Investigation of chromium isotope variability in the Canadian Arctic Archipelagos

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Measurements of total dissolved chromium concentration ($[Cr]_T$) and their isotopic ratio ($\delta^{53}Cr$) in modern oceans has increased with the need to calibrate Cr as a proxy for paleo redox changes in the ocean and atmosphere. In 2015, a set of 20 stations were sampled along a transect from the Labrador Sea to the Beaufort Sea, by way of the Canadian Arctic Archipelago (CAA). Preliminary measurements of $[Cr]_T$ and $\delta^{53}Cr$ range from 77 $ng{\cdot}Kg^{-1}$ to 263 $ng{\cdot}Kg^{-1}$, and –0.07 ‰ to +1.54 ‰ respectively. These waters are the first to plot systematically below the global Cr array on the $\delta^{53}Cr$ *vs.* ln(Cr) diagram, which, thus far, describes the behaviour of Cr and its isotopes in three of the worlds major ocean basins, including 47 new samples of waters from the subarctic Pacific down to 4200 m depth (see figure). The slope of the global Cr array is interpreted to reflect a globally unique fractionation factor associated with the dominant process(es) by which soluble Cr(VI) is reduced in the oceans to particle reactive Cr(III) species, which are susceptible to scavenging and export on sinking particles. Some of the exported Cr(III) is released into deep waters where the particles dissolve, and eventually re-oxidized to Cr(VI), thus, driving the deep ocean towards lower $\delta^{53}Cr$ values and higher $[Cr]_T$ than the surface mixed layer.

In this talk, we will evaluate potential mechanisms which can explain why the redox-imprinted signature of dissolved Cr cycling seen elsewhere in the oceans is augmented in the Labrador Sea and CAA, with a particular emphasis on mixing effects involving local riverine inputs of Cr.