Bendego IC-Iron: HSE and Re-Os

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The Bendego Meteorite is a >5 ton iron found in Northeastern Brazil in 1784. Presently the main mass is hosted at the Brazilian National Museum, being the 16th largest specimen in the world. Bendego is a coarse octahedrite displaying kamacite bands (1.8 mm) of irregular Widmanstatten pattern and abundant Neumann lines. It belongs to the rare IC-group of (11) irons and contains abundant troilite, which occurs as macroscopic nodules as well as microscopic bands, both elongated and aligned. Macroscopic inclusions of cohenite exhibit internal nodules of troilite. Inclusions of plessite, schreibersite, rabdite, [$(Fe,Ni)_3P$] polymorphs, and chromite were also recognized. It has 6.1-6.9% Ni, 0.40-0.51% Co, 600ppm Cr; 0.05% S; 54-56ppm Ga; 0.17-0.22ppm Ir; and smaller values of As (5.3-6.0ppm) and Au (0.69-0.80ppm), which are slightly different from values reported for other IC-group meteorites.

Re-Os and Highly Siderophile Element (HSE) analyses

This work reports the first Re/Os isotope results from the IC-group. Seven samples collected in different areas of Bendego were analysed at the University of Maryland. Iron meteorites are much richer in siderophiles (1284 < Re < 3249 ppt; 15 < Os < 48 ppb) than terrestrial crust and mantle rocks (Re ~390 ppt; Os ~50 ppt). Bendego has 99-114 ppb Os and 10-12 ppb Re. Ir, Ru, Pt and Pd concentrations were also measured. Normalized to the Orgueil meteorite (CI) these data result in a unique pattern (Figure) that differs from that of other magmatic iron meteorites and pallasites.

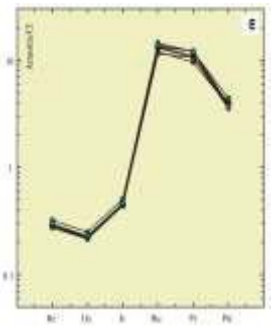

Figure: Bendego Meteorite HSE' multi-elementar diagram.

Concluding Remarks

IC-group meteorites are believed to have formed by magmatic processes similar to those of meteorites in groups IIAB, IIIAB and IVA, even they are thought to have formed on a separate parental body. Our data show: (i) negligible fractionation of highly siderophile elements over the volume of material sampled and (ii) a very distinct highly siderophile element pattern compared to the more voluminous iron groups. It is difficult to make any conclusions about crystal-liquid fractionation processes or the composition of the starting metal but the observed pattern clearly indicates a unique set of conditions compared to the other groups. The Re-Os isotopes of this sample are consistent with a primordial isochron, but given the essentially invariable Re/Os of all pieces analyzed, this cannot yet be confirmed. More samples from the same group will have to be analyzed for a better understanding of Bendego's HSE distribution and its relationship to a chondritic precursor.

The Nordic Seas in the Pliocene: A hot spot or not?

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Pliocene climatic and oceanographic conditions of the Nordic Seasneeds to be better constrained. Therefore, the Pliocenen section of ODP Site 642B (Eastern Nordic Seas, 1286 meter water depth) is studied with the aim to determine the role of the Nordic Seas as a gateway linking the North Atlantic and the Arctic Oceans. Site 642B is located underneath today's pathway of the Norwegian Atlantic Current, and will detect changes in polar heat transport within a current regime comparabla to the present. A multi-proxy approach is used to characterize surface, subsurface and bottom water conditions at the site throughout the Pliocene. The presented results is based on planktic and benthic oxygen and carbon isotopes, planktic foraminiferal counts and SST estimates, and alkenones.

The predominant conditions of the Nordic Seas changed at several occation through the Pliocene, e.g. with the surface water temperatures swiching between longer periods with 1-2°C warmer than present conditions to colder than present by 1°C. Occationally there is indications of strong fresh water influence at the surface, corresponding with reduced ocean-atmosphere gas exchange. However, strong ocean-atmosphere gas exchange or high productivity was the more normal Pliocene situation. Throughout the Pliocene large variability is seen within the mixed layer, however, independent of this variability colder and/or saltier than today's water is seen most of the time. The bottom water conditions at the site swiched between being comparable to and significantly saltier than at present. Reduced stratification between subsurface and bottom water characterize most of the Pliocene. The bottom water was less ventilated than presently through much of the Pliocene, however, conditions more similar to the present occurred towards the early to mid Piacenzian.

The oceanographic conditions of the Nordic Seas was distinctly different from the present day through much of the Pliocene. However, at no point through the Pliocene does our records show extreme polar amplification or strong deep convection and ventilation in the Nordic Seas.