5.2.P11

Geochemistry and age of basalts from the Shatsky Rise, NW Pacific

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The 500,000 km^2 Shatsky Rise is the oldest of the great Pacific oceanic plateaus. Most of the crustal volume is concentrated in three edifices, the largest of which is the >2.4 × 10^6 km^3 south high [1]. Seafloor magnetic lineations indicate the rise was formed at the Pacific-Izanagi-Farallon triple junction, beginning at about M20 time (146 Ma), when the triple junction jumped ~800 km northeastward. Following emplacement of the south high, formation of the rise continued at a decreasing rate as the triple junction migrated to the northeast, until about M4 time (127 Ma). At ODP Site 1213 on the south high, 46 m of slightly to moderately altered basalt were penetrated, and samples of highly altered basalt were dredged from several locations during cruise TN037 of the R.V. *Thomas G. Thompson*. We obtained ^{40}Ar-^{39}Ar plateau ages of 144.8 ± 1.2 Ma; 143.7 ± 3.0 Ma (uncertainties are 2s) for two Site 1213 samples. This result confirms that volcanism on the south high took place very close in time to the formation of the adjacent lithosphere. This age is also very close to the Jurassic-Cretaceous (Tithonian-Berriasian) boundary, and we speculate that this boundary may at least partly have been a consequence of the eruption of the south high. The least-altered basalts are tholeiites with Mg-no. of 58-61. Their incompatible element patterns are intermediate between those typical of N-MORB and OIB, and thus broadly similar to patterns of ~120 Ma basalts from the Ontong Java Plateau. However, the Site 1213 basalts and least-altered dredged Shatsky Rise rocks have relatively N-MORB-like age-corrected $\varepsilon_{Nd}(t)$ (+9.8 to +8.6), $(^{206}Pb/^{204}Pb)_t$ (18.09 to 18.25), and $(^{87}Sr/^{86}Sr)_t$ (0.7028 to 0.7030). In this respect, they are distinct from Ontong Java basalts (e.g., with $\varepsilon_{Nd}(t) < +6.5$) but rather similar to Icelandic basalts. The rapid formation of the south high at a triple junction that had just jumped to a new location, the originally shallow water depths of the three highs [1], and the rather long-lived but gradually dwindling volcanism that followed the formation of the south high are consistent with a plume-head origin. However, the isotopic data indicate a major input of Pacific-MORB-like mantle, and we cannot presently rule out a non-plume origin.

Reference

[1] Sager, W.W. et al. (1999) *JGR* **104**, 7557-7576.

5.2.P12

New insights into Pd-Pt-Ir fractionation during magma evolution

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Introduction

Recent studies on the geochemical behaviour of Pd and Pt in basaltic volcanics have revealed a wide range of sub-primitive mantle [PM] Pt/Pd-ratios which are not in accordance with the experimentally determined partition coefficients for Pd and Pt between monosulphides [mss] and sulphide melt or between mss and basaltic melt. According to their partition coefficients, Pd and Pt should behave similarly incompatible during mantle partial melting. Thus the Pt/Pd-ratio of a primitive melt should be identical to that of mantle peridotite, i.e. 1.76, assuming that sulphides are the major host for Pt and Pd in mantle peridotite, which is the common consensus. Some authors explain the sub-PM Pt/Pd-ratios by the occurrence of Pt-Fe-alloys in the source or their precipitation from the partial melt. However, systematic studies of Pt-precipitation have not yet been published, due - among others - to the lack of a large PGE data-set.

A new model for the systematics of Pt-precipitation in flood-basalts and their mantle source

We have carried out a detailed PGE-study of 80 basalts from the Large Igneous Province of the Kerguelen Plateau in the Indian Ocean. Using these data in combination with literature data from other plume-associated volcanics we show that the commonly observed range of sub-PM Pt/Pd-ratios can be explained by Pt-Fe-alloys being present in the magma source (i.e. formed by incongruent melting of mss) and precipitation of more Pt-Fe-alloys from the partial melt in which they will remain suspended due to their very small grain-size.

Systematics of PGE fractionation of basalts from different tectonic settings

A comparison of the fractionation between Pd, Pt and Ir in mafic volcanics of different tectonic settings shows that three groups may be distinguished: Group 1 are intraplate basalts which display a range of sub-PM Pt/Pd-ratios and a range of Ir/Pd-ratios owing to Pt-Fe-alloys in their source and Pt-Fe-alloy- and Ir-Ru-alloy precipitation in the melt. Group 2 are subduction-related magmas; they show a similarly large range of sub-PM Pt/Pd-ratios due to Pt-Fe-alloys in their source and Pd-enrichment as a result of subduction-related Pd-enriched fluid-infiltration into the source. Group 3 comprises intraplate-magmatism intersected by a rift system as well as continental-rift-related magmas; they are characterized by a small variation in their sub-PM Pt/Pd ratios at variable Ir/Pd.