Old Sm-Nd ages for cumulate eucrites and redetermination of the Solar System initial $^{146}Sm/^{144}Sm$ ratio

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Early solar system evolution from planetesimal formation to initial differentiation is studied using short-lived radioisotope systems to provide high temporal resolution. However, extinct radionuclides must be used in combination with long-lived chronometers in order to convert the relative time intervals provided by the extinct radioisotopes into absolute ages. Sm-Nd systematics include two decay schemes: the extinct ^{146}Sm-^{142}Nd ($T_{1/2}$=103 Ma) and the long-lived ^{147}Sm-^{143}Nd chronometers ($T_{1/2}$=106 Ga). Because absolute ages can be obtained from the latter, no additional anchor point is required for Sm-Nd studies. In the case of a protracted cooling history, coupled Sm-Nd systematics present the advantage that both chronometers have the same isotopic closure temperature.

In order to better understand the chronology of the HED parent body differentiation and, in particular, its crustal evolution, we focused on three cumulate eucrites. Isotopic measurements were performed using the DTM Finnigan Triton. Coupled Sm-Nd measurements on whole-rocks and mineral separates of two cumulate eucrites (Binda and Moore County) give concordant results and suggest that the last Sm-Nd isotopic closure occurred at ~4547 Ga. Moama has known a more complex history and probably multi-stage evolution as illustrated by its initial radiogenic Nd isotope composition and younger Sm-Nd isotopic closure age.

Considering these new results and eucrite data from the literature, we find an initial solar system $^{146}Sm/^{144}Sm$ ratio of 0.00865±0.00038. This value is more precise but fully consistent with the previous estimate of 0.008±001 defined from angrite and eucrite studies. This work suggests that ^{146}Sm was homogeneously distributed in the inner solar system, with the exception of the formation region for carbonaceous chondrites which preserved nucleogenic anomalies [1, 2].

[1] Andreasen & Sharma (2006) *Science* **314**. [2] Carlson *et al*. (2007) *Science* **316**.

Iron distribution in the surface and Oxygen minimum waters of the tropical North Atlantic

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Bergquist & Boyle [1] and Measures *et al*. [2] reported high iron levels (>1 nmol/kg) in the oxygen minimum zones (OMZ) of the western and central tropical North Atlantic. Although iron is expected to be high in oxygen minimum waters because of the decomposition of sinking biological debris, iron levels in the OMZ of the tropical North Atlantic (TNAtl) are significantly higher than would be expected from typical Fe:C ratios of marine organic matter. Two possibilities for these high Fe levels seem possible: (1) Fe may escape from reducing continental margin sediments on the African margin and diffuse/advect into the ocean interior, or (2) Fe:C ratios of biological debris in the TNA may be higher than elsewhere because of the supply of iron from North African dust transport into the surface waters. In order to better constrain these possibilities, we have occupied 27 stations in the TNAtl between 6-20 degN and 21-60 degW (August 2008) collecting data for hydrography (T,S) nutrients (O2, P, NO3, Si) and samples for Fe and Mn from the upper 1000 m (all stations) and full water column (5200 m, one station). In 46 TNAtl surface samples from this cruise and two others, 70% of the Fe concentrations range from 0.4-0.8 nM, with 5 lower (min 0.12nM) and 7 higher (max 1.30nM). At 500m, Fe concentrations vary over a narrow range from 0.54nM in the northwest to 1.43nM in the northeast; Fe is roughly correlated with AOU implying an C:Fe ratio of about 8x10^4. This ratio is about a factor of three lower than the ratio inferred from the northeast Pacific water column. Although there is somewhat of an east to west decreasing Fe concentration at 500m, the spatial distribution does not appear consistent with a northwest African sedimentary source. We conclude that the high levels of Fe in the TNAtl oxygen minimum are created by decomposition of biological debris that is enriched in iron because of high surface concentrations contributed by African dust.

[1] Bergquist & Boyle (2006) *GBC* **20,** GB1015.
[2] Measures *et al.* (2008) *GBC* **22**, GB1005.