Geophysical Research Abstracts
Vol. 13, EGU2011-3465-1, 2011
EGU General Assembly 2011

Explosive interaction between the crust and magma in the Beaunit tuff ring, Chaîne des Puys, France

Manon Hardiagon (1), Valentin Troll (2), Hans Annersten (2), Benjamin van Wyk de Vries (1), Dougal Jerram (3), Abigail Barker (2), and Estelle Piquet (1)

(1) Magmas et Volcans CNRS/IRD - Université Blaise Pascal, Clermont-Ferrand, France, (2) Departtment of Earth Sceinces, Uppsala University, Villavâgen 16, 75236 Uppsala, Sweden, (3) Department of Earth Sciences, Durham University, Science Labs, Durham DH1 3LE , UK

There are many highly explosive tuff ring and maar volcanoes in the Chaîne des Puys (Auvergne, France). The Beaunit tuff ring is a prime example and has a characteristic basal deposit rich in crustal rock and a small juvenile fraction. This juvenile fraction itself contains abundant specks of partly-melted xenoliths (e.g. buchites): the restite from an efficient melting episode. Small amounts of light coloured pumice is found concentrated in some bands, this may be the melted fraction of xenoliths that did not mix with the basaltic magma. Going up-sequence, the tuff ring contains more and more juvenile material, which becomes more scoriaceous. The eruption ends with a small scoria cone, that contains abundant frothy, partly melted crustal rocks and peridotite xenoliths. We have studied the field relations, the textures and compositions of the basement and magmatic components. We have also taken fresh basement samples and have heated then to near magmatic pressures and temperatures. The resulting textures are identical to those seen in Beaunit and glass compositions from the melted samples are close to those of Beaunit. We propose a model where ascending basalt mixes strongly with brecciated crust, that quickly melts, rapidly liberating volatiles that rise fast, to create a gas charged, country-rock rich initial eruption. Magma rapidly follows up, creating an increasingly magmatic gas powered eruption, as the ratio of crustal gas to magma diminishes. The rapid jump to the surface of the magma could explain the incorporation and preservation of partly-melted xenoliths. The peridotite may have been scavenged also by the rapid rise following the initial gas rich phase, possible by propagation of a pressure shock downwards. If the model is correct, the highly explosive eruptions in the Chaîne des Puys and similar areas could occur very rapidly, but would be of short duration. Interestingly, the 19th century volcanologists had initially suggested that gas rich eruptions had formed such deposits, but hydromagmatic theories in the 20th Century have overshadowed their original, perceptive ideas.