Natural iron fertilization in the ocean and GEOTRACES

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The recent investigations conducted in naturally iron fertilized areas (KEOPS, [1], CROZEX [2]) have demonstrated the large potential of such natural laboratories to improve our knowledge of the iron biogeochemical cycle in the ocean. During these experiments the use of geochemical tracers was crucial to identify and quantify the different sources of iron and the major processes that transport this micro nutrient to the surface layer where it is used by planktonic organisms. However, some questions are still lacking a clear answer (e.g. the contribution of the different sources of iron to the dissolved iron pool) and new once have emerged (e. g. the biovailability of particulate iron). New studies are clearly needed to improve our understanding of the mechanisms that drive natural iron fertilization and of the response of biology. Naturally fertilized laboratories are very suitable environments to conduct process studies investigating the coupling between geochemistry and biology.

Besides the two sites extensively studied during KEOPS and CROZEX, there are a large number of other potential sites for studying natural iron fertilization. They need to be identified and explored.

GEOTRACES presents the adequate framework to address all the issues mentioned above and to carry out new studies on natural iron fertilization in the ocean.

[1] Blain *et al.* (2007) *Nature* **446**, 1070-1075 [2] Pollard *et al.* (2007) *Deep-Sea Research II*, **54**(18) 1905-1914.

The effect of chlorine on the solubility of Pt in a haplobaslatic melt at 0.2 GPa and 1523K

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The effect of Cl on Pt solubility in hydrous haplobasaltic melt was determined for a DiAn eutectic composition melt at 0.2 GPa and 1523K, using a sealed capsule technique. DiAn glass and water were sealed within a Pt or PtIr capsule along with a source of Cl, brought to experimental temperature and pressure and allowed to equilibrate with the capsule material. All experiments were run in an internally heated pressure vessel equipped with a rapid quench device which allowed quenching of the melt at the conclusion of the experiment and resulted in a bubble and crystal-free glass representative of the melt at experimental conditions. Experiments were run at different water contents (which resulted in different oxygen fugacities) and at different Cl contents, from less than 1 wt. % to saturation for both volatiles.

Due to the presence of micronuggets in the majority of the experiments, samples were analyzed using laser ablation ICPMS to determine baseline Pt concentrations free of micronuggets. Chlorine contents were determined by electron microprobe and the water contents were analyzed by KFT and FTIR.

Results indicate an increase in Pt solubility with an increase in Cl in the melt, until volatile saturation of the melt where Pt solubility drops drastically to near Cl-free values. Maximum enrichment is over three orders of magnitude higher than the Cl free values resulting in Pt solubilities in the tens of ppm. The behaviour at Cl and water contents below saturation suggest that there is complexing of the Pt with Cl in the melt and could have significant implications in modelling of PGEs in layered intrusions where Cl is present.

The results of this study provide a possible mechanism for allowing the magma to evolve while still maintaining the PGEs in the residual melt. Chlorine present in the parental magma to the intrusion will concentrate in the residual melt during crystallization increasing the magmas capacity for Pt. Upon saturation of an aqueous volatile phase, Cl contents in the melt will drop drastically lowering Pt solubility forcing Pt from the melt and into either the exsolving fluid or as discrete micronuggets.