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Intertidal sediments exhibit different nutrient filtration capacity along the estuarine salinity gradient

Dunia Rios-Yunes, Justin C. Tiano, Dick van Oevelen, Jeroen van Dalen, and Karline Soetaert
Royal Netherlands Institute for Sea Research, Estuarine and Delta Systems, Yerseke, Netherlands

Estuarine systems filter nutrients and organic matter from riverine input and lower concentrations reaching the sea. Sediments within these ecosystems play a significant role in the mineralization and retention of nutrients and organic matter within the estuary. Such processes are influenced by abiotic (e.g. salinity, temperature, etc.) and biological (e.g. fluctuations in the benthic community) parameters which may contrast remarkably between intertidal or subtidal zones. Despite their relative importance, few studies have investigated the biogeochemistry of intertidal sediments with high spatiotemporal resolution. This study reports the results of monthly biogeochemical monitoring in intertidal muddy sediments along the salinity gradient of the Western Scheldt estuary (NL). Budgets of OM mineralization and nutrient retention were calculated for the fresh, brackish, and marine water zones. Temperature controlled sediment oxygen consumption rates and nutrient fluxes. Fresh and brackish sediments had a net influx of dissolved inorganic nitrogen (DIN) (-1.62 mmol DIN m^{-2} d^{-1} and -2.84 mmol DIN m^{-2} d^{-1}, respectively), while the freshwater area had the only net influx of phosphate (-0.07 mmol m^{-2} d^{-1}). Marine sediments showed net effluxes of DIN and DIP. Despite the net influx observed in freshwater sediments, geospatial analysis showed that their contribution to the total estuarine filtering capacity was minimal due to their small area. In contrast, brackish and marine regions had a more important contribution to the estuarine filter because of their larger surface area. Overall, sediments removed 11% (1,500 t N y^{-1}) and 15% (~200 t P y^{-1}) of the total nitrogen and phosphorus entering the estuary from riverine input. Our findings highlight the importance of using spatially-resolving remineralization budgets to improve models and nutrient cycling estimates in estuarine systems.