Ocean-pH evolution and weathering conditions during the Ediacaran: Insights from B, Sr & Li isotopes at the Gaojiashan Section, South China

FRANK OHNEMUELLER [1,*] ANETTE MEIXNER [1] ANTONIA GAMPER [2] AND SIMONE A. KASEMANN [1]

[1] Dept. of Geosciences, University of Bremen, Leobener Str., D-28359 Bremen, *(fohnemueller@marum.de)
[2] Museum für Naturkunde, Invalidenstr. 43, D-10115 Berlin

The Ediacaran to Cambrian transition was a decisive time in Earth history since substantial changes in ocean-atmosphere interactions, climate, tectonics and bio-geochemical processes catalyzed the advent and radiation of metazoa. In this study, we investigate the boron, strontium and lithium isotope records of the Algal Dolomite, Gaojiashan and Beiwan Members (all Dengying Formation) at the Gaojiashan section (551-542 Ma) in south-western Shaanxi, South China to gain detailed insights into changing ocean-pH and weathering conditions. The 65 m thick carbonate-siliciclastic Gaojiashan Section is located at the north-western margin of the Ediacaran Yangtze-platform. Sedimentary data suggest a near shore shallow water setting that is exceptionally well preserved and only present in this part of the platform. Carbonate sedimentation is influenced by continuous detrital input presumably from a pro- and retrograding delta front.

In the upper part of the Gaojiashan Member, a negative $\delta^{13}C$ and $\delta^{11}B$ anomaly is unveiled with nadirs down to ~ -7‰ for carbonate carbon and -2‰ for boron, respectively. In total, the excursion comprises a shift of -13‰ for $\delta^{13}C$ and -12‰ for $\delta^{11}B$ which equals a decrease of ~ 1.5 pH units. At the same time, Sr isotopes display a positive excursion ($^{87}Sr/^{86}Sr$ 0.7085 to 0.7110) indicating a time of enhanced weathering through relative sea-level fall. To further assess the continental silicate weathering flux, Li isotopes have been analysed.

If we accept that those changes in the isotope pattern and ocean geochemistry are of primary origin, it needs to be discussed whether a (temporarily) restricted environment or open-ocean conditions are recorded. In view of the pronounced negative $\delta^{13}C$ anomaly it must also be considered that the Precambrian-Cambrian boundary interval is recorded in the uppermost Gaojiashan Member and the overlying sediments already belong to early Cambrian strata.

Determination of ^{129}I by ICP-MS/MS; it's application to Fukushima soil samples

TAKESHI OHNO[1], YASUYUKI MURAMATSU[1], SHOICHI TOYODA[1] AND HIROYUKI MATSUZAKI[2]

[1] Department of Chemistry, Faculty of Science, Gakushuin University, Mejiro 1-5-1, Toshima-ku, Tokyo, Japan, 171-8588,(takeshi.ohno@gakushuin.ac.jp)
[2] Department of Nuclear Engineering and Management, School of Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan, 113-8656

The accident at the Fukushima Daiichi nuclear power plant (FDNPP) resulted in a substantial release of radioiodine and radiocesium into the environment. The distribution of radiocesium has been studied. On the other hand, ^{131}I could only be determined within a couple of months, due to its short half-life (8 days), resulting in a lack of data on the deposition of this nuclide. Another iodine isotope, ^{129}I (half-life: 1.57×10^7 y), was released simultaneously with ^{131}I. To reconstruct the early distribution of ^{131}I, ^{129}I has been used as a tracer. The determination of ^{129}I in Fukushima soils is of importance to investigate the distribution of radioiodine released from the FDNPP.

Recent advances in ICP-MS/MS (Agilent 8800) have enabled us to determine the long-lived radionuclide ^{129}I in soil samples. The ICP-MS/MS has an additional quadrupole mass filter, situated in front of the reaction cell, which allows only the analyte mass to enter the cell. Therefore, polyatomic interferences, such as $^{127}IH_2^+$ generated in the cell, can be reduced. In this study, we measured ^{129}I in samples collected from an orchard in Koriyama-shi (about 60 km from the FDNPP). The measured $^{129}I/^{127}I$ ratios in the samples by ICP-MS/MS are consistent with the value determined by AMS within the analytical error, suggesting the applicability of this method to measurements of ^{129}I in Fukushima soils. We also examined the depth distributions of radioiodine and radiocesium in the orchard. Sampling was carried out in April 2011 and July 2012. Our results demonstrate that, in April 2011, more than 80% of the radioiodine was distributed in the upper 4 cm of the soil column in the orchard. About one year after the accident, the proportion of the inventory in the upper 4 cm was about 60%, indicating 20% of the radioiodine had transferred to the lower part of the column. On the other hand, no significant change was observed in the depth distribution of radiocesium. This result suggests that it is difficult to use radiocesium as a tracer of ^{131}I released from the FDNPP.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.15