



Area of Interest: Erta Ale Volcano, Ethiopia

Dates Covered: 21 July – 3 Aug 2025

Plain language summary:

On 25th July, a new plume/cloud appeared within the 200 m-wide crater at Hayli Gubbi, located ~12 km to the southeast of Erta Ale. Sentinel-1 data show ~5 cm of uplift between 21st July and 3 August.

Sentinel-1 interferograms show ~7 cm of uplift at Erta Ale along a central SE-NW lobe flanked by subsidence, but no changes were observed in the summit pit craters and visible activity is limited to plumes from the recent lava flows.

Since 21 July, the dike between Erta Ale and Lake Afrera has not propagated further southeast. The southernmost ~10 km segment continues to open at a declining rate, with the line-of-sight (LOS) displacement decreasing from ~1 m during 16-22 July to ~50 cm during 22-28 July and to ~10 cm during 28 July – 3 August.

Purpose/Caveats: This event response report was produced to assist situational awareness and rapid response efforts. It represents best endeavours at the time of issue. Analysis and interpretation of the data is preliminary, which may not reflect the most up-to-date or complete information due to the evolving situation.

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Acknowledgements: The analysis and report were produced in collaboration with Addis Ababa University, and the projects: VolcScatter (ESA Fellowship); MAST (ERC Consolidator); and University of Bristol PhD scholarship to LW.

Recent Activity:

Decrease in activity at Erta Ale and new activity at Hayli Gubbi

At Hayli Gubbi, Sentinel-2 and Planet imagery show the appearance of a plume/cloud confined to Hayli Gubbi crater (Fig 1D-F), which first appeared on 25 July and is still visible on 5 August. Hayli Gubbi volcano is located at the southern end of the Erta Ale volcanic segment (Pagli et al., 2012), approximately 12 km southeast of Erta Ale. The summit of Hayli Gubbi is characterised by a scoria cone approximately 200 m in diameter, situated within a graben formed by recent tectonic activity (Barberi et al., 1973; GVP, 2025). Fumarolic activity was observed in this crater in the 1960s (Barberi et al., 1973).

At Erta Ale, Sentinel-2 and Planet imagery show a persistent plume from the recently emplaced lava flows (Fig 1A-C). There was no further advancement of the lava flows during this period. No changes have been observed in the north and south pit of Erta Ale northern (summit) caldera. Thermal anomalies have returned to pre-eruption levels (MIROVA).

