



Stable carbon isotopes in DIC as indicators for biogeochemical carbon cycling in the Beibu Gulf, South China Sea

Michael E. Böttcher (1), Peter Escher (1), Nicole Kowalski (1), Olaf Dellwig (1), Andrea Bauer (2), Joanna J. Waniek (2), Alexander Stark (1), and Zhen Xia (3)

(1) IOW, Geochemistry & Stable Isotope Geochemistry Group, Marine Geology Section, Warnemünde, Germany (michael.boettcher@io-warnemuende.de), (2) IOW, Marine Chemistry Section, Warnemünde, Germany, (3) Guangzhou Marine Geological Survey (GMGS), Guangzhou, China

The bilateral German-Chinese BMBF-funded research project 'BEIBU' started in July 2009 with research focusing on the Beibu Gulf area in the South China Sea. The area is of particular scientific interest as it plays a crucial role for the understanding of naturally and anthropogenically induced matter and energy fluxes in the north-western coastal areas of the South China Sea. The fate of organic matter (OM) in the Gulf area is a fundamental process to understand biogeochemical element cycling in the water column and surface sediments. Here, we present new results from a joint German-Chinese expedition with R/V FENDOU-5 in 2009. Water column samples were recovered at 29 stations by mean of a Pump-CTD system. Suspended matter was separated via membrane filtration. Sediments were obtained by multi and gravity coring devices. Pore waters were extracted from intact sediment cores by using rhizons. Water column and pore water samples were analyzed for the carbon isotopic composition of dissolved inorganic carbon (DIC) by a Thermo Finnigan MAT 253 coupled to a Thermo Finnigan gas bench and major ions, dissolved trace metals, P, and Si by ICP-OES (iCAP 6300 Duo, Thermo Fisher).

Due to OM mineralization and possibly element fluxes from underlying surface sediments, DIC was enriched in C-12 in the bottom waters (isotope values down to -1 per mil vs. V-PDB) compared to surface waters. This trend was more pronounced in sediments, where down-core variations showed an increasing enrichment of the lighter isotope in DIC (isotope values down to -16 per mil vs. V-PDB) due to oxidation of OM with different electron acceptors. Phosphate and silica consistently showed down-core trends compatible with mineralization of OM (including diatoms) and, in the top parts of the sediments, the dissolution of iron oxy-hydroxides. According to pore water profiles, significant net sulfate reduction was only observed at greater sediment depths, but dissolved Mn and Fe accumulated in shallow pore waters to different extends. Therefore, we conclude, that sufficient reactive metal oxides were available to sustain intense sulfide re-oxidation. The pore water composition indicates distinct site differences due to OM contents and quality, availability of electron acceptors, sedimentation rate, sedimentology, and probably specific microbiological factors.

The biogeochemical process studies will be extended on a second cruise with R/V SONNE in 2011.