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Carbon Fluxes and Ocean Acidification in the Irminger Sea

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Complex horizontal and vertical circulation in the Irminger and Labrador Seas has the potential to influence global ocean circulation and climate patterns. Deep water formation coupled with strong winds, and high rates of primary productivity in spring and summer result in these regions of the North Atlantic acting as strong sinks for atmospheric carbon dioxide. An increase in surface water pCO_2 over the past two decades at a rate greater than that of the atmosphere has been observed and indicates a decrease in the air-sea pCO_2 difference, the driving force of the air-sea CO_2 flux. In response to the increasing pCO_2, the surface water pH and the aragonite saturation states (Ωar) show a decreasing trend. Much of the previous work in the region has occurred on a few repeated transects over time, or in specific regions the Irminger basin. There is therefore a need for surveys of carbon parameters with broader horizontal spatial coverage to determine the CO_2 fluxes and the effect of ocean acidification (OA) in the Irminger Sea.

Here, we estimate surface pCO_2 and CO_2 fluxes, and Ωar over a large portion of the Irminger Sea and adjacent waters in the summer of 2013. These estimates are based on measurements of total alkalinity (TA) and pH from discrete samples in the upper 100m, collected at 83 stations on two cruises during the International Redfish Survey. The present study is designed to provide a baseline of inorganic carbon parameters for future, long-term study in the region. The large spatial scope of this study, and planned future work, will provide data that will help contextualize measures from repeated transect studies, underway measures, as well as measures from fixed observatories such those deployed by Ocean Observatories Initiative (OOI).