

EGU22-9601

<https://doi.org/10.5194/egusphere-egu22-9601>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## Seafloor iron mobilization across the deep-water redox gradients of the Black Sea and the Sea of Marmara

**Nimet Alımlı** and Mustafa Yücel

Institute of Marine Sciences, Middle East Technical University, Mersin, Turkey (nimetalimli@gmail.com)

Iron is one of the most important redox-sensitive elements in marine systems. A better understanding of the marine iron cycle is urgently needed for many scientific questions, including the evolution of ancient co-factors under changing redox conditions, marine primary production, and global climate change. Given the scarcity of iron in oceans, the interplay between different iron pools in various redox settings is analytically challenging and poorly understood. In this study, we report on new downcore profiles of pore water iron species along with their size distributions across the oxic, suboxic, and sulfidic regions of the Black Sea and in the recently deoxygenated areas of the Sea of Marmara. The vertical distribution of dissolved iron ( $<0.45 \mu\text{m}$ ) in sediment pore water showed strong subsurface iron peaks reaching maximum concentrations around  $87 \mu\text{M}$  in the Sea of Marmara, resulting in high benthic iron fluxes and indicating high rates of bacterial iron mineral respiration under hypoxia. In the Black Sea, highly sulfidic sediment conditions appeared to limit dissolved iron mobility, with iron concentrations in pore water ranging from  $0.3$  to  $0.05 \mu\text{M}$ . We also performed additional experiments at selected sites to understand the nature of the colloidal fraction. Size fractions were obtained by sequential filtering and filtered samples were analyzed by the spectrometric ferrozine method. To achieve the low detection limits required for the water column samples, the spectrometer was used in conjunction with a  $50\text{cm}$  liquid waveguide capillary cell, allowing rapid on-board detection of iron at nanomolar levels. The partitioning between soluble ( $<0.02 \mu\text{m}$ ) and colloidal ( $0.02\text{--}0.2 \mu\text{m}$ ) iron pools in the pore water showed that the dissolved iron was mainly dominated by the soluble fraction, while colloidal fraction behaved differently. The results suggest that the colloidal fraction may be more dependent on other biogeochemical characteristics of the environment in addition to redox conditions. We also applied to colloidal fraction a revised sequential acid leaching scheme originally developed for hydrothermal iron fractions. Preliminary results suggest that the characteristics of the colloidal iron pool in the pore waters of the Sea of Marmara and Black Sea sediments differ from the nanomineral-dominated vent iron, and that organic fractions may play a greater role in mobilizing iron colloids from sediments of deoxygenated basins.