COMET

Event Response

Area of Interest: Erta Ale and Hayli Gubbi Volcanoes, Ethiopia
Dates Covered: 19 November – 26 November 2025

Plain language summary:

- Satellite images show the formation of new craters at Hayli Gubbi and Erta Ale and the deposition of ash to the north.
- The co-eruptive deformation map shows further contraction of the dyke-like source under Erta Ale and a small amount of subsidence at Hayli Gubbi. There is no evidence for a fresh dyke intrusion.

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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Surface changes (Optical and SAR)

Sentinel-2 and Planet optical images from 25 November 2025 show a collapse in Erta Ale summit crater (Fig. 1D, 2B). At Hayli Gubbi, there is development of new fractures, two pits and enlargement of original crater at Hayli Gubbi (Fig. 1E, 2D).

Widespread ash is visible in Sentinel-2 image (Fig. 1A-B) across the rift and towards the Red Sea. Not possible to say how much is suspended or deposited from optical imagery. SAR backscatter (Fig. 1C, G) detects ash deposits between Erta Ale and Hayli Gubbi.

Thermal anomaly continues to be observed at Hayli Gubbi (VIIRS, Fig 3) on the 25 November. Hot material is visible within new pits at Hayli Gubbi (Sentinel-2 SWIR, Fig. 3)

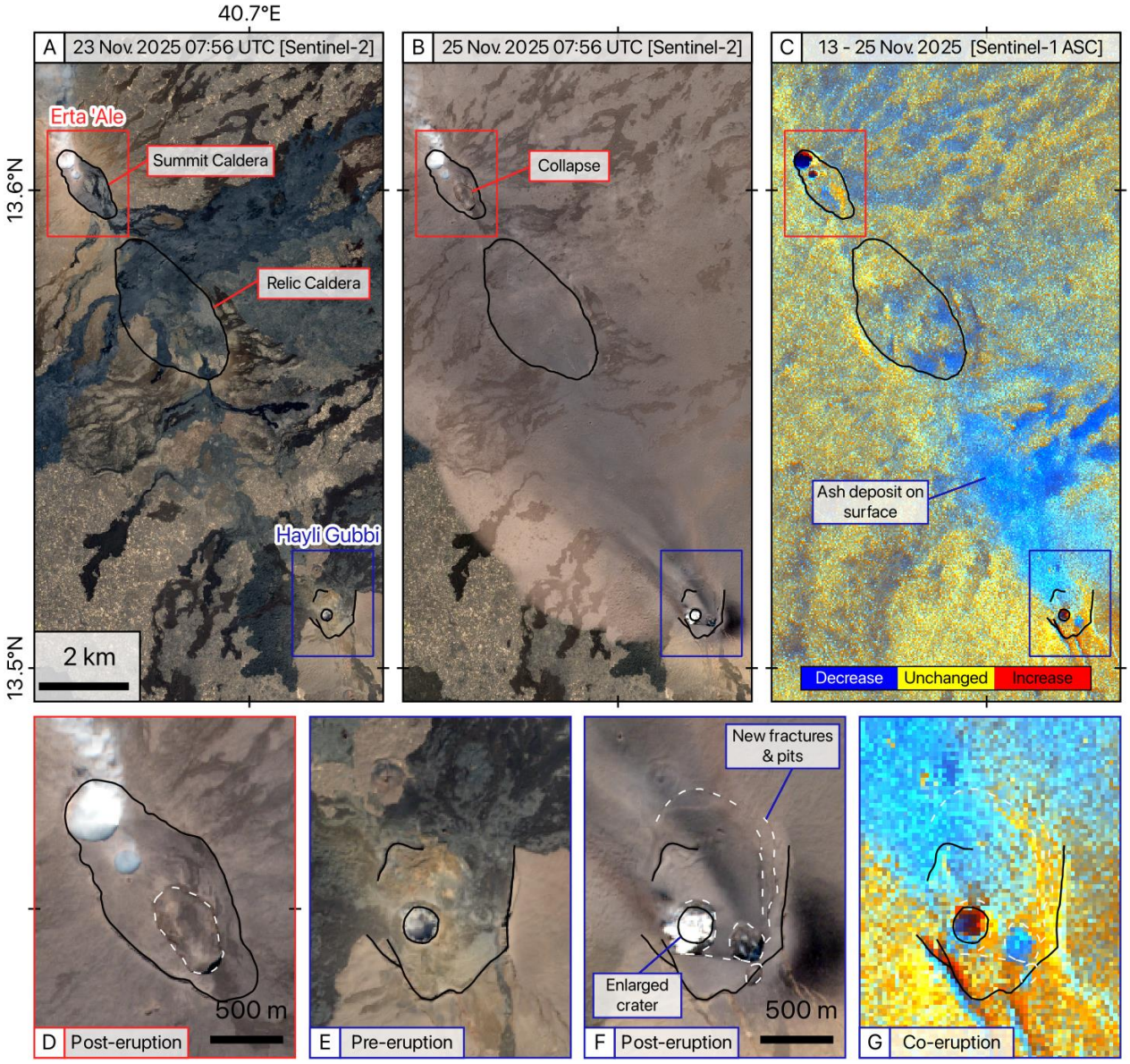

Figure 1. Optical (A-B; D-F) and SAR backscatter (C, G) images over Erta Ale and Hayli Gubbi. (A) Pre-eruption Sentinel-2 optical image with zoom in over Hayli Gubbi (panel E). (B) Post-eruption Sentinel-2 optical image showing collapse event in Erta Ale summit crater (panel D), topographic changes at Hayli Gubbi (enlarged pit, new fractures, panel F) and widespread ash

(deposited and suspend). (C) SAR backscatter change difference image showing ash deposit (decrease) and changes within Erta Ale crater and Hayli Gubbi (panel G).