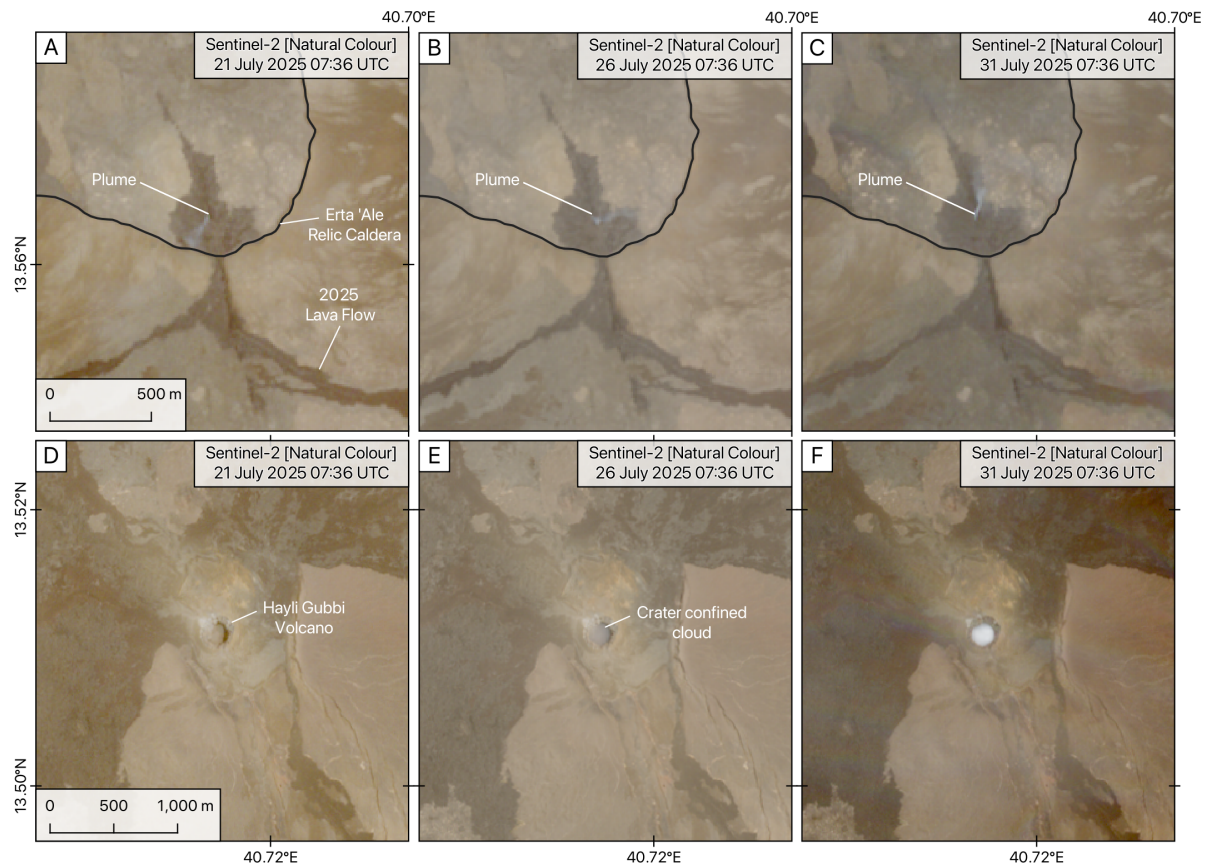


Fig 1. Sentinel-2 natural colour images showing (A-C) a persistent plume from the recent lava flows at Erta Ale and (D-F) the appearance of a plume/cloud confined to Hayli Gubbi crater.

Dike opening continues to slow down

From Sentinel-1 InSAR interferograms, the dike intrusion between Erta Ale and Lake Afrera has not propagated further southeast since 21 July. The southernmost segment of the dike is still opening, as observed from the latest 6-day ascending interferogram (28 July – 3 August), while the rate of opening continues to slow down (Fig 2). The line-of-sight (LOS) displacement towards the satellite associated with opening in the southernmost ~10 km segment was > 1 m during 16-22 July, > 50 cm during 22-28 July, and > 10 cm during 28 July – 3 August.

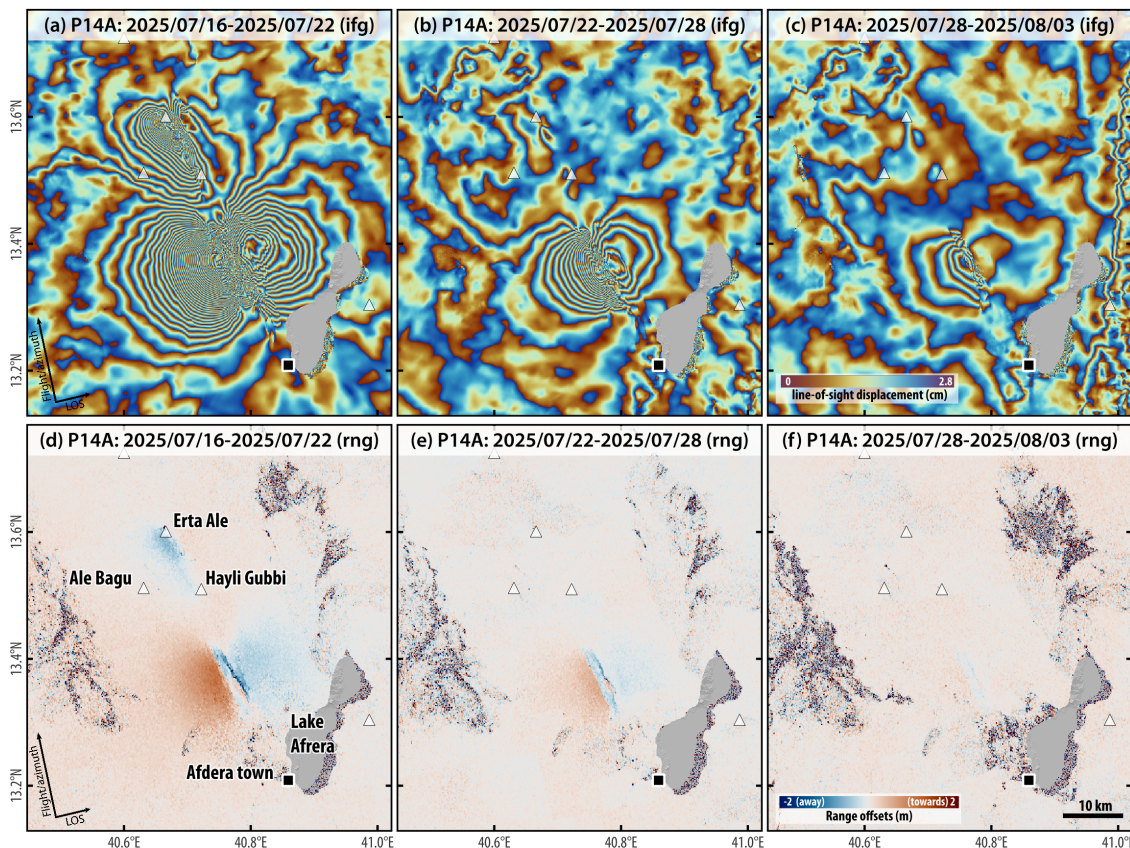


Fig 2. Sentinel-1 6-day consecutive ascending interferograms (top row, a-c) and range offsets (bottom row, d-f) spanning 16 July to 3 August. There is no further propagation of the southernmost dike, but opening of the ~10 km dike segment continues at a slower rate. For range offsets (d-f), red represents motion towards the satellite, and blue away.

