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Heterogeneous mantle source of the Belingwe komatiites (Zimbabwe) detected by the study of olivine-hosted melt inclusions

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The ca. 2.7 Ga Belingwe Greenstone Belt (BGB) in Zimbabwe hosts some of the best-preserved komatiitic flows. They provide invaluable insight into the physical and chemical state of their Archean mantle source. However, syn- and post-magmatic processes overprinted part of that information, especially for mobile and volatile elements in whole-rock samples. Working with melt inclusions shielded in highly magnesian olivine, we recovered the komatiites' primary chemical and isotopic signature, shedding new light on their petrogenesis.

We will present results for the chemical and Rb-Sr isotope composition (EPMA, Raman and LA-ICP-MS) of more than 260 experimentally homogenised inclusions.

Entrapped melts have MgO concentrations ranging from 18.7 to 24.6 wt%, which correlate with most elements due to the fractionation of magnesian olivine. However, excess Na_2O, K_2O, Cl, H_2O, Rb, Ba, Pb, Th and U in some inclusions suggests AFC processes during the magma ascent. Based on the least contaminated inclusions, we estimate the composition of parental melt for the BGB komatiites, with ca. 26.5 wt% of MgO and a low 0.3 wt% of H_2O, supporting a high potential temperature of the source. Melts show elevated Cl/K (up to 25 times over normal) and H_2O/Ce (up to 50 times over normal) ratios, a feature attributed by [1] to the interaction between a partially molten dry plume and the hydrated transition zone.

Age-corrected $^{87}Sr/^{86}Sr$ values have a heterogeneous distribution with an MSWD of 1.9 for 73 individual analyses. The data have been divided into three homogeneous subsets using 95% confidence intervals for individual values and the mean of the population. The mean values of these groups range from 0.7005±0.0004 for the un-radiogenic subset of 5 inclusions to 0.7017±0.0001 for the main group of 64 inclusions, and 0.70283±0.00043 in the radiogenic subset of 4 inclusions. These results correspond to the minimal separation age of the source of un-radiogenic melts from the Bulk Silicate Earth of over 3.4±0.3 Ga. This suggests the existence of a previously unidentified paleo-Archean depleted component and a radiogenic component of indeterminate age in the source of Belingwe komatiites.

[1] Asafov et al. (2018), *Chemical Geology* 478, 39–59.