

## Osmium isotope insights into high $^3\text{He}/^4\text{He}$ mantle and convecting mantle in the North Atlantic

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Evidence for ancient depletion and enrichment of the mantle can be retained by Os isotopes, even in the convecting mantle. Therefore, Os isotopes in high  $^3\text{He}/^4\text{He}$  North Atlantic picrites (NAP; Baffin Island and West Greenland) can potentially discriminate between depletion and primordial models for high  $^3\text{He}/^4\text{He}$  mantle formation. In addition, the  $^{187}\text{Os}/^{188}\text{Os}$  composition of typical convecting mantle is still uncertain due to heterogeneity on a variety of scales. Large-degree picritic melts, rather than small degree melts, should most closely represent the bulk Os isotope composition of the source which, in the case of North Atlantic picrites, is indistinguishable from depleted MORB mantle in terms of Nd and Sr isotope compositions and trace elements.

Baffin Island and the earliest West Greenland picrites, which have  $^3\text{He}/^4\text{He}$  ratios up to 50 Ra, are remarkably uniform in composition with  $^{187}\text{Os}/^{188}\text{Os}_{\text{initial}}$  between 0.1267 and 0.1280, and a mean and mode of  $0.1272 \pm 0.0007$  [1] — less radiogenic than primitive upper mantle estimates, but similar to the least radiogenic mid-ocean ridge basalts and the most common composition of ophiolite-derived platinum-group alloys and chromites. These compositions appear to represent a source dominated by peridotite. The absence of significantly sub-chondritic  $^{187}\text{Os}/^{188}\text{Os}$  values indicates that these picrites do not tap a region that has been totally isolated since an ancient depletion event. Furthermore, the lack of supra-chondritic  $^{187}\text{Os}/^{188}\text{Os}$  likely precludes a bulk core contribution. Subsequently erupted West Greenland picrites have slightly supra-chondritic  $^{187}\text{Os}/^{188}\text{Os}$  and also contain  $^3\text{He}/^4\text{He}$  ratios of  $>45$  Ra, suggesting either complex mixing of depleted MORB mantle, recycled oceanic crust and high  $^3\text{He}/^4\text{He}$  primitive mantle, or that He is decoupled from other isotopic tracers and is dominated by minor addition of a He-rich, high  $^3\text{He}/^4\text{He}$  component probably of primordial nature.

[1] Dale *et al.* 2009 *EPSL* **278**, 267-277.

## Erosion and impact of human disturbance on sediment transport in the Red River, Vietnam

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Mechanical erosion and sediment transfers depend strongly on many natural parameters related to topography, climate and land cover [1]. Additionally, anthropogenic activities may affect sediment supplies to estuaries, deltas and the coastal zone [2]. The Red River (China/Vietnam,  $A=155\,000\text{ km}^2$ ) is a typical tropical humid river originating from the mountainous area of the Yunnan Province in China. Based on daily discharges (Q) and suspended particulate matter (SPM) concentrations between 1960-2007 at SonTay gauging station (outlet of the river and entry to the Delta) provided by the national institute IMHE-MONRE, the mean annual SPM fluxes was estimated to 90 Mt/yr, corresponding to a sediment yield of  $600\text{ t/km}^2/\text{yr}$ , similar to the Ganges/Brahmaputra system [3], and probably due to same controlling factors. The temporal variability of annual SPM fluxes (ranging from 24 to 200 Mt/yr) is strongly related to the interannual hydrological conditions. However, some years of high water flow did not account for high sediment fluxes, especially after 1989 when the HoaBinh dam was operated. Sediment rating curves (power law-type;  $\text{SPM}=aQ^b$ ) were fitted for both periods (1960-1989; 1990-2007). The analysis of the pre- and post-1989 sediment rating parameters (a, b) suggests a downshift of a-parameter values after 1989, attributed to decreased sediment supply [4]. A single sediment rating curve derived from 1960-1989 data was used to simulate the annual variability of former sediment delivery, generating excellent cumulative flux estimates (error  $<-5\%$ ). In contrast, applying the same rating curve to the 1986-2007 data resulted in systematic, important (up to 97%) overestimation. This suggests that the HoaBinh dam reduces annual SPM delivery to the delta by half, implying changes in nutrient and contaminant transport.

[1] Milliman & Syvitski. (1992) *J. Geol.* **100**, 525-544.

[2] Farnsworth & Milliman, (2003) *Glob. & Plan. Change* **39**, 53-64. [3] McLennan (1993) *J. Geol.* **101**, 295-303. [4] Wang

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