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On the comparison of redox-interfaces sructure in the Black Sea, the Baltic Sea and Oslo Fjord

S. Pakhomova (1) and E. Yakushev (2)

(1) Shirshov Institute of Oceanology RAS, Moscow, Russian Federation (s-pakhomova@yandex.ru/+74991245983), (2) Norwegian Institute for Water Researches, Oslo, Norwey (evgeniy.yakushev@niva.no/+4722185200)

The joint analysis of the data of phosphorus and manganese species distributions (phosphate, polyphosphate, dissolved Mn, particulate Mn, and bounded Mn) obtained in the Black Sea, the Baltic Sea and the Oslo Fjord allowed to reveal the common features, that testify the similarity of the mechanism of the redox layer formation in these regions.

Our investigations demonstrated that Mn bounded in stable complexes with hypothetically organic matter or pyrophosphate is observed in the redox zones in significant concentrations (up to 5 uM), and is likely presented by Mn(III), an intermediate product of Mn(II) oxidation. This bounded Mn(III) can explain phosphate distribution in redox interfaces – formation of so-called “phosphate dipole” with a minimum above the sulfidic boundary and a maximum just below, and with a steep increase of the concentrations between these two. This dipole structure serves as a geochemical barrier that decreases the upward flux of phosphate from the anoxic layer.

Modeling results shown that exactly manganese cycle (formation of sinking down Mn(IV) and presence of dissolved Mn(III)) is the main reason of oxygen and hydrogen sulfide direct contact absence.