



Global Molybdenum isotopic signature recorded by pelagic ooze from ODP-Legs 208 and 198

A. R. Voegelin (1), Th. F. Nägler (1) and E. Samankassou (2)

(1) Institute of Geology, Isotope Geochemistry Group, University of Bern, Switzerland, (2) Department of Geoscience, University of Fribourg, Switzerland, (voegelin@geo.unibe.ch)

Mo is an important trace metal in the ocean. Its isotopic composition has been used to investigate ocean paleo-redox conditions (Siebert et al., 2003, EPSL; Barling et al., 2001, EPSL; Arnold et al., 2001, Sci.). So far, black shales and Fe-Mn-crusts are used to reconstruct paleo-seawater composition. Carbonates could provide a more continuous record of ocean oxygenation. Our measurements of both skeletal and non-skeletal carbonates have revealed considerable fractionation in the ocean environment, exceeding the range of 3δ recognized before. It is thus important to characterize the signatures of different carbonate sinks and to determine the processes leading to the observed fractionation.

We present Mo-isotope data of pelagic ooze from ODP-Legs 198 (Shatsky-Rise, NW-Pacific) and 208 (Walvis-Ridge, S-Atlantic). As a first step towards the understanding of Mo isotope fractionation in biogenic carbonates, bulk rock samples were selected. At both locations, samples from three drill-sites were combined to cover continuous sequences from the uppermost Cretaceous to the Pleistocene. The two sections have congruous lithologies rich in CaCO_3 and with low terrigenous content. Given the long residence time of Mo (800ky), the profiles were sampled at a resolution of 2-3 Ma. The Legs supply a complementary dataset to well studied Fe-Mn-crusts (Siebert et al., 2003, EPSL), which serve us as a reference for the interpretation of the isotope record. The overall variation of the isotopic composition of the pelagic ooze is large (2.6 per mill). This is in strong contrast to the results of the Fe-Mn-crusts, whose isotopic compositions show uniformly light values for the last 60my. Accepting that the latter reflect coeval seawater implies that carbonate ooze does not store the Mo-isotopic

ocean water signature and that additional fractionation mechanisms are involved. As the record of the two ODP-cores correlate well from the base of the Eocene to the Pleistocene, a globally acting mechanism that governs the isotopic signal is suggested. We have argued that inorganically precipitated carbonates have the potential to store Mo seawater composition (Voegelin et al., 2007, GCA). However, as concluded from modern, skeletal rich ooids, admixture of Mo from skeletal components may alter the seawater signal even in non-skeletal carbonates (von Allmen et al., 2008, SwissSed Abstract). Taking into account the involvement of Mo in biological processes (e.g. Mendel, 2005, Dalton Trans.) a biologically controlled fractionation in the pelagic ooze seems likely.