



## **Estimated pressure and temperature during magma extraction beneath São Jorge Island, Azores**

**L.P. Ribeiro, (1);** Z. França, (2,3); V. H. Forjaz, (2,3) M. P. Abreu, (1),  
EMEPC@team

(1) EMEPC – Estrutura de Missão para a Extensão da Plataforma Continental, Portugal,  
luisapr@emepc.gov.pt

(2) Departamento de Geociências da Universidade dos Açores, Portugal

(3) OVGA – Observatório Vulcanológico e Geotérmico dos Açores, Portugal

São Jorge Island (38°46' – 38°33'N and 28°20' – 27°45'W) is a part of the Azores Plateau, a wide and complex region which encompass a triple junction between American, Euroasia and Nubia plates. São Jorge Island has grown by fissural volcanic activity along fractures with the regional WNW-ESE trend, unveiling the importance of the regional tectonic control during volcanic activity (Lourenço et al., 1998). Stratigraphically the island developed during three main volcanic phases (Forjaz & Fernandes, 1975), Topo complex in the east, Rosais complex in the west and Manadas complex in the center. Lavas are dominantly alkaline with  $Y/Nb \leq 1.0$ , and experience some degree of differentiation extending from basanite and tefrite to basaltic trachyandesite composition. During cruise EMEPC/Açores/G3/2007 relatively fresh pillow lavas were recovered at ca. 1222m bsl, southeast of the Island shore line (38°28'N -27.48'W). These pillow lavas are considered to belong to São Jorge submerse volcanism and compositionally, accordingly with TAS diagram, are alkaline basalts.

Using the most primitive lavas ( $Mg\# > 0.59$  and  $Ni > 115\text{ppm}$ ), will allow a characterization of the source from which the lavas were extracted.

REE patterns normalized to chondritic values (Sun & McDonald 1992) for offshore lavas show LREE enrichment relative to HREE, as is common in ocean island basalt where garnet is present in the source. However  $(La/Yb)_n$  and  $(Tb/Yb)_n$  ratios for the

pillow lavas are a little lower than to the ones found onshore (Ribeiro et al., 2007).

Incompatible elements pattern are identical to subaerial lavas with exception of Nb and Ta, where the ratio between these elements in the pillow lavas ( $Nb/Ta \approx 17.5$ ) is distinctly higher than the ones found onshore ( $Nb/Ta \approx 12.4$ ).

Using Albarède (1992) method to estimate P and T of magma extraction, we obtain for São Jorge island P values in the order of 23.9 and 13.8 Kbar and T between 1427 and 1250°C, analogous to the ones estimated by Madureira (2006) for Terceira island fissural complex. These values are higher than the ones estimated for pillow lavas where P and T are in average 13 Kbar and 1275°C.

Associating the estimated P and T and the volcanic stratigraphy of São Jorge with the new data from the offshore we verify decreasing depth of melt extraction with time. Future work will examine the temporal evolution of volcanism in the area and the importance of P and T on melt extraction and in geochemical composition of erupted lavas.

Albarède F. (1992) – How deep do common basaltic magmas form and differentiate?. *Journal of Geophysical Research*, vol. 97, nº 87, pp. 10997-11009.

Forjaz, V.H.; Fernandes, N.S.M. (1975) – Carta Geológica de Portugal na escala de 1:50000. Notícia explicativa das Folhas “A” e “B”, Ilha de São Jorge (Açores), Serviços Geológicos de Portugal, 32pp.

Lourenço, N.; Miranda, J.M.; Mendes-Victor, L.A.; Madeira, J.; Needham, H.D. (1998) – Morpho-tectonic analyses on the Azores Volcanic Plateau from new bathymetric compilation of the area. *Marine Geophysical Researches*, 20, 141-156.

Madureira, P. (2006). Geoquímica elementar e isotópica (He e Ne) das lavas máficas da ilha Terceira: evidências para uma origem profunda da pluma dos Açores. PhD thesis presented to Évora University, 230 pp.

McDough, W.F.; Sun, S.-S.; Ringwood, A.E., Jagoutz, E.; Hoffmann, A.W. (1992) – Potassium, rubidium, and cesium in the Earth and Moon and the evolution of the mantle of the Earth. *Geochim. Cosmochim. Acta*, 56(3), 1001-1012.

Ribeiro, L. P.; França, Z.; Rodrigues, B.; Forjaz, V. H.; (2007) – First approach to geochemical study of São Jorge lavas, Azores. EGU 2007, Geophysical Research Abstracts, Vol. 9, 09998.