



## **Subsidence at Dallol proto-volcano, Afar (Ethiopia): cooling of the magma chamber or deep interconnection?**

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In this work we study the crustal deformation at Dallol proto-volcano, the seventh volcanic centre of the Erta Ale range (Northern Afar, Ethiopia), employing InSAR data acquired by the ENVISAT and Sentinel-1 satellites between 2005 - 2015. This was done to continue to monitor the long term at Dallol after the dike intrusion event in October 2004. The intrusion was fed by a magma chamber under at 2.4 Km depth. After this event no significant deformation has been detected at Dallol. We analyzed SAR images acquired by ENVISAT between January 2005 and February 2010. We also processed a time series of SAR images acquired by SENTINEL-1 satellite for the period ranging from March 2015 to December 2015. The ENVISAT data show a circular deformation pattern around Dallol volcano from October 2008 to February 2010. Sentinel data show the same deformation trend from March 2015 to December 2015. This deformation pattern is a clear increase in the line-of-sight distance (LOS) from the sensor to the target, defining a long term subsidence pattern at Dallol. The results of the inversion of InSAR measurements show that, for the ENVISAT acquisition, the sill source is the best fitting source geometry to explain the Dallol subsidence deformation. The results reveal a source depth of  $1284 \pm 343$  m, located under the volcano. The source has a volume variation of  $-5.9 \pm 0.6 \cdot 10^5$  mc.