# Deep phlogopite-olivine melilitite and melt-rock interaction in sub-continental lithospheric mantle (Tanzanian Craton)

F. PARAT[1], C. BAUDOUIN [1,2], A. CLUTIER[1], S. DEMOUCHY[1]

[1] Géosciences Montpellier & University of Montpellier, Place E. Bataillon, 34095 Montpellier, France. (*correspondance: Fleurice.Parat@gm.univ-montp2.fr)
[2]CRPG/CNRS, Nancy, France, celine.baudouin@univ-lorraine.fr

The North Tanzanian Divergence (NTD) corresponds to early stage rifting of the eastern branch of the East African Rift. In the southern part, quaternary volcanoes of the Manyara-Balangida rift have erupted primary melilitites (34.9–42.1 wt% $SiO_2$ and Mg# = 79–65) with deep mantle xenoliths. Melilitites are olivine-rich and contain up to 4 vol% magmatic phlogopite as a liquidus phase suggesting that primary melts were $K_2O$-rich and contain $H_2O$ (4.63–5.48 wt% $H_2O$, 66-117 ppm Cl in phlogopite, from SIMS measurements). Lavas have high incompatible element contents, LREE/HREE fractionation, high Rb/Sr ratio and negative anomaly in K and Zr-Hf. Geochemical modelling indicates that the melilitite magmas resulted from deep and low partial melting of a carbonate-rich (0.3–0.5%) garnet peridotite containing ~2 vol% phlogopite. The depth of partial melting is estimated close to or below the lithosphere-asthenosphere boundary (>130 km).

Mantle xenoliths include phlogopite-bearing peridotite and phlogopitite (100% phlogopite + rare spinel). Mantle phlogopites have high $Al_2O_3$ and MgO content (12.7-15 wt.% $Al_2O_3$, Mg#=83-93) and high water and Cl content (2.6-5.3 wt% $H_2O$, 100-200 ppm Cl) with major element composition close to magmatic phlogopites. They have very low incompatible element contents compared to phlogopite in melilitite and differs significantly from phlogopite in phlogopite-rich PIC and MARID xenoliths as deep-seated segregations from melts genetically linked to kimberlitic magmas. Percolation of deep asthenospheric $CO_2$-$H_2O$-alkaline magmas during their ascent may have produced the strong heterogeneities in the thick sub-continental lithospheric mantle beaneath the East part of the Tanzanian craton by inducing metasomatism and phlogopite crystallization in spinel lherzolite and phlogopitite lithologies.