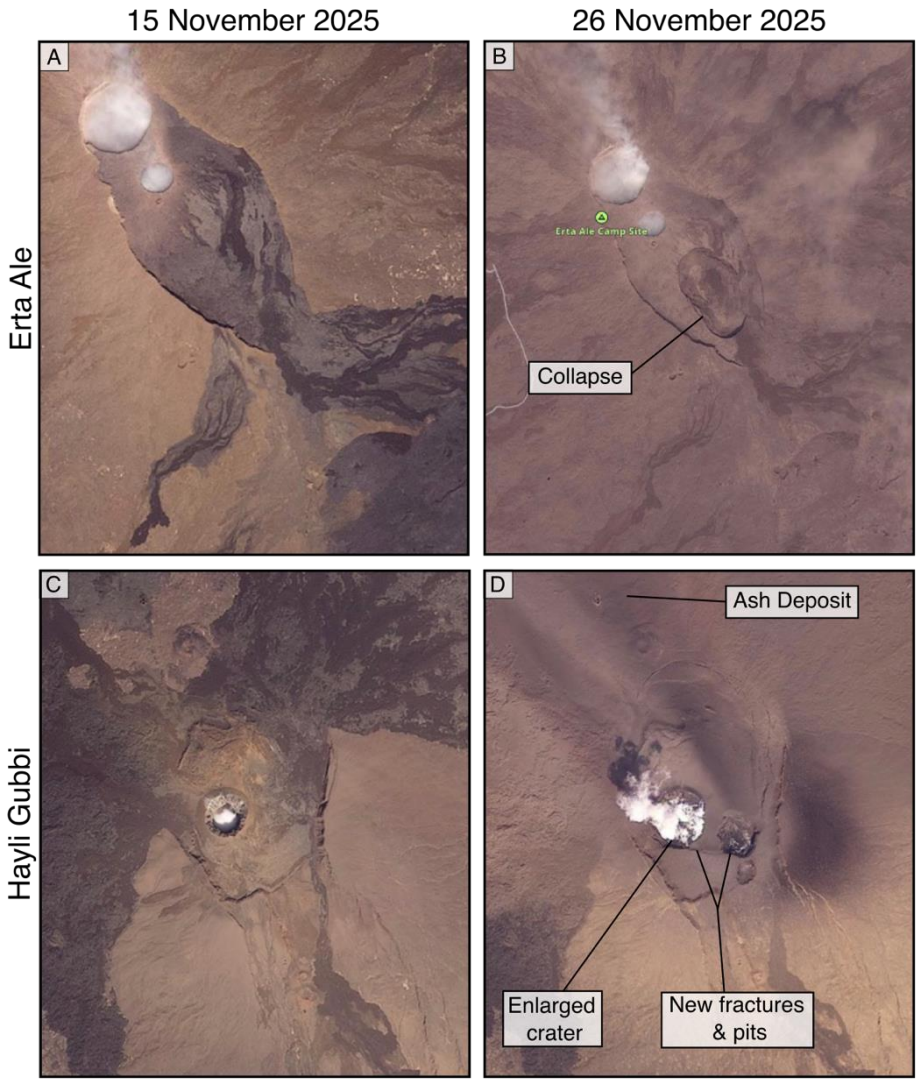

Fig 2. Planet imagery of Erta Ale and Hayli Gubbi acquired on 15 November 2025 and 26 November 2025 showing changes to crater following the eruption.

