Tracing sources of Fe to the Central and Eastern Equatorial Pacific with rare earth elements and aluminium

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The Eastern Equatorial Pacific (EEP) is an HNLC region where supply of Fe limits productivity. Several studies [e.g., 1] have indicated that an important (and perhaps the dominant) source of Fe to this region is by eastward transport in the Equatorial Undercurrent (EUC) and subsequent upwelling. In this study we have investigated the distribution of Fe in the EUC at and close to 140°W, and have used Al and the rare-earth-elements (REEs) to assess the sources and transport of this Fe. A total of 180 seawater samples were analysed from the Biocomplexity cruise in 2005, augmented by a further 93 samples from the SS06/2007 cruise in 2007 to the Bismarck Sea from which the EUC originates [2].

A distinct subsurface enrichment of dissolved Al and Ce was found associated with the high velocity core of the EUC. A weak Fe enrichment was displayed at the Ce maximum. The relative enrichment of the Al, Ce and Fe, and lack of any Eu anomaly, indicates that the source of these metals is pluvial rather than hydrothermal. Subsurface Ce maxima in the stations of Bismarck Sea suggest that the high-energy sediment remobilisation regimes off the mouths of the large tropical rivers that drain the highlands of Papua New Guinea are the main sources of this enrichment. The extensive penetration of this continental signal into the open ocean provides an important link between coastal and open ocean biogeochemical cycles.

[1] Coale *et. al* (1996*) Nature*, **379** 621-624. [2] Tsuchiya *et. al* (1989) *Progress in Oceanog*, **23** 101-147.

Mesozoic decratonization of the North China Block: Evidence from Hf-Os isotopes

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Cratons are old, stable parts of the continental crust, typically underlain by a thick, cold, and refractory lithsopheric mantle. They have survived at least since Proterozoic time and have not undergone strong magmatism or tectonism since their stabilization.

The North China Craton (NCC), the largest and oldest cratonic block in China, appears to have had characteristics similar to those of other cratons before the Middle Ordovician. However, geochemical and Sr-Nd-Hf isotopic data of mantle xenoliths contained by Late Triassic kimberlites and *in situ* PGE and Os analysis of sulfides show that the lithospheric mantle beneath the North Korea is largely juvenile, indicating replacement of the ancient and refractory lithosphere by a young and fertile lithospheric mantle beneath east part of the NCC before and at Late Triassic.

The eastern part of the NCC contains large volumes of Mesozoic igneous rocks. Hf-isotope compositions of magmatic zircon grains from igneous rocks in the Liaodong Peninsula, east NCC, indicate that widespread late Mesozoic granitoids formed by partial melting of ancient crust, but with significant input of a mantle component via magma mixing [1-2]. This magmatism has accompanied by asthenospheric upwelling and the removal and modification of lithospheric mantle,. The Hf isotopic signatures thus record the addition of juvenile crust beneath the eastern part of the NCC.

In summary, Os and Hf isotopic data of sulfides and zircons from mantle xenoliths and Mesozoic magmatism suggest the replacement of ancient and refractory lithospheric mantle by a young and fertile lithospheric mantle beneath the east NCC since ca 200 Ma. This decratonization of the east North China Block [3], which may have been triggered by the Triassic collision between the North China and Yangtze cratons, coincides with the subduction of the Pacific plate beneath the region, and could be related to extension associated with rollback of that plate.

[1] Yang *et al.* (2007) *Contrib. Mineral. Petrol*. **153**, 177-190.[2] Yang *et al*. (2007) *Chem. Geol*. **242**, 155-175. [3] Yang *et al*. (2008) *Geology* **36**, 467-470.