# Sea Ice, Climate Change and the Marine Ecosystem

## Summary

### Project Leader

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The observed decline in the summer sea ice, in terms of both magnitude and trend, is alarming. We are changing the arctic from one that has been dominated by multiyear sea ice to one that will now be dominated by first-year sea-ice related processes. We can expect a seasonally ice free arctic early in this century. It is important to note that our planet has not had a seasonally ice-free Arctic for at least the past 1.1 million years. This reduction in sea ice is of critical importance to all peoples of the world because of the role that the Arctic plays in the ventilation of the Atlantic and Pacific (Carmack et al. 2006) and because of the large effect that the sea ice albedo-feedback mechanism has on acceleration of warming and increased fluxes of green house gases to the atmosphere (due to permafrost melt). Both flora and fauna have evolved over millions of years to take advantage of the presence and timing of the seasonal sea ice life cycle. Now, northern peoples increasingly are finding their traditional way of life under pressure from these changes as they struggle to adapt. Global warming changes both dynamic and thermodynamic processes of snow covered sea ice and these changes have an impact throughout both the physical and biogeochemical cycling in the Arctic marine system. The next few decades will proceed with significant challenges for the Arctic. Marine ecosystems will come under increasing pressure; industrial activity will increase as more exploration and development occurs; and the Inuit people will increasingly find it a challenge to use sea ice for cultural and subsistence purposes. This project will provide sea ice expertise to the coordinated ArcticNet IRISs of the coastal Canadian Arctic, supplying the required information for sound management of these challenges.

## People

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## Partners

Aboriginal Affairs and Northern Development Canada - BREA
BP Exploration Operating Company Ltd
BREA/AANDC
Canada Excellence Research Chairs
Canada Research Chair on the Response of Arctic Marine Ecosystems to Climate Change
Canadian Space Agency
Centre for Earth Observation Science (CEOS)
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Manitoba Hydro
Manitoba Innovation Fund
Natural Resources Canada - Environmental Studies Research Fund (ESRF)
Natural Resources Canada - Office of Energy Research and Development
Program of Energy Research and Development (PERD)
Province of Manitoba
Transport Canada
University of Manitoba

# Publications

## Articles Published in Refereed Publications

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Else, B. G. T., Papakyriakou, T. N., Galley, R. J., Mucci, A., Gosselin, M., Miller, L. A., and Thomas, H., 2013, Annual Cycle of Air–Sea CO2 Exchange in an Arctic Polynya Region, Global Biogeochemical Cycles, v. 27, no. 2, 388–398, Published

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