Geochemical and geophysical insights into a large magmatic system in Central Java, Indonesia

J. P. CHADWICK[1], D. WAGNER[2], V.R. TROLL[1], I. KOULAKOV[3] AND B.-G. LUEHR[3]

[1]The Dept. of Geology, Trinity College Dublin, Ireland (chadwij@tcdie)
[2]Institute for Geosciences, Christian-Albrechts-Universität zu Kiel, Otto-Hahn Platz 1, Kiel, Germany
[3]GeoForschungsZentrum Potsdam, Telegrafenberg, Potsdam, Germany.

Ascent and stalling of primary arc magmas in the crust promotes modification by numerous processes including crystallisation, magma mixing and crustal interaction. We have studied a suite of recent lavas, crystals, enclaves, plutonic inclusions, and crustal xenoliths to evaluate the role of these processes in magmatic evolution at Merapi volcano and the nature of the magmatic system feeding volcanism.

Crystalline components in recent Merapi lavas and hosted inclusions provide us with two complimentary sets of data:

1) Petrochemical and geobarometric analysis of igneous inclusions combined with geophysical techniques yields information on the structure of the Merapi plumbing system. Our results indicate that Merapi overlies a network of numerous magma bodies reaching down to the upper mantle. This is a far more extensive supply system than previously considered, with recycling of igneous material and the potential for increased interaction with the crust beneath Merapi.

2) Skarn-type meta-sedimentary xenoliths highlight the influence of the carbonate country rock on Merapi magma. Crystals from Merapi lavas show clear signs of interaction with this crust and their correlation with crystals in meta-sedimentary xenoliths may indicate integration of xenocrystic material. This interaction is not preserved in whole rock isotope analyses. Whole rock compositions may be buffered given the scale of the system feeding Merapi and potential recycling of igneous material.

Combined petrochemical and geophysical data indicate the development of a large and complex magmatic system in the crust of Central Java. These findings require a re-evaluation of how Merapi and potentially other similar systems are considered.

Murmanite lujavrites: A neglected member of the peralkaline intrusive sequence at Lovozero (Kola, Russia)

A. CHAKHMOURADIAN[1] AND R.H. MITCHELL[2]

[1]Dept. of Geological Sciences, University of Manitoba, Winnipeg, Canada (chakhmou@cc.umanitoba.ca)
[2]Dept. of Geology, Lakehead University, Thunder Bay, Canada (rmitchel@lakeheadu.ca)

Although murmanite lujavrites (ML) were distinguished at Lovozero (Kola, NW Russia) some 40 years ago, they are completely neglected in the recently published literature. These rocks occur as a discrete intrusive suite in the Lovozero composite pluton; they are emplaced into the earlier-formed Differentiated and Eudialyte-Lujavrite Units as small plugs and dike(let)s lacking chilled margins. The name ML alludes to a characteristic trachytoid texture of these rocks and the presence in them of abundant oikocrysts of exotic minerals (e.g., murmanite, lamprophyllite and lorenzenite). Clinopyroxene (Cpx), amphiboles (Amp) and eudialyte occur both as euhedral groundmass crystals and as oikocrysts. The groundmass also comprises alkali feldspars, nepheline (Ne), sodalite and accessory REE, Sr, Ti-Nb, U and Th minerals. Cpx has the compositional range $Ae_{69-94}Di_{7-17}Hd_{0-20}$; Amp is zoned from (fluor-)magnesio-arfvedsonite to (potassic-)arfvedsonite; Ne typically has higher Ks and lower SiO_2 contents (mol.%) in the rim (overall range $Ne_{69-82}Ks_{15-22}Qtz_{1-14}$). The ML are peralkaline rocks ($K_{peralk} \geq 1.4$) enriched in silica, Na, K, Rb, Mn, Sr, REE, Zr, Hf, U, Ta and W, but depleted in Mg, Ca, Fe^{2+}, Sc, V, Ti and P relative to the bulk Lovozero composition. This petrographic suite is characterized by its consistently superchondritic Zr/Hf (40-55) and subchondritic Nb/Ta signature (7-15). The ML are isotopically indistinguishable from the major intrusive units: $(^{87}Sr/^{86}Sr)_o = 0.7037$-$0.7043$; $\varepsilon(Nd) = 3.4$-3.8. We interpret the ML suite to have crystallized from a highly evolved phonolitic melt similar to the one that produced the Eudialyte-Lujavrite unit (EL melt), but containing higher normative Na_2SiO_3 and lower $CaMgSi_2O_6$. The ML parental magma could be derived from the EL melt by fractionation of Cpx, eudialyte, loparite and apatite.