Event Response

Area of Interest: Fentale Volcano, Ethiopia
Date Covered: 22 October 2024 – 3 January 2025
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Data Used:

- InSAR images collected by the European Sentinel-1 satellite and processed using the COMET LICSAR system (https://comet.nerc.ac.uk/comet-lics-portal/)
- USGS Earthquake Catalogue (https://earthquake.usgs.gov/earthquakes/search/)

Recent Activity:

After the last period of seismicity ended around 2 November 2024, seismic activity restarted on 19 December (Institute of Geophysics, Addis Ababa University). The most recent 12-day Sentinel-1 InSAR image (17-29 December) shows a significantly larger surface deformation than the previous intrusion that occurred in September–October. USGS reported 14 M4+ earthquakes during the same time period. The orientation of the dyke (NE-SW) is similar to both the previous intrusions in 2015 and in Sept-Oct 2024, but it extends further north and south.

The most recent dyke intrusion is about 40 km long, extending from Fentale to just south of Dofen. As compared to the September-October deformation, the fringes in the latest December image are more compact. There is ~33 cm of displacement, almost twice that of the ~17cm displacement in September-October. As with the previous interferograms, there is evidence of surface fault rupture. The deformation pattern suggests variations in the magnitude of dyke opening corresponding to distinct lobes of deformation, as well as a possible deflating source beneath Fentale associated with the observed ground subsidence. There are reports of 2 phreatic eruptions south of Dofen on 2 January 2025.

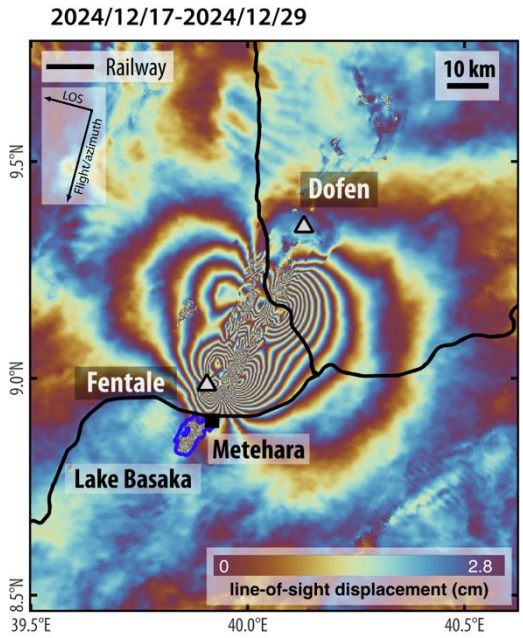

Fig 1. Latest Sentinel-1 descending interferogram (17-29 December 2024). The deformation extends from Fentale to south of Dofen.

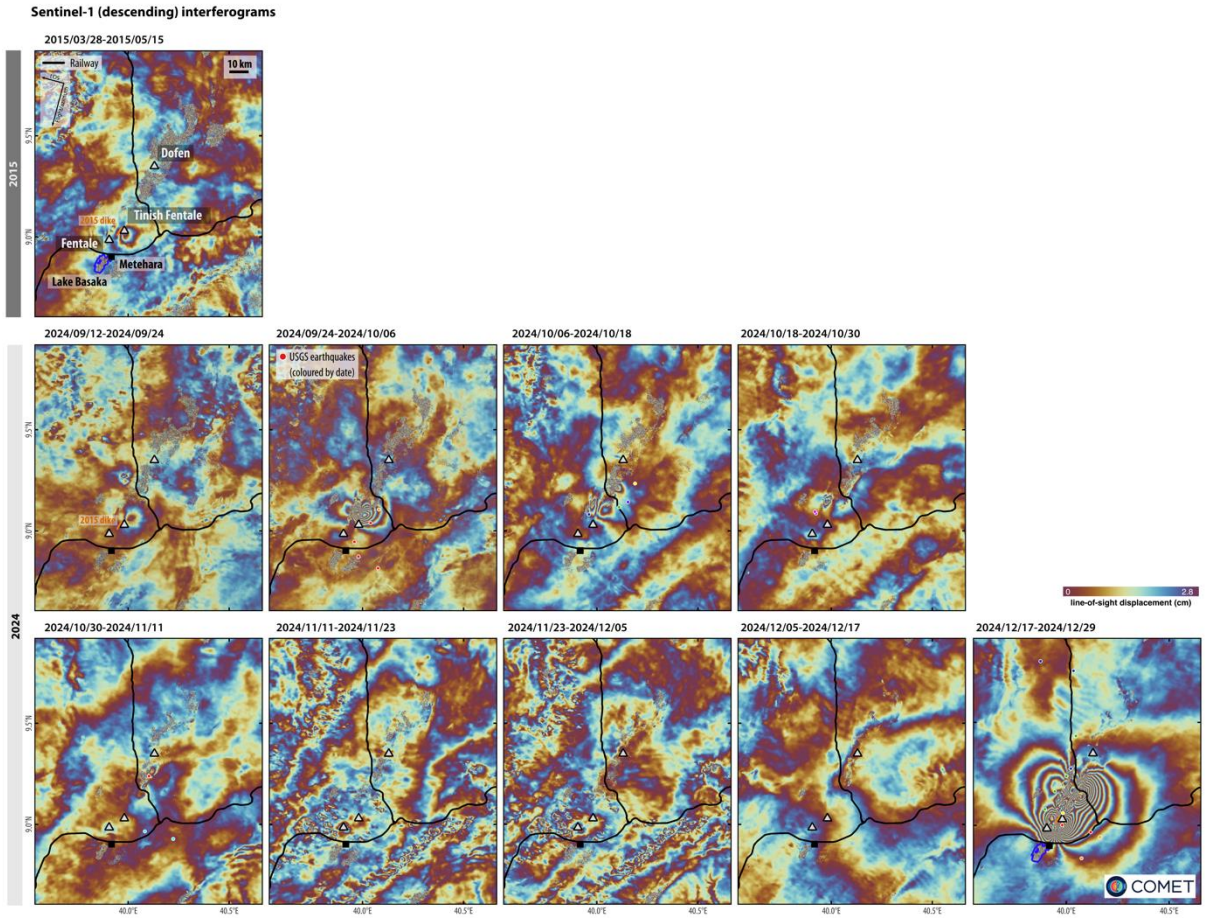

Fig 2. Sentinel-1 interferogram of the 2015 dyke intrusion, and a timeseries of 12-day interferograms from September-December 2024, showing both the initial deformation in September as well as the subsequent larger deformation in December.

Forward Look:

Seismicity is ongoing, with 47 earthquakes with magnitudes of 4.3-5.1 from 29 December 2024 to 3 January 2025. COSMO-SkyMed images from early December onwards as well as the upcoming Sentinel-1 acquisition on 10 January will be able to provide better constraints on the evolution of surface deformation and dyke propagation. Further data and modelling will inform conceptual understanding of the evolving event in the subsurface and on the ground in 4 dimensions. This, in combination with other data and observations, will provide evidence on which the potential evolution of the event can be considered. A scientific committee comprising scientists from Addis Ababa University (IGSSA and School of Earth Science), the Geological Institute of Ethiopia and other relevant institutions is monitoring the events and keeping the Ethiopian Disaster Risk Management Commission (EDRMC) and the public continuously informed. The government has reminded citizens to follow precautionary messages given by professionals.