Northwest Atlantic water masses biogeochemistry in a changing climate

A casual research contract at DFO

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The Context

This project (maximum of 90 days to be completed before 31st March 2018) is funded through the Aquatic Climate Change Adaptation Services Program (ACCASP) initiative from Department and Oceans Canada (DFO). This project falls into **ACCASP priority area 1**, namely **ocean acidification and biogeochemistry**.

The project

According to the International Panel on Climate Change (IPCC), about 93% of the Earth heat excess resulting from the human release of greenhouse gases has already been absorbed by the ocean (*IPCC*, 2013). This imbalance has two main consequences for the ocean biogeochemistry. First, the ocean temperature increase reduces the solubility of gases, causing, for example, the de-oxygenation of the ocean (*Keeling and Garcia*, 2002). Second, changes in ocean buoyancy fluxes modify the general ocean circulation and thus the turnover time scales of most biogeochemical cycles (*Gnanadesikan et al.*, 2007). While changes in solubility are relatively easy to predict, modifications in ocean circulation patterns are much more difficult to address (*Jaccard and Galbraith*, 2012). Located on a crossroads of the Atlantic meridional overturning circulation (AMOC), Newfoundland and Labrador shelves are specially affected by large-scale ocean circulation changes. A growing body of evidence suggests sustained circulations changes of the AMOC (including slowing downs) at multi-decadal and shorter time scales (*Bryden et al.*, 2014). Such circulation changes impact not only the regional climate, but also the overall water masses composition, with consequences on nutrient availability, oxygen content, ocean acidification, etc. Although of global significance (e.g., for fish habitats), the details of these changes are still largely unknown in the oceanographic community. Thanks to recurrent monitoring efforts deployed by DFO and the NAFC since as far as 1948, and consolidated with the creation of the Atlantic Zone Monitoring Program (AZMP) in 1999, a considerable database witnessing these physical and biochemical changes in the AMOC is available for the region. In this context, we are looking to hire a scientist with strong computer skills to perform "data mining" among this database covering nearly 7 decades of oceanic observations. The focus will be made on climate-related changes and low frequency variability of biogeochemical data. Results of this project will serve as a baseline to assess upcoming changes that the region may face and to design future observation needs in relation to climate change.

The candidate

Preferred candidate would have a background related to ocean sciences (physical, biological or chemical oceanography, ocean engineering, etc.) and strong computer skills. Ease with *Linux* environments and knowledge of languages such as *Python*, *Matlab* or *R* (in this order of preference) are strong assets. Because of time constrain, candidate with valid DFO security clearance will be prioritized. Targeted starting date is early December 2017. Please contact Frederic.Cyr@dfo-mpo.gc.ca for further info. Interested candidates may also apply via this address by sending a motivation letter and a short CV.

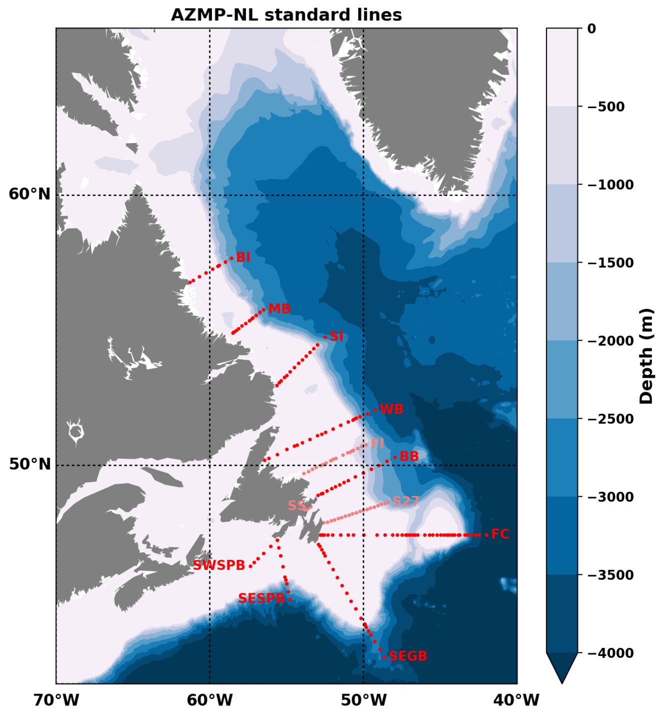

Figure 1: Map of the area targeted by this project. The standard AZMP hydrographic lines under the responsibility of DFO-NL are: Southwest St. Pierre Bank (SWSPB), Southeast St. Pierre Bank (SESPB), Southeast Grand Bank (SEGB), Flemish Cap (FC), Bonavista (BB), White Bay (WB), Seal Island (SI), Makkovik Bank (MB) and Beachey Island (BI). Opportunistic lines are: Station 27 (S27), Smith Sound (SS) and Funk Island (FI).

References

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Gnanadesikan, A., J. L. Russell, and F. Zeng (2007), How does ocean ventilation change under global warming?, *Ocean Science*, *3*(1), 43–53, doi:10.5194/osd-3-805-2006.

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Jaccard, S. L., and E. D. Galbraith (2012), Large climate-driven changes of oceanic oxygen concentrations during the last deglaciation, *Nature Geoscience*, *5*(2), 151–156, doi:10.1038/ngeo1352.

Keeling, R. F., and H. E. Garcia (2002), The change in oceanic O2 inventory associated with recent global warming, *Proceedings of the National Academy of Sciences*, *99*(12), 7848–7853.