10% decrease of dissolved oxygen in the Japan Sea (East Sea) bottom water for the last 30 years

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Japan Sea (East Sea) is known as a semi-closed marginal sea surrounded by the Japanese archipelago and Eurasia. In spite of no exchange of deep waters between the Japan Sea and the surrounding seas in the western Pacific, the Japan Sea water shows high dissolved oxygen content (>200 µmol kg^{-1}) even in bottom layers down to >3,500 m depth, indicating the existence of an independent abyssal (thermohaline) circulation system as a miniature of the world ocean. The timescale of the abyssal circulation has been estimated to be an order of 100 years, much shorter than that of the global conveyor belt of ~2,000 years. The Japan Sea consists of three deep basins: Japan Basin (northern part), Yamato Basin (southeastern part), and Ulleung Basin (southwestern part). In the northwestern Japan Basin near Vladivostok, and northern coastal areas, dense and O_2 rich surface water is expected to be formed in severe winters, sinking to the deep and bottom layers to supply fresh waters southward to the Yamato and Ulleung Basins. As reported previously [1–3], research cruises by the Ocean Research Institute since 1977 and the CREAMS expeditions have found a significant decrease of bottom O_2 (below a depth of ~2,000 m) in the Japan and Yamato Basins. Here we present the latest data obtained by the Japan-Korea collaborative cruise conducted in September to October 2007, demonstrating that the O_2 decrease of the bottom waters in recent 30 years reached by almost 10% of the 1977 values commonly for all the three basins. Although a temporal formation of the bottom water was observed in winter 2000-2001 [4, 5], the long term O_2 decreasing trend in almost the Japan Sea bottom waters is apparent, probably associated with a climatic change to cause decrease of dense water sinking and O_2 supply to the bottom waters.

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A detailed Sm-Nd investigation of enstatite chondrites

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The fact that terrestrial samples are enriched in ^{142}Nd relative to chondrites has reanimated the debate about our understanding of Earth formation and its early evolution (Boyet and Carlson, Science, 309, 2005). If Earth accreted from chondrites then the presence of a hidden complementary enriched reservoir in its interior is required. So far, no samples of deep mantle origin had provided ^{142}Nd/^{144}Nd ratio lower than chondrites. As an alternative, is it possible to store a small percentage of REE in the Earth's core? Ensatite chondrite (EC) is an ideal candidate to investigate this possibility. These meteorites were formed in a highly reduced part of the solar nebula. Under such conditions, REE are mainly chalcophile and concentrated in oldhamite (CaS). Oldhamite is present in both EH and EL chondrites in moderate abundance (≤ 2%; [1]) and shows fractionated REE patterns with enrichments factors of 100 to 1000 times the chondritic average [2].

A detailed petrological study of primitive EH chondrites show the existence of several oldhamite generations: inside metal clasts, on the surface of troilite-kamacite intergrowth clasts, assembled with major silicates in the matrix…, which reflect probably a condensation in sequential episodes or in different regions of solar nebula. Preliminary results on bulk EC show a wide ^{142}Nd/^{144}Nd variation ranging from -10 to -40 ppm relative to terrestrial standard. Variable and high ^{142}Nd anomalies (up to 90 ppm) are expected in oldhamites due to their high ^{147}Sm/^{144}Nd ratios (>0.21). Ongoing technical development based on measurement of Nd as NdO^+ will allow us to measure much lower quantities (5 to 10 ng of Nd) in order to work on separated phases. We will present also REE patterns measured in different oldhamite generations. The results will permit us to discuss the origin of oldhamites and to explore more precisely the REE behavior in reducing conditions.

[1] Lin & El Goresy (2002) *M&PS* **37**. [2] Crozaz & Lundberg (1995) *GCA* **59**.