



Upper ocean T-S variations in the Greenland Sea and their association to climatic conditions

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Hydrographic data from the Nordic Seas over the last 53 years were analyzed to reveal upper ocean conditions during known periods of deep mixing. Hydrographic data from NOAA National Oceanographic Data Center and from ICES (International Council for the Exploration of the Sea) Oceanographic Database were collected for the analyses. Due to the sparseness of the wintertime data, this study considers only summertime data, primarily at 200m, which retains memory of previous winter's effects below summer mixed layer. Analysis shows that at the centers of the Greenland, Norwegian and Iceland Seas, density is tightly coupled to salinity but outside these limited areas, temperature effect dominates density. It is found that the salinity variability in the central Greenland Gyre follows closely the sea level pressure (SLP) fluctuations found e.g. at Angmagssalik. Corresponding large scale SLP field resembles North Atlantic Oscillation (NAO) in its negative index phase. Since the strongest association occurs between the SLP field and salinity at the gyre center, gyre circulation changes must play a role in central gyre salinity variations. The dissimilarity between the incoming Atlantic water salinity fluctuations and those at the gyre center suggests that intrusions of Arctic origin waters to the central gyre are important in modifying the incoming Atlantic waters, with less intrusion during periods of weak gyre, i.e. negative NAO index. This linkage is a critical element to explain the variation of salinity between the first (1950-1970) and last (1990-2003) part of the record, which corresponds to negative and positive NAO periods respectively.