



## **The influence of interstitial liquid on the whole rock geochemical composition of ODP Leg 118 en 176 samples: Insights from in-situ Laser Ablation ICP-MS analysis of clinopyroxene and plagioclase.**

**K. Horckmans, J. Hertogen**

Geo-Instituut, University of Leuven (K.U.Leuven), B-3001 Leuven, Belgium

(Karolien.Horckmans@geo.kuleuven.be)

Ocean Drilling Program Hole 735B, initiated during Leg 118 (1987) and later deepened by Leg 176 (1997), consists of a 1.5 km deep section through gabbroic lower crust. The diverse rocks range from strongly primitive troctolites, over common gabbros and differentiated FeTi-gabbros, to extremely fractionated plagiogranites. Remarkable is the high frequency of FeTi-gabbro (especially in the upper part of the core) which formed out of trapped interstitial iron- and titanium-rich melt.

It is an intrinsic difficulty of cumulate rocks to properly interpret whole rock contents of incompatible trace element data, because the amount of trapped interstitial residual liquid might be the controlling factor. Moreover, as early formed cumulates might have been permeated by later-stage evolved liquids, there is no guarantee that whole rock data represent 'equilibrium' compositions. This raises an important issue since models of fractionation for the lower ocean crust sampled by the Leg 118 en Leg 176 drillings are largely based on whole rock geochemical trends.

To gain more insight into this matter a Laser Ablation ICP-MS study was performed on samples of both Leg 118 and Leg 176. The *in situ* LA-ICP-MS micro-analyses were specifically focused on the Rare Earth Elements (REE) content of clinopyroxene and plagioclase grains of polished mounts. The REE concentrations in these minerals should reflect the state of evolution of the residual liquid from which they crystallised or with which they last equilibrated.

The data show that samples with higher whole rock REE contents also have correspondingly higher REE concentrations in their clinopyroxene and plagioclase. REE chondrite normalized plots of clinopyroxenes display significantly larger negative Eu-anomalies with increasing REE concentrations, which points to the influence of protracted plagioclase crystallisation with increasing melt differentiation. Generally, clinopyroxene and plagioclase from the same sample cover a restricted concentration range, which implies that each sample represents a restricted interval of the total crystallisation path. In particular the clinopyroxene data are useful to calculate model compositions of the residual liquids. These compositions are in turn very useful to estimate the amount of trapped liquid present in the whole rocks, and to derive the state of evolution of the liquids at the moment of trapping or expulsion due to compaction of the gabbros.