Geophysical Research Abstracts,
Vol. 11, EGU2009-1046, 2009
EGU General Assembly 2009

Specific properties of the AMOC and paleo-sea surface conditions in the NW North Atlantic during recent interglacials

A. de Vernal and C. Hillaire-Marcel
GEOTOP, UQAM, Montréal, Canada (devernal.anne@uqam.ca)

Sites IODP-1305, ODP-646 and IODP 1302/1303 are ideally located for the documenting of Pleistocene climatic and glacial history over Greenland and eastern Canada, in addition to providing information on thermohaline conditions notably with regard to convection in the Labrador Sea (LS) and deep North Atlantic Water (NADW) sources. At site 1305 (Eirik Ridge), at the entry of the modern Greenland current, North-East Deep Atlantic Water and Denmark Strait Overflow Water into the LS, clay minerals and Nd-isotopes indicate that sedimentary supplies during marine isotope stages (MIS) 1, 5e, 7 and 9 differed from those of earlier interglacials, for which sedimentary supplies suggest soil development over volcanic rocks from a then partly deglaciated eastern Greenland. Pollen analyses also indicate denser vegetational cover than at present over southern Greenland during most interglacials prior to MIS 1, with specific features for each of them. For example, rich pollen assemblages dominated by spruce suggest the spreading of boreal forest vegetation over an ice-free southern Greenland during MIS 11, thus a significantly reduced ice-volume in comparison to those of more recent interglacials. Sheltered from direct influence of the western boundary undercurrent, IODP Site 1302/1303 (Orphan Knoll) provides a ca. 700 kyrs, uniform and continuous record of linkages between the northeastern Laurentide Ice-Sheet surge area (cf. Heinrich events) and the North Atlantic. The site also provides critical information about the Atlantic Meridional Overturning Circulation (AMOC) since all water masses contributing to the modern NADW still preserve their identity in the overlying water column. For example during MIS 5e, benthic foraminiferal assemblages, oxygen and carbon isotope records of Site 1302/1303, compared to those of site 1305, indicate distinct bottom water masses in the inner vs. outer basins of the LS, thus a distinct AMOC. Similarly, isotopic measurements in Globigerina bulloides suggest a warming trend in surface water toward the end of MIS 5e, in contrast to the present interglacial that shows an early thermal optimum. During most of MIS 5e, dinocyst data also indicate sea-surface temperatures much higher than present (+3°C in winter and +5°C in summer), too high for convection to occur in the LS. It is concluded that beside specific features for each interglacial, the Holocene stands clearly out, both for the intense convection in the LS from mid- to late Holocene, and the relative stability of the Greenland ice-sheet until the Present.