Paper Number: 4777

# Locating the depth of magma supply for volcanic eruptions

Geiger, H.[1], Barker, A.B.[1*] and Troll, V.R.[1]

[1]Department of Earth Sciences, CEMPEG, Uppsala University, Villavägen 16, SE 752 36, Uppsala, Sweden; abigail.barker@geo.uu.se

---

Mt. Cameroon, in West Africa, is one of the most active volcanoes of the Cameroon Volcanic line. It poses a threat to ≥0.5 million inhabitants in the direct vicinity of the volcano, yet no quantitative analysis of the volcano's magma plumbing system has so far been conducted. In order to improve our understanding of the inner workings of Mt. Cameroon, we present mineral-melt thermobarometry models for pyroxene and feldspar from the 1999 and 2000 eruptions in order to provide a comprehensive evaluation of the magma supply system beneath Mt. Cameroon.

Lavas from both eruptions are basanites containing olivine, clinopyroxene and plagioclase in a glassy, vesicular and microlite-bearing groundmass. Olivine phenocrysts are unzoned with $Fo_{67-86}$. Clinopyroxene classifies as diopside, is normally and reversely zoned and has Mg numbers in the range of 69 to 87 Mg#. Phenocrysts of plagioclase classify as labdradorite, bytownite and anorthite with a range of 62 to 91 An. Normal and reverse zoning is recorded in An variations.

Mineral chemistry of the clinopyroxene and plagioclase phenocrysts coupled with whole rock data as the nominal melt has been used to determine crystallization pressures by mineral-melt thermobarometry. The results document multi-level plumbing system beneath Mt. Cameroon. Primitive magma rising from the mantle first stalled in a deep reservoir in the oceanic lithosphere, in which plagioclase crystallized. This deep magma chamber is consistent with reported seismicity between 30 and 50 km depth. As the magma further ascended, it reached the Moho, leading to stagnation and fractional crystallization of clinopyroxene at 22-25 km depth. Magmas from the 1999 eruption also incorporated clinopyroxene from shallower magma pockets in the crust, located at 8-12 km and 16 km depth. Temporary unrest and short-lived explosive outbursts during repose time between the major eruptive events are consistent with active migration of small-volume magma parcels beneath the volcano. These shallow magma pockets are likely remobilised by renewed magma recharge from sub-Moho depth, which can lead to temporary changes in eruptive style, especially if gas-rich magma parcels mix with the ascending magmas prior to and during major eruptive events. Monitoring efforts should therefore focus on shallowing earthquake patterns migrating from sub-Moho levels, as these are likely precursors to major eruptions of Mt. Cameroon.