Geophysical Research Abstracts
Vol. 15, EGU2013-11472-1, 2013
EGU General Assembly 2013

The Holocene History of Placentia Bay, Newfoundland

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Marine sediments analyzed from cores taken in Placentia Bay, Newfoundland, located in the Labrador Sea, captured oceanographic and climatic changes from the end of the Younger Dryas through the Holocene. Placentia Bay is an ideal site to capture changes in both the south-flowing Labrador Current and the north-flowing Gulf Stream, currents which are closely tied to the strength of the North Atlantic sub-polar gyre and the North Atlantic Oscillation. Changes in the atmospheric and oceanographic circulation patterns in the North Atlantic after the last glacial period are inferred from faunal assemblages, mineralogy and dinoflagellate analyses. During the 2007 Akademik Ioffe cruise, three cores were taken from Placentia Bay: AI07-14G, representing the time period 12.7 to 9.8 cal kyr BP, AI07-10G, covering the period ca. 10.4 cal kya BP to the present, and AI07-12G, representing the last 5.7 cal kya. These cores have been analyzed using several climate proxies, including benthic foraminifera, diatoms, IP25, dinoflagellate cysts and XRF. Together, these cores provide high-resolution records of the changes in climatic conditions over the last ca. 13,000 years in the southern Labrador Sea.

After the Younger Dryas ended, the beginning of the warmer early Holocene was recorded by an increase in productivity-linked foraminiferal and diatom assemblages, as well as a drop in the presence of the sea-ice indicator IP25 in core 14G (Pearce et al., 2012). Variability in atmospheric circulation during the Holocene was analyzed in core 12G and used to reconstruct changes in the mode of the North Atlantic Oscillation during the late Holocene by analysis of exotic pollen grains. Sea-surface conditions during the late Holocene in Placentia Bay reflect a decrease in the strength of the Labrador Current, based on warmer sea-surface temperatures and a simultaneous decline in Arctic water export, from ∼4000 cal years to ∼3000 cal years BP, which falls into the overall large-scale trend of cooling during the last ∼5000 years of the Late Holocene, based on concentrations of exotic pollen in the core (Jessen et al., 2011).

Here, we will present preliminary results from analyses of the benthic foraminifera from the three cores. This combined record contains a full Holocene record of bottom-water conditions in Placentia Bay, which are expected to align with results from previous studies using the cores from the 2007 Akademik Ioffe cruise.

Jessen, C. A., Solignac, S., Nørgaard-Pedersen, N., Mikkelsen, N., Kuijpers, A., and Seidenkrantz, M.-S., 2011, Exotic pollen as an indicator of variable atmospheric circulation over the Labrador Sea region during the mid to late Holocene: Journal of Quaternary Science, v. 26, no. 3, p. 286-296

Pearce, C., Reynisson, N. F., Massé, G., Kristiansen, S. M., Kuijpers, A., and Seidenkrantz, M. S., 2012, Rapid oceanic changes at the Younger Dryas termination inferred from diatom analysis offshore Newfoundland, XXII International Diatom Symposium.