# Modeling fate of radioactive elements at the sediment water interface in different redox conditions

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Oxygen depletion is a serious environmental issue in the oceans (Stramma et al., 2008), as well as in coastal zones throughout the world (Diaz, Rosenberg, 2008). Coastal waters and fjords typical for the coastline are especially sensitive to these processes because of the restricted exchange with the sea. As a transition zone between the continents and the ocean, fjords possess a natural susceptibility for the occurrence of hypoxia and anoxia, as stratification due to the input of rivers and low-density coastal water and topographic restrictions extend the residence time of the bottom waters bodies and prevent their aeration. Fluxes of nutrients (O, C, P, N), redox metals (Mn, Fe), change magnitude and even direction in case of changes of redox conditions from oxic to suboxic and anoxic. The biogeochemistry and bioremediation of the priority radionuclides are connected with the redox conditions changes (Newsom et al., 2014). The studies in the anoxic Framvaren Fjord showed a clear influence of changing redox conditions in transformation of technetium, Tc (Keith-Roach, Roos, 2004) and uran, U (Swarzenski et al., 1999) through involvement in direct and indirect microbial transformation reactions and probable mechanism of co-precipitation with Fe and Mn oxides. The similar processes occurs at the sediment-water interface but there is a scarcity in the knowledge about the redox-dependent effects (Gulin et al., 2013).

An application of a model gives a unique possibility to numerically estimate variations in the fluxes of radioactive substances connected with changing redox processes, forced in its turn by anthropogenic (eutrophication) or climatic (mixing) changes. In this study we use a modified 1-dimensional C-N-P-Si-O-S-Mn-Fe Bottom RedOx Model (BROM) describing the processes in the water column, bottom boundary layers and upper sediments coupled with biogeochemical block simulating changeable redox conditions, and the carbonate system processes block.

The objective of the study is to:

1. Numerically test hypotheses on a significance of microbiological processes (chemosynthesis and decay of organic matter) and co-precipitation with Mn-Fe oxides on the radioactive elements transformation.
2. Simulate fluxes of radioactive elements at the sediment-water interface and their variability connected with redox conditions changes