

Iron speciation and iron(III)-oxide reactivity in sediments of eutrophic Jiaozhou Bay, China: Implications for benthic processes

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In this study, conventional extractions [1-3] and kinetic dissolution [4-6] were combined to investigate diagenetic processes of reactive iron (Fe), reactivity of microbially reducible Fe(III) (MR-Fe(III)), and potential of microbial iron reduction (MIR) in sediments of eutrophic Jiaozhou Bay. Results show that the presence of nonsulfidized Fe(II) over the upper 12 cm of the sediments points to the importance of MIR in a sulfide-poor setting, in the deeper layers, however, reduced Fe has been almost completely sulfidized. A quick downcore depletion of Fe(III)_{am} can be ascribed to the MIR. Intensive reduction of poorly crystalline Fe(III) oxides (Fe(III)_{pc}) is restricted to a thin layer beneath the redox interface; diagenetic dissolution of magnetite occurs over the upper 14 cm; well crystalline Fe(III) oxides (Fe(III)_{wc}) are almost not involved in Fe reduction. Besides the most bioavailable Fe(III)_{am}, Fe(III)_{pc} was also an important contributor to the MR-Fe(III). MR-Fe(III) in the sediments was much less reactive than fresh ferrihydrite and amorphous Fe(PO₄)_{0.7}, but its reactivity was not much different from aged ferrihydrite. Oscillating profile of kinetic parameter γ , which characterizes heterogeneity of Fe(III) oxide assemblages, may be a common feature recording dynamic diagenesis or depositional settings. Evidence available indicates that the availability of reactive Fe is not limiting diagenetic cycling of Fe and S in the sediments, whereas low degradability of organic matter is seemingly the ultimate limiting factor.

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