Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16176

Organic carbon distributions and carbon burial in a modern Proterozoic ocean analogue: the Sea of Marmara

MUSTAFA YUCEL[1], NIMET ALIMLI[1], **ZERAY AYRAL GÜLMEZ**[1], HILAL CURA[1] AND NAIM YAĞIZ NAIM DEMIR, MSC[2]

[1]Middle East Technical University, Institute of Marine Sciences
[2]Middle East Technical University

Presenting Author: zeray.gulmez@metu.edu.tr

It is now widely accepted that Proterozoic oceans were anoxic or hypoxic at depth, with sulfide accumulations possible in nearshore oceans. While the broad strokes of our understanding of how carbon burial occurred and how this is related to Earth System oxygenation are well developed, reconstructing past carbon cycling at the scale of near-shore to coastal ocean systems is more difficult. Modern anoxic to hypoxic systems research can shed new light on this and aid in the delineation of major processes that control the carbon cycle in coastal settings. The Sea of Marmara, which connects the Mediterranean and the Black Sea, has recently transformed into a hypoxic to suboxic water body, allowing researchers to assess organic carbon fluxes and burial in a recently deoxygenating coastal Precambrian ocean analogue. We performed water column particle and sediment multicore samplings, on-board microsensor measurements of cores, and on-shore geochemical analyses including particulate organic carbon and nitrogen during an expedition to the Sea of Marmara (max. sampling depth 1215 m) in the summer of 2022. Here we present recent distributions of particulate organic carbon in the water column and sediments of the Sea of Marmara. Particulate organic carbon concentrations reached up to 110 µM in the upper layer (>40 m depth, above the halocline) and up to 3 µM in deep waters beyond 1000 m, indicating efficient POC export due to high organic export fluxes and hypoxia. This enrichment was also reflected in the surface sediments, with up to 3 mmol/g (dry weight) in the top 10 cm and 1 mmol/g POC present at sediment depths of 40 cm and beyond, indicating burial. The high organic carbon loading, combined with water column hypoxia, reduced microsensor-based oxygen penetration depths to 2-3 mm at best, slowing organic carbon degradation and increasing burial. We conclude that the Sea of Marmara is a net carbon burial site in general, and as an accessible natural laboratory, it will continue to be an important Proterozoic ocean analogue where redox-sensitive changes in carbon and nutrient cycles can be thoroughly examined.