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Variability and pathways of Labrador Sea Water in the southern subpolar gyre of the North Atlantic

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We investigate the variability and spreading of two different modes of Labrador Sea Water (upper and deep LSW) in the southern part of the subpolar gyre of the North Atlantic. The analysis is based on hydrographic data gathered along the zonal WOCE-line A2/AR19 located at 43°-48°N (1993-2007) and along the GOOS-line at about 48°-51°N (1997-2002). This data set is complemented by time series records from two moorings installed at the western flank of the Mid-Atlantic Ridge (MAR) during 1996-2004.

The results show that due to interactions with the Deep Western Boundary Current (DWBC) close to Flemish Cap, the North Atlantic Current (NAC) detaches these LSW modes away from the boundary and shifts them into the interior of the Newfoundland Basin. The temporal and spatial progressions of hydrographic anomalies point to an eastward spreading from the DWBC towards the MAR with a time scale of 3-6 years.

The analysis of the mooring time series reveals an elevated level of variability. This is superimposed on the long-periodic evolution and points to intense eddy activity, thereby considerably influencing the circulation in this region. Despite the large eddy activity the results yield a clear indication of southward spreading of the two LSW components in the western basin as well as near the MAR. Though the interior LSW-route is less pronounced in comparison to the export within the DWBC, it is an important supplier for the interior North Atlantic, thus distributing older and recently formed LSW modes southward along the MAR.