Geophysical Research Abstracts
Vol. 16, EGU2014-14662, 2014
EGU General Assembly 2014

Volatile content in MI from Petrological study of basic lavas and melt inclusions from Cenozoic volcanism from Northern Victoria Land (Antarctica)

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New data on basic lavas and melt inclusions (MI) in olivine phenocrysts from Northern Victoria Land (NVL-Antarctica) are presented aiming at comparing major element composition and volatiles content in lavas and their mantle sources. Major elements and volatile (H_2O, CO_2, S, F and Cl) were measured in MI from Shield Nunatak, while major and trace elements were carried out on lavas from three localities, Eldridge Bluff, Shield Nunatak and Handler Ridge. Lavas are olivine-phyric (up to 15 %vol) with minor clinopyroxene and plagioclase in a glassy to microcristalline plagioclase-dominated groundmass; opaque minerals are mostly magnetites and subordinately ilmenites. The great majority of lavas are basanites (42.20-45.02wt% SiO_2, with 3.36-4.21wt% of Na2O+K2O) with Mg# (MgO/(MgO+FeO) mol%, $Fe2O_3$=0.15FeO) ranging from 44.9 to 60.1. Lavas from Handler Ridge are the most primitive.
MI compositions are comparable to those of the host lavas but encompasse a wider range from 43.68 to 48.73 wt% SiO_2 and from 2.81 to 4.55 wt% Na2O+K2O, with Mg# 49.5 74.44. The great majority of olivine calculated in equilibrium with MI are more forsteritic than the enclosing crystal suggesting that MI were trapped from a less evolved magma or, most probaby, that Mg-Fe interdiffusion occurred between olivine and MI after entrapment.
Most of MI have H_2O content ranging from 0.70 wt% to 1.19 wt% and CO_2 from 25 ppm to 341 ppm ($H_2O/CO_2 \sim 1$). At comparable H_2O contents few samples show a remarkable higher CO_2 values (1322 ppm to 3905 ppm) with a H_2O/CO_2 down to 0.8. F and Cl concentrations range from 808 to 999 ppm and from 443 to 570 ppm respectively, with a F/Cl ratio ranging between 1.4 to 2.0. S content varies from 537 ppm to 2002 ppm.
The relationships between MI and basic lava compositions are investigated by means of mass balance calculation reconstructing the composition of the mantle source, including amphibole from Baker Rocks (NVL) which allow us to also constrain its volatile content (Bonadiman et al., 2014). The amount of H_2O, F and Cl contained in the amphibole were compared with those measured in the MI in order to have a complete major, trace and volatile element modelling between solid mantle, MI and basic lavas. F and Cl contents in mantle source and primitive melts may indicate a metasomatic event influenced by subduction-related fluids, as also suggested by Melchiorre et al., (2011). A similar scenario has been also envisaged by noble gas and halogen measurments in mantle xenoliths by Bradley et al. (2013) and by melt inclusions study from Mary Birdie Land (Aviado et al., 2013).

Aviado et al., (2013). Mineralogical Magazine;
Bonadiman et al., (2014). Contribution to Mineralogy and Petrology, In Press;
Bradley et al., (2013). Mineralogical Magazine;
Melchiorre et al., (2011). Lithos. Vol. 124, p.p. 319-330.