Deformation at Erta Ale and Hayli Gubbi

We previously reported in Event Response Report 2.2 that there was no visible deformation at Erta Ale based on a 6-day ascending interferogram spanning 22-28 July. However, more recent longer interval ascending and descending interferograms spanning 12 days suggest distinct deformation patterns occurring at Erta Ale and Hayli Gubbi (Fig 3b, d).

Although InSAR displacements are measured along the satellite's line-of-sight, combining observations from different satellite tracks can provide information on the vertical displacements (whether the ground surface is dominantly uplifting or subsiding).

The signal at Hayli Gubbi indicates that the ground is moving towards the satellite in both the ascending (i.e., up and/or west) and descending (i.e., up and/or east) paths, suggesting that the ground is predominantly uplifting (~ 5 cm). Meanwhile at Erta Ale, there are 3 lobes of deformation: a central SE-NW elongated lobe (measuring ~ 4 km along the long axis) associated with ~ 7 cm uplift, flanked by 2 areas of subsidence.

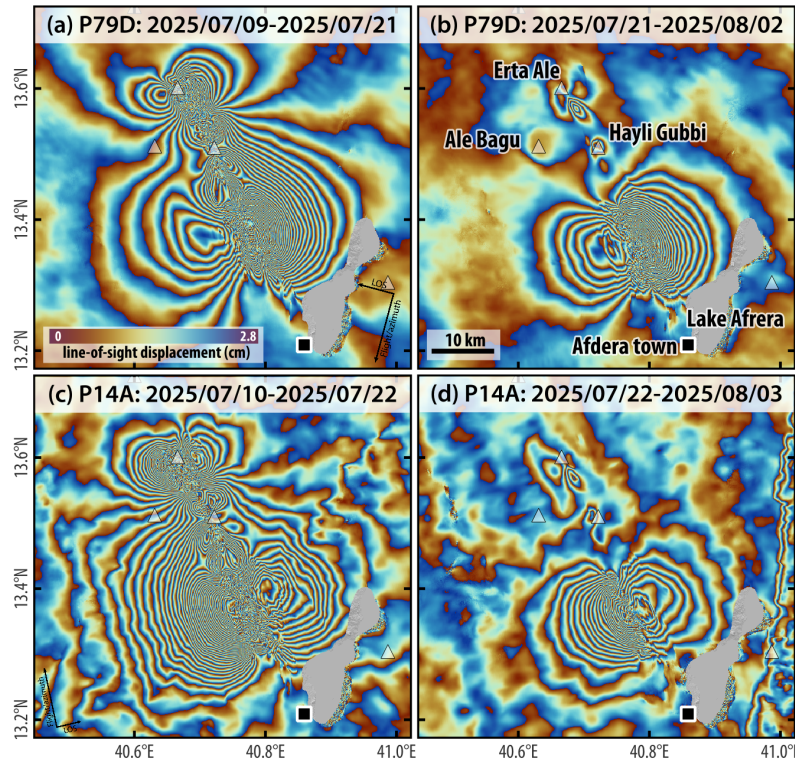


Fig 3. 12-day descending (top row, a-b) and ascending (bottom row, c-d) Sentinel-1 interferograms since the start of the unrest. The most recent images (b, d) show deformation signals at Erta Ale and Hayli Gubbi, in addition to the intrusion towards the southeast.

Forward look:

We will continue to monitor lava flow extents, lava lake levels, gas emissions, and surface deformation with upcoming SAR, optical and hyperspectral satellite images. We will continue to monitor the seismic activity with regional seismic stations. This, in combination with other data, observations and models, will provide evidence on which the potential evolution of the event can be considered. The next Sentinel-1 image will be acquired on 9 August.

Data used:

- InSAR and SAR backscatter images collected by the European Sentinel-1 satellites, processed using the COMET LiCSAR system (<https://comet.nerc.ac.uk/comet-lics-portal/>)
- Copernicus Sentinel-2 imagery (<https://browser.dataspace.copernicus.eu/>),
- MIROVA (Middle Infrared Observations of Volcanic Activity) provide detections of VIIRS thermal hotspots (https://www.mirovaweb.it/NRT/volcanoDetails_VIR.php?volcano_id=221080)

References

Barberi, F. & Chedeville, E. & Faure, H. & Giglia, G. & Marinelli, G. & Santacroce, Roberto & Tazieff, H. & Jacques, Varet. (1973). Geology of northern Afar (Ethiopia). *Revue de Geographie Physique et de Geologie Dynamique*. 15. 443-490.

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Pagli, C., Wright, T., Ebinger, C. et al. Shallow axial magma chamber at the slow-spreading Erta Ale Ridge. *Nature Geoscience* 5, 284–288 (2012). <https://doi.org/10.1038/ngeo1414>