

The potential of Ir and Os isotopes as point paleoflux tracers

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PGE concentrations (Pt, Ir and Os), and, $^{187}\text{Os}/^{188}\text{Os}$ 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 ^{230}Th [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 $^{230}\text{Th}_{\text{xs}}$ 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, $^{187}\text{Os}/^{188}\text{Os}$ variations at Sites 806 and 849 suggest that the $^3\text{He}/\text{ET Os}$ 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 $^{187}\text{Os}/^{188}\text{Os}$ 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 $^{187}\text{Os}/^{188}\text{Os}$ 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.