Report on fieldwork to collect ultramafic cumulate xenoliths and extrusive carbonatites in the Cape Verde Islands, February 2008

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The Cape Verde Islands are intraplate hotspot oceanic islands in different stages of evolution. They are well known for mantle xenoliths and the presence of carbonatites. In February 2008, in the company of Dr Simon Day (UCL), Dr Ioan Seghedi (Institute of Geodynamics, Bucharest) and two other research students from Birkbeck, we visited three of the islands to collect cumulate xenoliths and extrusive carbonatites.

Cumulate xenoliths comprise crystals and interstitial glass (quenched melt) that have been torn from solidification fronts along the boundary walls of subvolcanic magma chambers and conduits during eruptions. They are an instantaneous 'snap-shot' in the crystallisation history of the crystal mush, allowing the direct study of processes occurring in magma chambers and so can help to understand the crystallisation sequence and eruptions. A preliminary study (using major and trace element analyses) of a few pyroxenite and hornblendite cumulate xenoliths from Santo Antão (Cape Verde Islands) has already been made in an MRes thesis (Kelly, 2008) but the about 200 xenoliths collected from lavas in different stratigraphic levels on Santo Antão, Brava and Fogo will form the basis of a PhD thesis. The new xenoliths include pyroxenites, hornblendites and glimmerites, some are glassy and a number contain bright blue sodalite.

Little is known about mafic, silica-undersaturated cumulate xenoliths and few studies have investigated the relationship between the interstitial glass and cumulate minerals, important to the understanding of the magma chamber processes. The composition of the glass (liquid) and cumulate minerals (solid phase) in glassy cumulate xenoliths might relate to fractional crystallization and magma and can be used to determine mineral/melt distribution coefficients for this type of magma composition where the melt and minerals are in equilibrium. The previous work demonstrated that the melt (interstitial glass) had a very evolved, phonolitic composition. The new xenolith collection will be used to understand phonolite production on these oceanic islands.

There are few recognised extrusive carbonatite locations in the world, and only one on an oceanic island (Brava, Cape Verdes). Using information from Prof. Mike Le Bas, we visited carbonatite locations on Brava and found previously unrecognised carbonatite spatter and lavas. These are associated with four carbonatite volcanoes that appear to have erupted through phonolite domes. The 50 or so samples collected from Brava and neighbouring Fogo will form the basis of a PhD project for another Birkbeck student, Barbara Smith.

We would very much like to thank the Mineralogical Society for the bursary towards the cost of fieldwork, which was otherwise self-financed (JK) or partly financed by Birkbeck College (HD).

Photos:
Left: Judith Kelly near Tope de Coroa, Santo Antão, with xenolith field at left of picture

Below left: Professor Hilary Downes examining carbonatites in Brava, and below right, extrusive carbonatite (ruler is marked in cm)