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Links Between the Deep Western Boundary Current, Labrador Sea Water Formation and Export, and the Meridional Overturning Circulation

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Based on an isopyncal analysis of historical data, 3-year overlapping triad fields of objectively analysed temperature and salinity are produced for the Labrador Sea, covering 1949-1999. These fields are then used to spectrally nudge an eddy-permitting ocean general circulation model of the sub-polar gyre, otherwise forced by inter annually varying surface forcing based upon the Coordinated Ocean Reference Experiment (CORE). High frequency output from the reanalysis is used to examine Labrador Sea Water formation and its export. A number of different apprpoaches are used to estimate Labrador Sea Water formation, including an instanteous kinematic approach to calculate the annual rate of water mass subduction at a given density range. Historical transports are computed along sections at 53 and 56N for several different water masses for comparison with recent observations, showing a decline in the stength of the deep western boundary current with time. The variability of the strength of the meridional overturning circulation (MOC) from the reanalysis is also examined in both depth and density space. Linkages between MOC variability and water mass formation variability is considered.