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## Evidence of active magmatic rifting in Ma'alalta marginal volcano (Afar, Ethiopia)

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Growth of rift segments and development of crustal magmatic systems in continental rifts remain debated issues. We integrate volcanological, geochemical, petrological and seismic data from the Ma'alalta stratovolcano near the western rift margin of Afar to show that active magmatic rifting occurs there. Growth of Ma'alalta started around  $0.55 \pm 0.05$  Ma (Barberi et al. 1972) with the age of the youngest flows unknown. Ma'alalta produced lava flows but also large-volume, caldera-forming ignimbrites, as well as silicic intracaldera domes. The products are mainly trachytic and some are slightly peralkaline. The most recent magmatic activity of Ma'alalta consists of mafic lava fields, scoria cones and peralkaline obsidianaceous silicic domes produced along the ~40 km long magmatic segment and erupted from several vents aligned NNW-SSE rather than from central volcanic activity. Local seismicity (2005-2009 and 2011-2013) also shows a NNW-SSE-trending alignment of earthquakes with good correlation to where the recent magmatic products were erupted. The geochemical features of the mafic rocks (e.g., Ba/La, Rb/Ta and Zr/Ta) as well as the petrogenesis of the recent NNW-SSE-trending silicic domes are similar to the nearby on-rift Dabbahu and Durrie volcanoes. Inferred magma storage depth from mineral geobarometry show that a shallow, silicic chamber existed at ~4-5 km depth below the stratovolcano, while a stacked plumbing system with at least two magma storage levels at ~14 and ~24 km of depth fed the recent basalts. We interpret the wide set of observations from Ma'alalta as evidences that the area is an active rift segment, showing that localised axial extension can be heavily offset towards the rift margin.