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WILLING TO ATTEND WORKSHOP: Depending on date we should be able to send someone

TARGET NAMES: Labrador Sea - Global "hotspot" for climate change and carbon/heat export, production & deep water corals

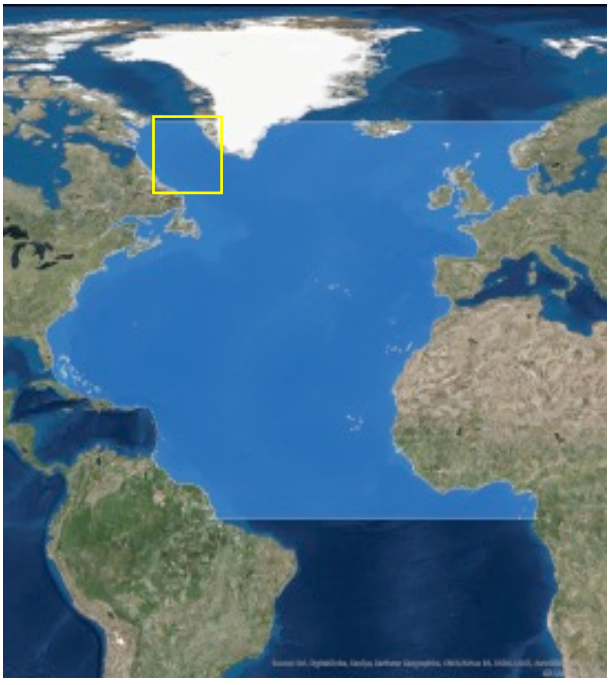
GEOGRAPHIC AREA(S) OF INTEREST WITHIN THE NORTH ATLANTIC OCEAN: Northwest Atlantic

RELEVANT SUBJECT AREA(S): Biology, geology, chemistry physical oceanography

Labrador Sea Ecosystem Dynamics

Description of Region

Virtually nothing is known about the biota in the deep ocean. For example, Canadian scientific trawl surveys do not extend deeper than 750 m depth, and targeted deep ocean mapping and seabed and fish surveys have only just begun (Canadian ISECOLD project and EU ATLAS project). Such knowledge is critical to understanding how these unique oceanographic processes link to the biota; specifically whether we might expect enhanced productivity in deep ocean areas of convection and how ocean acidification will affect vulnerable biota. Deep-water convection sites also might be expected to be the 'ground zero' of climate change effects in the deep ocean because these areas will experience the most pronounced rate of ocean acidification and potential changes in food delivery.



Rationale for Future Exploration

The Labrador Sea has attracted numerous been research studies over the past forty years, particularly researchers from Canada, the United States, and from the European Union. The Labrador Sea is one of the few places where the deep ocean exchanges gases such as oxygen and carbon dioxide directly with the atmosphere. Transport out of the Labrador Sea carries oxygen and anthropogenic CO_2 into the North Atlantic interior, oxygenating the subsurface layers and slowing the accumulation of CO_2 in the atmosphere, but exacerbating ocean acidification

along Canada's eastern margin. While much has been learned about convection, transport, and water property formation in this region, many fundamental questions remain unanswered: what is the relationship between convection and the Meridional Overturning Circulation (MOC)? How is the uptake of CO_2 changing with the possible slowdown of the MOC? Why is there a decline in nutrient concentrations and what are the implications for deep-sea biota as well as fisheries resources vital to Indigenous groups? How will the Labrador Sea respond to changes in the cryosphere (e.g. Greenland and other high latitude glaciers) and changing sea-ice conditions in the Arctic Ocean? These natural science questions are globally important, and can dovetail into timely social science questions on how coastal communities, scientists and governments can cooperate to analyze and mitigate risk in order to protect and enhance livelihoods in the face of rapid climate change and human development.

RELEVANT PARTNERSHIPS (If applicable)

The Ocean Frontier Institute, led by Dalhousie and Memorial universities, is a major initiative to examine key aspects of atmosphere-ocean interaction, resulting ocean dynamics and shifting ecosystems in the Northwest Atlantic. This partnership focuses on effective approaches to resource development that are sustainable, globally competitive, societally acceptable and resilient to change. Several of the major research modules in the Ocean Frontier Institute focus on this region and bring in researchers from GEOMAR and AWI in Germany. D. Wallace is leading the module studying biogeochemical processes in the Northwest Atlantic; P. Snelgrove is leading the module studying ecosystem indicators and B. DeYoung is leading the module to develop new observational technology for application in the Labrador Sea. We are partners in the international, meridional overturning circulation program, OSNAP, that has been active for several years and has plans to continue. We are developing a partnership with the TERIFIC program led by Eleanor Frajka-Williams from the National Oceanographic Center in Southampton. We are partners with U. Send of SIO who is building a new SeaCycler mooring system for deployment in the Labrador Sea. Through LabSea2020, Wallace and DeYoung, are developing an international, transdisciplinary program to bring together scientists and social scientists with a focus on the Northwest Atlantic including the natural systems and the coastal communities that rely on ecosystem services from the Labrador Sea. A nascent program led by Fisheries and Oceans Canada (ISECOLD) has collected limited deep-water data from the CGS Amundsen, in collaboration with the EU programs SponGES and ATLAS, which focus on deep-water ecosystems in the region. MEOPAR has also conducted Labrador Sea research cruises. Data from this effort can feed into newly developing data focused efforts such as CIOOS (Canadian Integrated Ocean Observation System) and DeepSense. In short, this region offers an ideal opportunity to deliver on the Galway Statement promises by capitalizing on international interests that already prioritize the Labrador Sea as a globally critical research site.

Canadian Team: Paul Snelgrove, Brad deYoung and Evan Edinger (Memorial) Doug Wallace and Eric Oliver (Dalhousie) David Cote (Fisheries and Oceans Canada), Kent Moore (University of Toronto)

European Potential Collaborators: Murray Roberts (ATLAS), Hans Tore Rapp SPONGeS, Johannes Karstensen (GEOMAR) Eleanor Frajka-Williams (NOC)

U.S. Potential Collaborators: U. Send (SIO), B.Pickart (WHOI)

Note that we collaborate with leaders of parallel ASPIRE LOIs including Metaxas, Roberts, and Morato and envision our effort as part of a broader geographic effort.