Petrological study of Cenozoic basic lavas and melt inclusions from Northern Victoria Land (Antarctica)

P.P. GIACOMONI[1*], M. COLTORTI[1], S. MUKASA[2], C. BONADIMAN[1], C. FERLITO[3] AND B. PELOROSSO[1]

[1]Dep. of Physics and Earth Sci., Univ. of Ferrara (*correspondance:pierpaolo.giacomoni@unife.it)
[2]Dep. of Earth Sci., Univ. of New Hampshire (sam.mukasa@unh.edu)
[3]Dep. of Biol. and Earth Sci., Univ. of Catania; (cferlito@unict.it)

This study offers a first view of the petrologic features of basic lavas and melt inclusions (MI) in olivine phenocrysts from Northern Victoria Land (Antartica). Samples were collected during three Italian expeditions with the aim of comparing major element composition and volatile content in the lavas and their mantle sources.

Major elements and volatiles (H_2O, CO_2, S, F and Cl) were analyzed in MI, 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 (42.20-45.02 wt% SiO_2, with 3.36-4.21 wt% of Na_2O+K_2O) with Mg# (MgO/(MgO+FeO) mol%, Fe_2O_3=0.15FeO) ranging from 44.87 to 60.83. Lavas from Handler Ridge are the most primitive. At similar fractionation degree, however two series can be distinguished based on K_2O and trace element contents (Rb, Ba, La, Nb and Zr).

MI in olivine phenocrysts from Shield Nunatak basanites were analysed. They are comparable to the host lavas but encompasse a wider range in composition (43.68 to 48.73 wt% SiO_2, with 2.81-4.55 wt% of Na_2O+K_2O) and Mg# 49.51 to 74.44). The great majority of olivine 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_2~1). 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.

Magma migration at Mt. Etna in 2012-2013 detected by gas emissions and plume temperature

S. GIAMMANCO[1], G.G. SALERNO[1], A. LA SPINA[1], L. SPAMPINATO[1], T. CALTABIANO[1], P. BONFANTI[1], F. MURÈ[1], R. MAUGERI[1] AND V. LONGO[1]

[1]Istituto Nazionale di Geofisica e Vulcanologia. Osservatorio Etneo. Catania. Italy (salvatore.giammanco@ct.ingv.it)

In 2012-13 gas emissions from Mt. Etna's summit craters have been continuously observed by the automated UV-scanner network surrounding the volcano, continuous radiometric measurements from a permanent station installed on the SE flank of the volcano, discrete FTIR spectrometry surveys, and soil gas emissions periodically measured in low altitude sites on the SW and E flanks of the volcano. Integration of the parameters derived from the different methodologies allowed tracking of the episodic paroxysms from the New South-East crater (NSEC) and of the sporadic explosive activity at the Bocca Nuova crater (BN). Geochemistry data suggest temporal evolution of gas emissions compatible with a solubility-dependent progressive release of gas species typical of processes of magma migration from depth to surface. In particular, we observed a new phase of degassing that started early in June 2012, two months after the closure of the 2012 paroxysmal eruptive sequence. The new degassing phase was clearly discriminated by all the monitored parameters and firstly detected by soil CO_2 increase. This was followed by increase in SO_2 flux and NSEC volcanic plume temperature in August 2012, and in HCl flux late in October 2012. Whilst soil CO_2 flux described a complete cycle that ended in November 2012, the other geochemical parameters and radiometric data continued increasing and climaxed with the renewal of the NSEC paroxysmal events early in February 2013. The decreasing pattern of the soil CO_2 flux starting from August 2012 contrasting the rising trend of the SO_2 and HCl fluxes and temperature measured at the volcanic plume suggests magma migration from depths less than 7 km to the surface. The low soil CO_2 fluxes recorded since November 2012 seem to indicate that no further magma has been supplied to the volcano shallow feeder system, and that the 2013 eruptive events have been fed by the same magma batch that has started degassing in June 2012.

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