



A continental rifting event revealed by InSAR: The Lake Natron (Tanzania) 2007 seismo-magmatic crisis

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We describe the capture by InSAR of a seismo-magmatic event that occurred in July-August 2007 between Lakes Natron and Manyara in Northern Tanzania. Seismic activity started on July 12 and continued up to early September, culminating in a Mw 5.9 pure normal faulting event on July 17, 2007. The crisis did not lead to an eruption at the Gelai volcano though the nearby Ol Doinyo Lengai volcano started erupting from September with unusual explosive eruptions.

Nine months of Envisat descending ASAR images from three different orbits and spanning the crisis are analyzed. Interferograms reveal a large deformation field affecting an area of about 70 x 50 km centered on the Southern flank of the Gelai volcano. Vertical displacements up to 60 cm were observed along up to 15km long surface ruptures as confirmed by field observations. Successive interferometric pairs allow determining different sources of deformation and allow drawing hypothesis on the sequence of events.

Modeling and inversions of these InSAR results allow determining that this crisis was caused by a dyke intrusion accompanied by dyke-generated normal faults and graben subsidence. Study of the stress field allows also drawing hypothesis on the role played by the seismic activity along normal faults and assessing how it has promoted the dyke opening. The InSAR results are consistent with field observations of open fractures,

seismicity (Déverchère, Albaric, Ferdinand and co-workers, personal communication) and GPS measurements. Thanks to a systematic programming of SAR data acquisition in the frame of an ESA Cat-1 project (project 3224, PI F. Kervyn), this is the first dyking event ever captured geodetically in a continental rift. This event holds important clues to our understanding of the role of magmatic processes in the dynamics of continental rifting.