



Constraining magma plumbing systems in the Main Ethiopian Rift using seismic tomography

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Volcanoes in the Main Ethiopian rift (MER) erupt a variety of magmas ranging from silica-rich (i.e. rhyolites, trachytes) to silica-poor (alkali basalts). However, it is not known where these different magmas are stored prior to eruption or whether the two systems interact with each other. The Bora – Tullu-Moye volcanic field, in the central part of the MER is an ideal laboratory to observe the magma plumbing systems beneath these volcanoes. We use a seismic network, deployed for 1.5 years around the volcano to detect and locate more than 1000 earthquakes. After refining the arrival time picks, we generate images of the subsurface seismic velocity by jointly inverting for P-wave velocity, V_p/V_s ratio and earthquake location. Beneath Tullu-Moye, the most recently active volcano, we image a low V_p/V_s ratio region caused by the presence of a free, supercritical water phase, most likely held in a silica-rich magma. Importantly, there is no evidence for the presence of silica-poor magmas in the upper parts of the crust suggesting that basaltic eruptions, at this volcano, are sourced from a deeper and probably separate plumbing system.