Rhenium systematics in submarine MORB, Arc and Back-Arc Basin glasses by laser ablation ICP-MS

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Rhenium and other trace elements were determined for MORB glasses from the Pacific and Atlantic Oceans, submarine volcanic glasses from the Lau, Vanuatu, Manus and Woodlark back arc basins, as well as melt inclusions from arc picrites, using laser ablation ICP-MS. Rhenium is strongly positively correlated with Yb for all submarine basaltic glasses. E- and N-MORB as well as King's Triple Junction samples show similar correlations with constant Re/Yb ratios, indicating that Re and Yb exhibit similar compatibility during melt evolution (Hauri and Hart, 1997). In contrast, samples from the East and Central Lau Spreading Centers have much steeper slopes compared with MORB samples and are similar to komatiite arrays. The more incompatible element-depleted samples, including those from the Lau Spreading Centers and Woodlark Basin and also depleted MORB samples, are negatively correlated in Yb/Re and Re, indicating that Re is more incompatible than Yb in these environments. This is interpreted to reflect melting of previously depleted mantle, resulting in melting out of sulfides in the source regions of these samples.

The trace element characteristics (e.g., low Nb, high LILE) of east Manus submarine volcanic glasses indicate their arc affinity. These samples have distinctively higher Re concentrations (0.26 to 40 ppb) and much higher Re/Yb ratios (0.23 to 9.18 ppb/ppm) compared to MORB. Melt inclusions from arc picrites have even higher Re/Yb ratios**.** These point to strong Re enrichment in some subduction zone environments, which is consistent with Re loss from eclogites (Becker, 2000). The low Re concentrations previously measured for arc volcanics (0.01 to 1.6 ppb; Alves et al., 1999, Woodland et al., 2002) possibly result from syn- and post-eruption Re loss as documented in Hawaiian suites. These results suggest that the contribution of Re by arc processes to crustal budgets may be significantly underestimated.

References:

Alves, S., Schiano P., and Allegre C.J., (1999) *Earth and Planet. Sci. Lett*., 168, 65-77.

Becker H. (2000) *Earth Planet Sci. Lett.* 177, 287-230.

Hauri E.H. and Hart S.R., (1997) *Chemical Geology* 139, 185-205.

Woodland, S.J., Pearson, D.G., and Thirlwall, M.F., (2002) *J. Petrology*, 42: 171-198.

Magmatism of the Indian and Atlantic Oceans as a consequence of deep mantle plumes activity

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The early stages of the Atlantic and Indian ocean' opening are connected in many aspects with the upwelling of super-plumes which initiate intensive melting of the low parts of continental crust causing the formation of large flood basalt provinces. At the same time, melts generated under conditions of starting spreading can inherit geochemical characteristics of flood magmas preceding the break-up. According isotope data, the enriched component for the magmas of the North Atlantic region (60-78^{o}N) of deep tholeiites developed close to Iceland and less deep Na-tholeiites of the Knipovich Ridge, is close to the basalts from Jan-Mayen island which magmas had undergone contamination by crustal material.

Upwelling of a large deep diapir (Caroo-Maud) preceded the starting stage of the opening of the eastern part of the Indian Ocean. About 130-120 m.y. ago tectono-magmatic evolution of the Indian was influenced by formation within its frame the largest magmatic province of Kerguelen plume developed to the east of the Karoo-Maud plume area along the boarder of India-Australia and Antarctic. The Kerguelen plume reached the maximum of activity during the formation of Kerguelen plateau, which is the largest volcanic province in the Indian Ocean. Its formation began about 115 m.y. ago and continues till now. Large volcanic uprisings, such as the Eastern-Indian Ridge (82-38 Ma), Naturaliste Plateau (100-57 Ma), the Broken Ridge, Aphanasey Nikitin Rise were influenced by the Kerguelen plume. Formation of geochemically enriched tholeiites within the oceanic rises of the eastern part of the Indian Ocean at the early stage of the ocean development is connected, probably, with the influence of this plume. The plume substance composition is unrevealed, but outpouring of tholeiites with typical for the Indian Ocean enriched isotope characteristics ($^{206}Pb/^{204}Pb<17$, high $^{87}Sr/^{86}Sr$ values) and characteristic ratios of lithophile elements (higher values of La/Ta, Ce/Pb ratios) evidence to participation of the substance of old continental crust in the melting process, which was impoverished in U, Pb, Th, Ta, Nb during the process of metamorphism, but not of the deep plume enriched substance.