

Decadal variability in the Eastern North Atlantic

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The strong warming and salinification of the Eastern North Atlantic starting in the mid 1990s has been attributed to a westward contraction of the subpolar gyre and stronger inflow of waters from the subtropical gyre. Temporal changes in the shape and strength of the two gyres have been related to the major mode of atmospheric variability in the Atlantic sector, the NAO. Hydrographic conditions along the Northwest European shelf are thus the result of different processes such as variations in transports, varying relative contributions of water masses from the two gyres and property trends in the source water masses.

We examine the decadal variability in the eastern North Atlantic based on Argo data from 2000-2015 and have constructed time series for four water masses (Subpolar Mode Water (SPMW), Intermediate Water (IW), upper Labrador Sea Water (uLSW) and deep Labrador Sea Water (dLSW)) at selected locations along the Northwest European shelf. Data from the Rockall Trough and the Iceland Basin are chosen to represent advective pathways in the subpolar gyre at two major branches of the North Atlantic Current towards the Nordic Seas and the Arctic Ocean. Temporal variability of subtropical waters transported northward along the eastern boundary is studied at Goban Spur around 48°N. The Argo data are extended in time with long-term hydrographic observations such as the Extended Ellet Line data and other climatological sources in the region.

For the study of transport fluctuations time series from the RACE (Regional circulation and Global change) program (2012-2015) and predecessor programs have been used. These programs have monitored the subpolar gyre in the western basin and provide time series of transports and hydrographic anomalies from moored instruments at the western flank of the Mid Atlantic Ridge (MAR).

First results show that the temperatures and salinities remained at high levels for the upper waters (SPMW and IW) until 2010 and have been decreasing since then, although with different timing and strength. The time series at the MAR demonstrate the advective spreading of LSW anomalies from its source region in the Labrador Sea but along the eastern margin the time series of uLSW and dLSW show different opposing trends and influences of changing properties in the subtropical waters as well as changes in its relative contribution to the ambient waters. During the second phase of RACE (2016-2018) it is planned to deploy a mooring array across the eastern shelf break at Goban Spur to monitor the poleward eastern boundary current transport and variability in the water mass properties.