Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5135

Comparison of Porewater Diffusive Nutrient Fluxes with External Inputs in the Northeastern Mediterranean Sea

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Redox-dependent benthic recycling of external nutrient inputs has a key role for sustaining primary production in the oligotrophic marine environments. The coastal ecosystem of the Northeastern (NE) Mediterranean Sea, having oligotrophic properties in the offshore region, has been recently subject to terrestrial organic and inorganic matter inputs from external sources. This section of the Mediterranean Sea is one of the major hotspots of anthropogenically driven nutrient inputs. Atmospheric nutrient inputs have also remarkable contribution to primary productivity in the NE Mediterranean Sea, especially in dry summer and autumn periods. The seafloor processing of the recent organic matter and nutrient fluxes has not been studied in the NE Mediterranean Sea. Particularly, sediment porewater (PW) diffusive nutrient fluxes into the NE Mediterranean are unknown, though benthic nutrient fluxes at the sediment-water interface is strongly associated with eutrophic conditions. In this study, therefore, sediment PW nutrient (Si, N, P) concentrations are reported in high resolution from the obtained multi-corer sediment samples in the NE Mediterranean in March-April 2018. Porewater diffusive nutrient fluxes and associated geochemical context are given. Sediment PW diffusive fluxes are then compared with the external nutrient inputs (riverine, wastewater, atmospheric) in the NE Mediterranean shelf waters. The results of the source assessment of nutrient fluxes to the NE Mediterranean Sea indicated that contribution of PW diffusive nutrient fluxes to the total nutrient inputs in the NE Mediterranean Sea was calculated as 5.8% for PO_4, 12% for NO_3, 19% for NH_4 and 22% for reactive silicate, respectively. Though high dissolved oxygen concentrations were measured in the deep waters of the NE Mediterranean Sea, contribution of PW diffusive nutrient fluxes was markedly high. Contribution of diffusive nutrient inputs was much greater than wastewater nutrient inputs for nitrate, ammonium and reactive silicate, but lower than phosphate due probably to adsorption of phosphate onto metal oxides in the oxygenated surface sediments of the NE Mediterranean Sea. Studying both external and internal nutrient fluxes into the oligotrophic Mediterranean Sea is critical to understand biogeochemical cycling of key elements for further use in biogeochemical modeling and assessing trophic status of the NE Mediterranean shelf waters.