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Inorganic Carbon Cycling and Biogeochemical Processes in an Arctic Inland Sea (Hudson Bay)

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The distributions of CO_2 system parameters in Hudson Bay, which not only receives nearly one third of Canada's river discharge, but is also subject to annual cycles of sea-ice formation and melt, indicate that the timing and magnitude of freshwater inputs play an important role in carbon biogeochemistry and ocean acidification in this unique Arctic ecosystem. This study uses basin-wide measurements of dissolved inorganic carbon (DIC) and total alkalinity (TA), as well as stable isotope tracers ($\delta 18OH_2O$ and $\delta 13CDIC$), to provide a detailed assessment of carbon cycling processes throughout the bay. Surface distributions of carbonate parameters reveal the particular importance of freshwater inputs in the southern portion of the bay. Riverine TA end-members vary significantly both regionally and with small changes in near-surface depths, highlighting the importance of careful surface water sampling in highly stratified waters. In an along-shore transect, large increases in subsurface DIC are accompanied by equivalent decreases in $\delta 13CDIC$ with no discernable change in TA, indicating a respiratory DIC production on the order of 100 μmol/kg during deep water circulation around the bay. Based on TA data we surmise that the deep waters in the Hudson Bay are of Pacific origin.