An Air-Sea Gas Exchange Buoy in the Labrador Sea

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The Labrador Sea is highly significant as one of the areas of North Atlantic Deep Water (NADW) formation. During spring, the Labrador Sea experiences a strong plankton bloom, and is a large sink for CO2. Deep convection during the subsequent winter mixes the CO2 rich waters throughout the water column. The newly formed NADW is then transported southward towards the Antarctic, with a circulation time scale of O(1000) years. Consequently the air-sea CO2 exchange characteristics in the Labrador Sea are of particular interest because it is one of the few areas of the global ocean that is a long term CO2 sink.

We describe here an experiment which measured the air-sea flux of carbon dioxide and the surface physical processes controlling it during the Labrador Sea spring bloom. The experiment was conducted from an air-sea interaction spar (ASIS) buoy. The buoy was instrumented to measure eddy correlation air-sea CO2 fluxes, CO2 profiles in the atmospheric boundary layer and water column, along with supporting variables: wind speed, wind stress, atmospheric stability, surface waves, upper ocean turbulence mixing. Additional instruments deployed on the mooring line to 35m measured key (e.g. CTD, PAR, DO, fluorescence, particulate organic carbon) governing mixed layer CO2 dynamics. This activity, part of US SOLAS ("Surface Ocean-Lower Atmosphere Study"), will provide a measure of the variability of air-sea CO2 fluxes with physical and biological processes.