

Contribution and effects of organic alkalinity on pH and carbonate chemistry in coastal waters influenced by intertidal salt marshes

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The exchanges and interactions between tidal wetlands, estuaries, and coastal waters are complex yet important for coastal biogeochemical cycles. Recent studies suggest that inorganic carbon exports from tidal salt marshes may play an important role in the coastal carbon cycle and seawater chemistry. So far only a handful of studies suggested that salt marshes are potentially an important alkalinity source to coastal oceans. Carbonate alkalinity can be generated through various anaerobic respirations in marsh sediments. Interestingly, total alkalinity (TA) in tidal marsh water may also contain a significant amount that has not been defined previously, namely organic alkalinity (OrgAlk), much of which is also a part of dissolved organic carbon (DOC). The contribution and effects of OrgAlk to pH and carbonate chemistry in marsh tidal water are rarely studied, yet it potentially represents an important source in the coastal alkalinity budget. In this study, we focus on the contribution, source, and characteristics of organic alkalinity in tidal marsh water on tidal and seasonal timescales in order to assess the factors controlling the variability of OrgAlk, and evaluate the significance and role of the DOC pool in contributing OrgAlk and affecting water pH and the CO₂ system. The results indicate that the origin of OrgAlk may be complex, and it can be an important controlling factor to water pH, buffering capacity, and carbonate chemistry. These evidences suggest that there is an important and direct linkage between the DOC and DIC pool in marsh influenced coastal waters. Such a linkage might also play an important role in other aquatic systems.