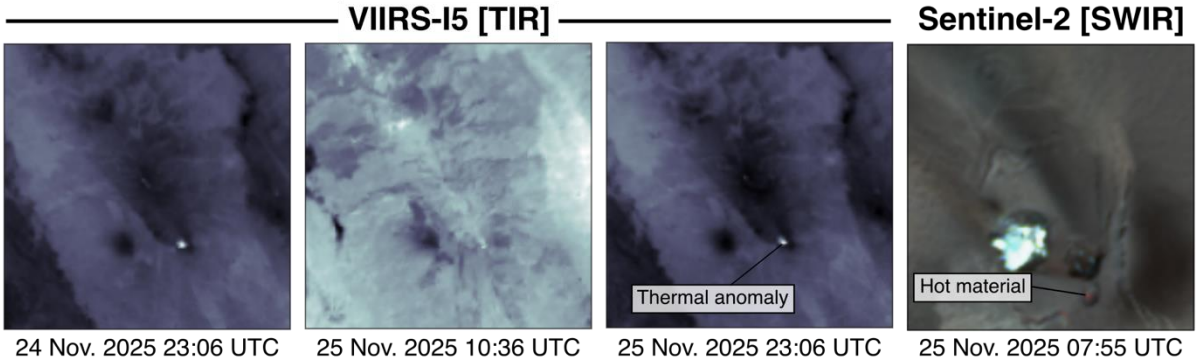

Fig. 3. Thermal and optical imagery showing thermal anomaly at Hayli Gubbi. VIIRS (MIROVA VIIRS375 product) detects thermal anomaly predominately when dark and Sentinel-2 imagery SWIR imagery shows hot material (red) within new pit.

Co-eruptive surface deformation from InSAR interferograms

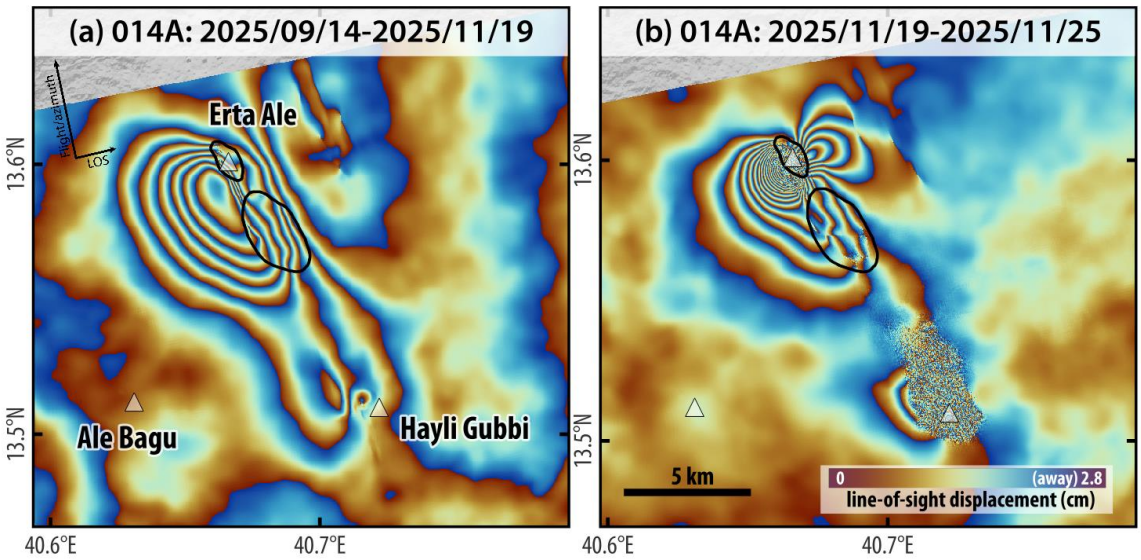

Fig 4. Sentinel-1 ascending interferograms showing (a) pre-eruptive surface displacement at Erta Ale and Hayli Gubbi over ~2 months, and (b) cumulative displacement of 4 days pre- and 2 days co/post-eruptive. Each fringe represents 2.8 cm of satellite line-of-sight (LOS) displacement, red-to-blue indicates range increase (displacement away from the satellite).

Erta Ale:

The co-eruptive Sentinel-1 ascending interferogram spanning 19-25 November suggests that there was continued and accelerated contraction of the subsurface source beneath Erta Ale during the days leading up to and during the eruption on 23 November (Fig 4b). The deformation pattern is consistent with a contracting dike (see event reports 2.1 and 2.4). Source contraction during this 6-day period is concentrated beneath the northern summit caldera, indicated by the denser fringes with ~40 cm of line-of-sight (LOS) displacement away from the satellite in the western lobe. The lateral extent of the deformation at Erta Ale remained unchanged during the eruption.

Hayli Gubbi:

There is at least 5 cm of LOS displacement away from the satellite at Hayli Gubbi, which could be indicative of subsidence. Note that this is likely a lower bound on the displacements as a ~2 km wide region extending ~3 km NW and ~1.5 km SE of the crater is incoherent in the co-eruptive interferogram (could be a result of changes to the surface properties such as deposition of eruptive products), obscuring any further deformation in the area.

Forward look:
We will continue to monitor both Erta Ale and Hayli Gubbi using upcoming satellite acquisitions. The next Sentinel-1 acquisitions will be on 30 November (descending) and 1 December (ascending). COSMO-SkyMed Second Generation (CSG) data will be used to track possible lava flow and detect high-resolution surface deformation. With an 8- or 16-day revisit cycle, the next CSG acquisition will be acquired on 29 November or 7 December. Gas emissions will continue to be monitored using daily overpasses from TROPOMI.

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/)
- High-resolution optical imagery collected by the PlanetScope satellites of the Planet Lab constellation (https://www.planet.com/). PlanetScope SuperDove products are copyright of Planet company, provided by R. Grandin (IPGP) under “Education and Research Standard License n°81527”.
- 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)