



Holocene Subpolar Gyre variability illustrated by multi-proxy studies of marine sediment cores from the Irminger Sea, Labrador Sea and Baffin Bay regions

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The subpolar gyre (SPG) is a major feature controlling climate and ocean circulation of North Atlantic region, with significant variability of cold and warm ocean currents feeding into the gyre. The western sector of the SPG, the Labrador Sea, is a major deep water formation site, thus also directly influencing the Atlantic Meridional Overturning Circulation (AMOC). Here we compare records of SPG circulation from selected sites off south Iceland, west and southeast Greenland and Newfoundland in order to establish a combined record of SPG circulation through the Holocene. Our records combine multi-proxy studies (foraminifera, diatoms, dinoflagellate cysts, sediment properties, biomarkers, elemental composition and environmental magnetics) from a range of marine sediment cores to test for large-scale changes in ocean circulation in the Holocene. The SPG region has experienced several major changes in ocean circulation, with a major reorganisation occurring during the deglaciation and again at approximately 7.5 kyr BP and 3-4 kyr BP. Especially during the late Holocene, climatic conditions were largely antiphase in the Labrador Sea to the general North Atlantic region climate due to influence of the Northern Annular Mode affecting the strength of the Atlantic component of the West Greenland Current as well as the flow of the Labrador Current. This again influenced the strength and expansion of the SPG and exemplifies that the SPG has undergone significant variability at multi-decadal to millennial time scales during the Holocene.