Geophysical Research Abstracts
Vol. 13, EGU2011-4198-1, 2011
EGU General Assembly 2011

Glaciers, sea ice, fresh water, and climate variability in the North Atlantic during the last glacial cycle

Sidney Hemming (1), Camille Li (2), and Camille Li (3)

(1) Lamont Doherty Earth Observatory, Palisades, N.Y., United States (sidney@ldeo.columbia.edu), (2) Bjerknes Centre for Climate Research, Bergen, Norway, (3) Department of Earth Science, University of Bergen, Bergen, Norway (camille@uib.no)

Records from the Greenland ice cores, sub-polar North Atlantic and Nordic Seas show evidence of dramatic climate shifts, as measured by proxies for ocean circulation and surface climate conditions, during the last glacial cycle. Abundant published and emerging evidence imply close connections between these climate shifts and fresh water fluxes from continental ice sheets via floods and/or iceberg discharges. The spatial signature of the climate shifts covers the entire Northern Hemisphere, with particularly strong expression in cave proxy records of Asian monsoon variability, and there is growing evidence of Southern Hemisphere involvement as well. However, the timing of the climate shifts relative to the meltwater and iceberg discharge events is still not well known. The goal of this presentation is to take a close look at the available data constraints from the North Atlantic region, and to use a combination of observations as well as model simulations to focus on gaps in our understanding of the abrupt climate shifts and their relationship to the growth and demise of the continental ice sheets.

The cryosphere (continental ice sheets and sea ice cover) responds to climate perturbations, but it can also cause or at least magnify variations in sea and land surface temperature, surface ocean salinity and wind patterns. These ice-climate feedbacks complicate the challenge of determining the phasing of discharge events and North Atlantic climate variability. We review observational studies aiming to link information from proxy indicators for sea ice formation, geologic indicators for fluctuations of glacial margins (including ice rafted detritus layers in deep sea cores and provenance analyses) to develop a conceptual picture of the mechanism(s) behind abrupt climate events. On the modeling side, ongoing work points to freshwater stratification, sea ice albedo effects and subsurface ocean warming as important factors linking the cryosphere to climate variability in the North Atlantic region and beyond.