of the edifice has been recorded. This sequence was initially marked by deep seismicity beneath the northern rim of the *Dolomieu* crater (4–5 km deep). From November, 24 onwards, this deep activity was accompanied by the appearance of several long-period (LP) events, then, from November 26 onwards, by an increase in more shallow seismicity, at a depth of around 2 km below the summit.

This seismicity has been accompanied by low increase in concentrations of sulphur in the atmosphere at the summit of the volcano, and since the end of November by a resumption of the edifice inflation, the source of which is located at a depth of around 2.5 km.

It should be noted that this process of pressurization of the shallow reservoir can last from several days to several weeks 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 November 2025, the OVPF-IPGP recorded:

- 76 local earthquakes (below the island, within a radius of 200 km around the island, Figures 10 and 11);
- 0 regional earthquake (in the Indian Ocean basin).

In November 2025, the OVPF-IPGP recorded 78 local earthquakes located mainly below the *Plaines* and *Roche Ecrite areas* (Figure 11). 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 beneath the *Plaines* area continued at a level similar to that observed in October, with an average of one to two earthquakes per day. Located between 15 and 25 km below sea level, this seismic activity does not correspond to a main shock-aftershock sequence, but could reflect a transient loading episode linked to the pressurization of the deep parts of the Piton de la Fournaise magmatic system, located beneath this sector.

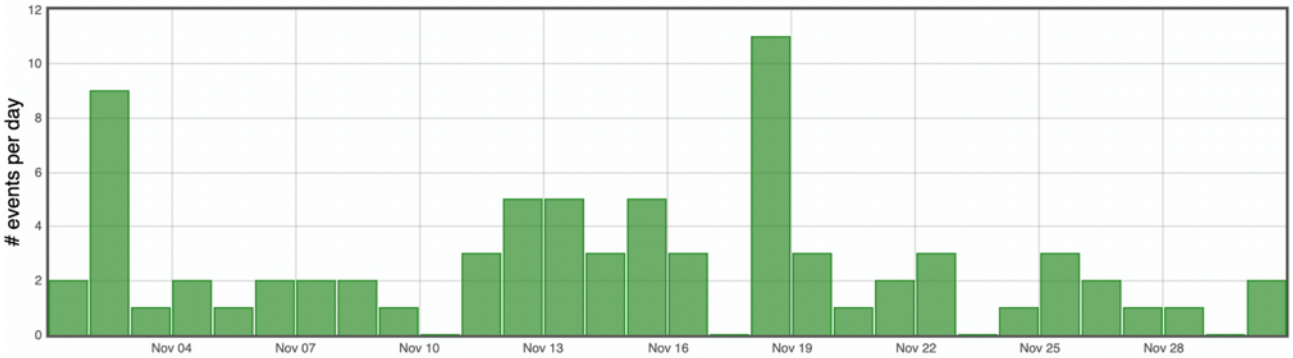

Figure 10: Number of local earthquakes (La Réunion island) per day recorded in November 2025 (© OVPF-IPGP).

