Geophysical Research Abstracts
Vol. 14, EGU2012-8414, 2012
EGU General Assembly 2012

Reconstruction of inflow of Atlantic Water to Isfjorden, Svalbard during the Holocene: correlation to climate and seasonality

T.L. Rasmussen (1), M. Forwick (1), and A. Mackensen (2)

(1) Department of Geology, University of Tromsø, Tromsø, Norway (tine.rasmussen@uit.no), (2) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

The distribution patterns of benthic foraminifera faunas, stable isotopes and ice rafted debris (IRD) have been studied in piston core JM98-845PC from Isfjorden, western Svalbard to reconstruct changes in the flow of Atlantic Water during the Holocene interglacial. The paleoenvironmental conditions in Isfjorden and the inflow of the Atlantic Water followed closely the changes in insolation with strong seasonality in the early Holocene and weaker seasonality in the middle to late Holocene. The record showed an early Holocene temperature maximum of the Atlantic Water from 11,200 to c. 8200 years BP. The mid-Holocene c. 8200-4000 years BP was characterised by weaker seasonal contrasts with inflow of well mixed, but cooler Atlantic Water. This phase was characterised by stepwise coolings at c. 8200 years, 7400 years and 4000 years BP. Each cooling step correlated with a decrease in influence of Atlantic Water and an increase in ice rafting and supply of polar water. During the temperature maximum the surface water was stratified with inflow of subsurface warm Atlantic Water during summer. The summer bottom water temperature was 3°C higher than in the mid-late Holocene c. 8200-2000 years BP, except for a short-lasting event c. 11,000-10,500 years BP, when the bottom water cooled. The late Holocene interval 4000-2000 years was very cold and characterised as a 'temperature minimum' with near-permanent sea ice cover. The record also shows a small amelioration in bottom water conditions from 2000 years BP to today. However, conditions were also more unstable with periods with increased episodic inflow of Atlantic Water to Isfjorden and warmer conditions interrupted by periods with reduced inflow and colder conditions. The data indicate that the flow of Atlantic Water is closely linked to the development of the terrestrial climate and forcing by polar meltwater and sea ice together with insolation changes.