Geophysical Research Abstracts
Vol. 20, EGU2018-7020-1, 2018
EGU General Assembly 2018

The effect of transport processes in marine surface sediments on multi-isotope (C, S, O) dynamics: A modelling approach

Bo Liu (1,2), Marko Lipka (1), and Michael E. Böttcher (1)

(1) IOW, Geochemistry & Isotope Biogeochemistry, Warnemünde, Germany (michael.boettcher@io-warnemuende.de), (2) current address: Research Section Marine Geochemistry, Helmholtz Centre for Polar and Marine Research (AWI), Bremerhaven, Germany

Under steady-state conditions, multi-isotope profiles in marine surface sediment reflect the redox condition, transformation rates and fluxes of dissolved species in the sediments and across the sediment-water interface. Most of these processes in nature, however, take place under non-steady state conditions and the top sediment below oxygenated bottom waters are commonly under the impact of transport processes. Sedimentation events, macro zoo-benthos, wave actions or even fishing activity could affect the top parts of shallow sediments. The consequences of sediment disturbance on the isotope profiles is fundamental for understanding the relationship between redox condition, biogeochemical processes and fluxes of elements with the development of biogeochemical stable isotope signatures and proxies in natural ecosystems. We present here a sediment ecosystem model, incorporating oxic respiration, sulfate reduction, and sulfide re-oxidation. In this study, the dynamics of downcore profiles of DI13C, 34SO4 and S18O4 in pore waters are used to identify the impact of sediment disturbance on the dynamics of biogeochemical processes with a focus on the carbon and sulfur cycles. Two extreme cases of sediment disturbance upon early diagenesis were considered: 1) sediment and pore water mixing, and 2) only pore water mixing. The average oxygen uptake rate, and sulphate and DIC flux are dependent of the frequency and depth of the disturbance, and an overall enhancement of the element flux was estimated. The consequence for the developed of different relationships between C, S and O isotope signatures is demonstrated.

The study is supported by BMBF during SECOS II project and Leibniz IOW.