

The breathing of the Labrador Sea

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The Labrador Sea is one of the few oceanic regions where the deep ocean exchanges gases such as oxygen and carbon dioxide (CO₂) directly with the atmosphere. This gas exchange, driven by wintertime deep convection is the ocean's "deep breathing" and the Labrador Sea can be viewed as a "lung" in the Earth System. Gas uptake and redistribution processes ("breathing and circulation") are expected to respond to and feedback on climate change, as the high latitude warming surrounding the Labrador Sea increases stratification via surface warming and/or enhanced freshwater input. As part of the Canadian-led "Ventilation, Interactions and Transport Across the Labrador Sea" (VITALS) project, we are establishing novel time-series measurements of multiple gases, with differing exchange characteristics, in the Central Labrador Sea. Time-series data will be used to examine the exchange of gases during deep convection events, differentiate the roles of physical, chemical and biological processes on gases fluxes and redistribution, and determine the impacts of stratification, re-stratification and lateral exchange on the "breathing" process. Data will be presented of dissolved oxygen time-series within the upper 200m, collected with optodes deployed on GEOMAR's K1 mooring (56.5°N 52.7°W) since August 2014. The presentation will highlight the design of a unique multi-sensor, profiling mooring ("SeaCycler"), equipped with multiple biogeochemical sensors including multiple oxygen and pCO₂ sensors. The SeaCycler mooring will be deployed in September 2015 and will allow for unique testing of dissolved gas sensors and approaches to profiling of dissolved gases with sensors in cold waters.