Primitive melts and mantle sources of the Cameroon Volcanic Line based on melt inclusion geochemistry

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The 1700 km-long Cameroon Volcanic Line (CVL) in West-Africa is the largest presently active continental intraplate volcanic province. The CVL displays alkaline volcanism since 40 Ma and recent activity occurs at its largest volcano Mount Cameroon that is with 7 eruptions last century one of the most active subaerial volcanoes in the world. The cause for magmatism along the CVL is poorly understood as its unique features (e.g. no age-progression, crossing of the ocean-continent boundary, volcanoes built on structural highs) cannot be explained through plate tectonics and hotspot theory alone. Hypotheses for its origin vary from heating-related (i.e. hotspot(s)/hotline) to decompression melting due to extension or shear-zone reactivation and/or lithosphere instabilities [see overviews in 1, 2].

Since none of the previously proposed models based on physical causes for melting can convincingly explain the CVL, we investigate whether the chemistry of the mantle source (e.g. enhanced volatile activity) could be responsible for CVL magmatism. High CO_2 contents are known from CVL maars, particularly from CO_2 degassing at 'Killer Lakes' Nyos and Monoun [3, 4], and even trace amounts of volatiles can significantly lower mantle solidi.

We study the primitive magmas and mantle sources by major and trace element and volatile contents of melt inclusions in olivines from pyroclastics of Mt. Cameroon (with a range of ages) and of Debunscha Maar, Tombel Graben and Foumbot Volcanic Field (Lake Monoun). The inclusions show that the primitive melts were formed by low melting degrees (typically <5%) from a heterogeneous mantle source. This mantle source is mostly peridotitic and in the Gnt to Sp stability field, but with low amounts of pyroxenite. The peridotite mantle displays signs of metasomatism and of being carbonated. Calculated mantle potential temperatures show now sign of a hotter mantle.

[1] Milelli *et al.* (2012), *Earth Plan. Sci. Let.* 335-336, 80-87.
[2] Njome & de Wit (2014), *Earth-Sci. Rev.* 139, 168-194.
[3] Sigurdsson *et al.* (1987), *J. Volcanol. Geotherm. Res*. 31, 1-16. [4] Kling *et al.* (1987), *Science* 236: 169-175.