

The potential of Ir and Os isotopes as point paleoflux tracers

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PGE concentrations (Pt, Ir and Os), and, ¹⁸⁷Os/¹⁸⁸Os have been measured in bulk pelagic carbonate samples from ODP Site 806 (Hole C) on the Ontong-Java Plateau (OJP) and from Site 849 (Hole D) in the Eastern Equatorial Pacific. Previously published ³He [1] and ²³⁰Th [2] data from Site 806 and ³He data [3] from Site 849 provide a basis for empirically evaluating the total PGE burial flux and the contribution of particulate extraterrestrial (ET) material to these fluxes. Hydrogenous Ir dominates the sedimentary Ir budget at both sites, while ET Ir accounts for approximately 20% of total Ir at site 849, and only 10% at Site 806. Contributions of lithogenic Ir are estimated to be less than 5% of total Ir at both sites. In spite of the varied Ir sources to the sediment, comparison of Ir and ³He concentrations lends support to the idea that Ir can be used as a point paleo-flux tracer. For example point paleoflux estimates based on Ir agree with those based on ²³⁰Th_{xs} and ³He within a factor of two at Site 806. However, total Ir burial fluxes can vary in space and time requiring that flux estimates be locally calibrated to total Ir flux rather than the background flux of ET Ir.

The sedimentary Os budget can be constrained by performing similar mass balance calculations. These results indicate that approximately 5% of the bulk sediment Os inventory is ET Os at both sites. However, ¹⁸⁷Os/¹⁸⁸Os variations at Sites 806 and 849 suggest that the ³He/ET Os ratio in the bulk sediment may not be constant. At Site 806, estimates of ET Os based on Os isotope mass balance calculations exceed those based on ³He, while at Site 849, the opposite appears to be true. These results have important implications for interpreting bulk sediment Os isotope records because ¹⁸⁷Os/¹⁸⁸Os ratio variations can potentially result from changing patterns in Os burial flux and be unrelated to changes in the Os isotopic composition of seawater. However, if the ¹⁸⁷Os/¹⁸⁸Os of hydrogenous Os can be independently constrained, then Os isotopes can also be exploited as point paleo-flux tracers.

References

- [1] Patterson & Farley (1998) *GCA* **62**, 3669-3682.
- [2] Higgins et al. (2002) *EPSL* **203**, 383-397.
- [3] Winckler et al. (2004) *Quat.Sci. Rev.* **23**, 1873-1878.