Fundamental changes in the activity of the natrocarbonatite volcano Oldoinyo Lengai, Tanzania

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Abstract

On September 4, 2007, after 25 years of effusive natrocarbonatite eruptions, the eruptive activity of Oldoinyo Lengai (OL), N Tanzania, changed abruptly to episodic explosive eruptions. This transition was preceded by a voluminous lava eruption in March 2006, a year of quiescence, resumption of natrocarbonatite eruptions in June 2007, and a volcano-tectonic earthquake swarm in July 2007. Despite the lack of ground-based monitoring, the evolution in OL eruption dynamics is documented based on the available field observations, ASTER and MODIS satellite images, and almost-daily photos provided by local pilots. Satellite data enabled identification of a phase of voluminous lava effusion in the 2 weeks prior to the onset of explosive eruptions. After the onset, the activity varied from 100 m high ash jets to 2–15 km high violent, steady or unsteady, eruption columns dispersing ash to 100 km distance. The explosive eruptions built up a ~400 m wide, ~75 m high intra-crater pyroclastic cone. Time series data for eruption column height show distinct peaks at the end of September 2007 and February 2008, the latter being associated with the first pyroclastic flows to be documented at OL. Chemical analyses of the erupted products, presented in a companion paper (Keller et al.2010), show that the 2007–2008 explosive eruptions are associated with an undersaturated carbonated silicate melt. This new phase of explosive eruptions provides constraints on the factors causing the transition from natrocarbonatite effusive eruptions to explosive eruptions of carbonated nephelinite magma, observed repetitively in the last 100 years at OL.

Keywords

Oldoinyo LengaiExplosive eruptionsEffusive-explosive cyclesAsh falloutPyroclastic flows