



Seasonal variability of dissolved inorganic carbon and surface water pCO₂ in the Scotian Shelf region of the Northwestern Atlantic

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The seasonal variability of inorganic carbon in the surface waters of the Scotian Shelf region of the Canadian northwestern Atlantic Ocean is investigated. Seasonal variability is assessed using hourly measurements covering a full annual cycle of the partial pressure of CO₂, (pCO₂), and hydrographic variables obtained by an autonomous moored instrument. These measurements are complimented by frequent shipboard sampling of dissolved inorganic carbon (DIC), total alkalinity (TA), and pCO₂, at the mooring site, and over the larger spatial scale. Biological processes are found to be the dominant control on mixed-layer DIC, with the delivery of carbon-rich waters from below also playing an important role. The competing effects of temperature and biology influence surface pCO₂ in roughly equal magnitude. The air-sea fluxes of CO₂ are computed; while the mixed-layer is overall autotrophic, the region acts as a net source of CO₂ to the atmosphere on the annual scale, with a reversal of this process occurring only during the spring phytoplankton bloom, when a pronounced undersaturation of the surface waters is reached for a short period.