Goldschmidt 2024 Abstract
https://doi.org/10.46427/gold2024.24667

The Inorganic Carbon System across the Land-to-Ocean Continuum: Impacts of Organic Alkalinity

ZHAOHUI ALECK WANG[1] AND WEI-JUN CAI[2]

[1]Woods Hole Oceanographic Institution
[2]University of Delaware College of Earth, Ocean, and Environment

Presenting Author: zawang@whoi.edu

The land-to-ocean continuum, which extends from the reach of tide to continental shelfbreak, encompasses a transition from poorly buffered freshwater to relatively well-buffered seawater. This may cause changing variability of the inorganic carbon (carbonate) system that is inversely correlated to buffering capacity and lead to contrasting impacts from and responses to climate change and anthropogenic stressors along salinity gradients and across geographic locations. This continuum is also a highly productive zone where inorganic and organic carbon cycling interacts intensively, profoundly impacting carbon biogeochemistry, budgets and fluxes. Among the various known unknowns, organic acid species in the dissolved organic carbon (DOC) pool often exists in significant amounts in coastal systems and contributes to a portion of total alkalinity (TA), known as organic alkalinity (OrgAlk), which can substantially affect carbonate speciation, water pH, buffering capacity and CO_2 fluxes. Although a growing number of studies have shown the importance and prevalence of OrgAlk in the coastal ocean, there are fundamental gaps in our understanding of OrgAlk, ranging from the definition, measurement method to their generation and variability in aquatic systems. For example, there is a lack of a robust operational definition of OrgAlk given the complex characteristics of organic acids; there may be large discrepancies between titrated OrgAlk and estimated OrgAlk from CO_2 calculation. The main objectives of this synthesis presentation are to: 1) to review the current theoretical consideration of OrgAlk and compare methods commonly used to determine OrgAlk; 2) to synthesize recent findings of the effects of OrgAlk, the variability, and potential controlling mechanisms across a few coastal systems; and 3) to propose a conceptual framework by considering organic acids, thus OrgAlk, generation and removal as a distinct biogeochemical linkage between the carbonate system and DOC pool.