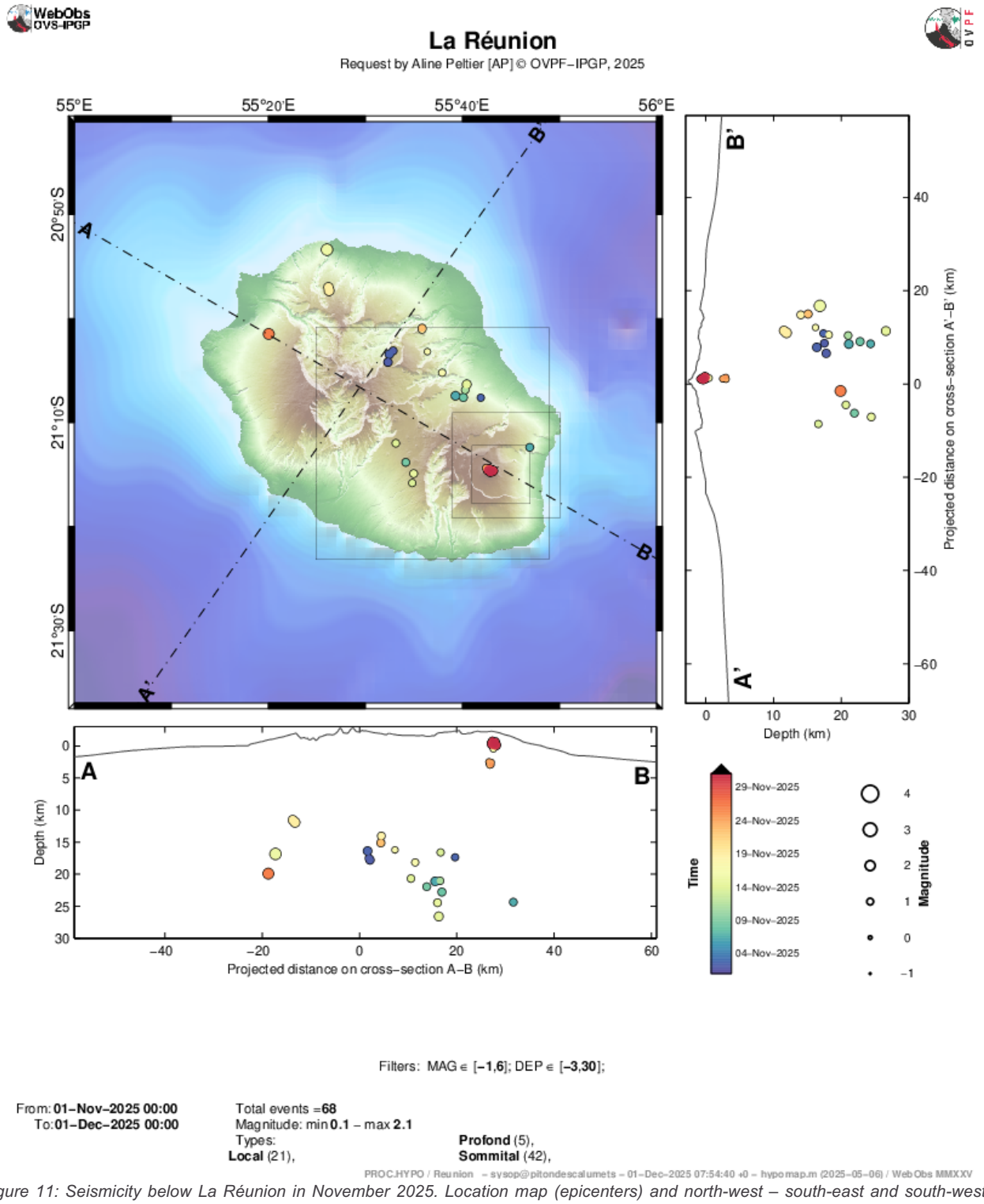

Figure 11: Seismicity below La Réunion in November 2025. Location map (epicenters) and north-west – south-east and south-west – north-east cross-sections (hypocenters) of earthquakes as recorded by OVPF-IPGP. Only localizable earthquakes are shown on the map (© OVPF-IPGP).

Seismic-volcano activity in Mayotte

The « REseau de surveillance VOlcanologique et SIsfmologique 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

December, 1 2025
OVPF-IPGP Director

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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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References

Altamimi, Z., Rebischung, P., Collilieux, X., Métivier, L., & Chanard, K. (2023), ITRF2020: an augmented reference frame refining the modeling of nonlinear station motions, Journal of Geodesy, 97(5), 47. https://link.springer.com/article/10.1007/s00190-023-01738-w

Arellano, S., Galle, B., Apaza, F., Avard, G., Barrington, C., Bobrowski, N., ... Yalire, M. (2020), Synoptic analysis of a decade of daily measurements of SO_2 emission in the troposphere from volcanoes of the global ground-based Network for Observation of Volcanic and Atmospheric Change, Earth System Science Data Discussions, 2020, 1-3

Bénard, B., Di Muro, A., Liuzzo, M., Gurrieri, S., Boissier, P., Brunet, C. et al. (2023), Seasonal environmental controls on soil CO_2 dynamics at a high CO_2 flux sites (Piton de la Fournaise and Mayotte volcanoes), Journal of Geophysical Research: Biogeosciences, 128(6), e2023JG007409

Bertiger, W., Bar-Sever, Y., Dorsey, A., Haines, B., Harvey, N., Hemberger, D., ... & Willis, P. (2020), GipsyX/RTGx, a new tool set for space geodetic operations and research, Advances in space research, 66(3), 469-489

Boudoire, G. (2017), Architecture et dynamique des systèmes magmatiques associés aux volcans basaltiques : exemple du Piton de la Fournaise. Volcanologie, Université de la Réunion, 2017. Français. ⟨NNT : 2017LARE0022⟩. ⟨tel-01902958⟩

Herring, T.A., King, R.W., McClusky, S.C. (2010), GPS analysis at MIT, Release 10.4, Massachusetts Institute of Technology, Cambridge

Lomax, A., Virieux, J., Volant, P., & Berge-Thierry, C. (2000), Probabilistic earthquake location in 3D and layered models. In C. H. Thurber & N. Rabinowitz (Eds.), Advances in Seismic Event Location, Modern Approaches in Geophysics (pp. 101–134). Springer, Dordrecht, Netherlands

Murphy, D., Bertiger, W., Hemberger, D., Komanduru, A., Peidou, A., Ries, P., & Sibthorpe, A. (2024), Jet Propulsion Laboratory Analysis Center Technical Report 2024. In R. Dach & E. Bockmann (Eds.), International GNSS Service Technical Report 2024 (IGS Annual Report), IGS Central Bureau and University of Bern; Bern Open Publishing. https://doi.org/10.48350/191991

Rebischung, P., Altamimi, Z., Métivier, L. et al. (2024), Analysis of the IGS contribution to ITRF2020, J Geod 98, 49. https://doi.org/10.1007/s00190-024-01870-1

SeisComP (2024), SeisComP 6 – Earthquake Monitoring Software, https://www.seiscomp

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).