Carbon and sulfur isotope anomalies across the Permian-Triassic boundary (PTB) in W. Slovenia

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A high-resolution study of carbonate, organic carbon and pyrite sulfur isotope variability in the Idrijca Valley section, W. Slovenia, suggests "light" carbon and "light" sulfur isotope events at the PTB (Fig. 1).

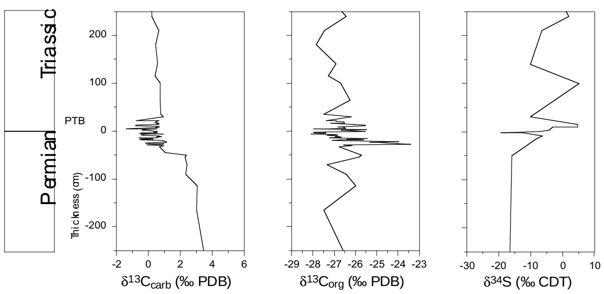

Figure 1: Carbonate, organic carbon and sulfur isotope variability across the PTB in the Idrijca Valley (W. Slovenia).

The accelerated decrease in δ^{13}Ccarb values, as well as the negative δ^{13}Corg anomaly between 6 and 2 cm below the PTB and δ^{34}S negative excursion 2 cm below the PTB are associated with an abrupt disappearance of Upper Permian marine fauna in the studied section. These perturbations in carbon and sulfur cycles recorded in the Idrijca Valley section span an approximately 20 cm thick boundary interval (from about -10 cm below to +10 cm above the PTB). Our data suggest that the PTB events indicated by short-term perturbations in the carbon and sulfur cycles in the Idrijca Valley section were sudden and, according to time-frequency analyses of the magnetite susceptibility curve (Hansen et al., 2000), most probably lasted no more than 200 kyr. They could be related to a combination of some more or less co-occurring events such as mass mortality from an impact or radiation blast with release of large amounts of methane from stored hydrates and Siberian volcanic activity as proposed by Berner (2002).

References

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Fractionation of mercury at the molecular level in tuna and whale from world oceans: Potential and limits of this novel approach to assess global mercury cycling

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Oceans are important pathways and reservoir for mercury. Biogeochemical studies have in general assessed the speciation of Hg in these environments, looking at deposition or the emission of Hg from these large ecosystems. Isotopic fractionation is most often used in biogeochemistry to trace the mixing of water masses. It can be understood in a different way if one attempts to determine the fractionation of an element to be measured at the molecular level. Uptake of light elements such as C in marine food chain generally translates into enrichment in lighter isotopes.

We are applied the same philosophy to evaluate the potential and limits of examining the potential fractionation of Hg in top predators from world oceans. In order to assess potential information occurring at this level and understand its environmental relevance, we have made the speciation of Hg in tuna fishs and whale (candidate reference samples from the NIST) for during world oceans. The speciation measurements were performed after hyphenation of GC to Multicollector ICP/MS. Results show that such system can clearly determine isotopic fractionation at the molecular level for enrichments or depletion of isotopes larger that 2 ‰. Results in the different samples show that for the most concentrated one (whale samples), significant isotopic fractionation between inorganic mercury and methylmercury can be evidenced.

We will present and discuss the potential and limitation of the method, of the results obtained and their importance in improving our understanding of biogeochemical pathways of elements in the biosphere.