Local seismicity near the actively deforming Corbetti volcano in the Main Ethiopian Rift

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Corbetti is currently one of the fastest uplifting volcanoes globally, with strong evidence from geodetic and gravity data for a subsurface inflating magma body. A dense network of 18 stations has been deployed around Corbetti and Hawassa calderas between February 2016 and October 2017, to place seismic constraints on the magmatic, hydrothermal and fault slip processes occurring around this deforming volcano. We locate 122 events of magnitudes between 0.4 and 4.2 were located using a new local velocity model. The seismicity is focused in two areas: directly beneath Corbetti caldera and beneath the east shore of Lake Hawassa. The shallower 0-5km depth below sea level (b.s.l.) earthquakes beneath Corbetti are mainly focused in NW-elongated clusters at Urji and Chabbi volcanic centres. This distribution is interpreted to be mainly controlled by a northeard propagation of hydrothermal fluids from a cross-rift pre-existing fault. Source mechanisms are predominantly strike-slip and different to the normal faulting away from the volcano, suggesting a local rotation of the stress-field. These observations, along with a low Vp/Vs ratio, are consistent with the inflation of a gas-rich sill, likely of silicic composition, beneath Urji. In contrast, the seismicity beneath the east shore of Lake Hawassa extends to greater depth (16 km b.s.l.). These earthquakes are focused on 8-10 km long segmented faults, which are active in seismic swarms. One of these swarms, in August 2016, is focused between 5 and 16 km depth b.s.l. along a steep normal fault beneath the city of Hawassa, highlighting the tectonic hazard for the local population.