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Links between thermohaline anomalies in Northwest Atlantic and Nordic Seas

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Oceanography of Northwest Atlantic and North European Basin are formed by similar large-scale processes: export of warm and saline North Atlantic Water and flows of cold fresh water from Arctic Ocean. These processes in both regions develop in some opposition driven by the atmospheric variability described by the North Atlantic Oscillation and Atlantic Multidecadal Oscillation. The Greenland Sea is a place where surface waters sink to great depth. The conditions are established by transport of warm and salty Atlantic Waters and fresh polar waters to the convective gyre, by surface temperature decreasing and the rests of previous convective event. The Labrador Sea is also one of the major deep water formation sites that contribute to the initial composition of North Atlantic Deep Water. Central parts of Labrador and Greenland Seas are a major source of convective renewal and production of North Atlantic Deep Water as a return branch of Atlantic Meridianal Overturning Circulation.
Oceanographic data from Northwest Atlantic and Nordic Seas was collected for the following investigation. Time series of representative parameters of thermohaline anomalies were constructed to analyze temporal and spatial variability and relations between thermohaline anomalies in both areas for the period of instrumental observations. For all regions three strong positive salinity anomalies periods (1958–1963, 1967–1972, 2002–2009) and two negative (1976–1981, 1992–1997) can be marked, attended by temperature anomalies with the same sign. Temperature and salinity time series indicates that convection in Labrador Sea became deeper since mid-1960s till early 1990s as the same time deep water of the Greenland Sea is warmer and saltier since the early 70s. Contents of fresh water in upper layer in both regions were used to consider the influence of fresh cold flows from the Arctic to Baffin Bay and Nordic sea on vertical mixing. Correlation between thermohaline and atmosphere anomalies over these regions enable to value mutual impact of atmosphere and ocean with defining time lag. This analyze allows to compare spatial-temporal variability of thermohaline anomalies with climate change in the regions and to consider the features of variability in connection with variations in North Atlantic.