BARIUM, MANGANESE, IRON AND SULFUR AUTHIGENESIS IN MODERN EUXINIC BASINS: THE STATE OF THE ART

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The deeps of the Baltic Sea provide ideal places to follow (trans)formations of barium, manganese and sulfur-bearing minerals in Holocene sediments under changing environmental and diagenetic conditions. The modern brackish conditions allow for the development of steep compositional pore water gradients already in surface sediments, leading to physico-chemical dis-equilibrium conditions that may trigger the authigenic formation and destruction of minerals. The Baltic Sea deeps are in particular well known for the occurence of authigenic manganese(II)-calcium carbonate solid-solutions, manganese(II)sulfide, and different iron sulfides. Anoxic basins of the Baltic Sea, for instance, are the only known localities world-wide where authigenic MnS has been identified. Very recently, evidence for the formation of a previously unrecognized low-temperature BaMn double carbonate was found (BÖTTCHER et al., 2012). For a proper mechanistic relation of compositional and textural mineral occurences to environmental conditions, experimental calibrations and physico-chemical interpretations are mandatory.

We present results from different studies on authigenic mineral (trans)-formation in the Baltic Sea system. Sediment cores were retrieved from sediments deposited during brackish and freshwater stages. Besides chemical and phase analytical compositions, the stable isotopic composition of sulfur was analyzed as a function of depth with high resolution. Brackish and freshwater stages during sediment formation can be separated, for instance, by the contents and stable isotope composition of organic carbon and sedimentary sulfur. Microbial reactions associated with the oxidation of organic matter result in the formation of characteristic (thermodynamically stable and metastable) carbonate, sulfide and sulfate mineral assemblages. The limnic pre-Litorina sediments are a place where downward diffusing species lead to a superimposition of original geochemical signatures by diagenetic mineral (trans)formations. Textural and (isotope) geochemical characteristics will be discussed.

Besides trace elements (BÖTTCHER & DIETZEL, 2010) and light stable isotopes (C, O, S) also new non-traditional stable isotope systems like Ba and Mo may be of particular value for the interpretation of mineral authigenesis (VON ALLMEN et al., 2010; NÄGLER et al., 2011).

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