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Subpolar gyre decadal variability explains the recent oxygenation in the Irminger Sea

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The North Atlantic is one of the hot-spot for ocean oxygen ventilation due to cold surface water and strong winter convection. This region is subjected to large interannual to multidecadal variability, which is suspected to strongly impact the regional and temporal oxygen ventilation and inventory.
Here we investigate the oxygen variability over 1991-2018 and driving mechanisms of the two main water masses of the Irminger Sea: the Labrador Sea Water (LSW) and the Island Scotland Overflow Water (ISOW). For this, we combined the most recent Argo dataset with ship-based hydrographic data in the Irminger Sea. The dissolved oxygen concentration of the LSW oscillated between 300 mu mol/kg in the early 90's and between 2016 and 2018, and 280 mu mol/kg in the period 2002-2015. The temporal changes in oxygen concentration are less pronounced in the underlying Iceland Scotland Overflow Water (ISOW).
We show that, while solubility changes partly explain the variability of the dissolved oxygen concentration within the Labrador Sea Water (LSW), the main driver of oxygen variability is the Apparent Oxygen Utilisation (AOU).
In the early 90's and between 2015 and 2018, the deep convection was more intense and led to less stratified, thicker, colder, and more oxygenated LSW than during the period 1995-2015. This was attributed to larger ocean heat loss, stronger wind stress, and colder subpolar gyre under positive NAO conditions.
The observed oxygen variability in the Irminger Sea between 1991 and 2018 does not show any significant linear trend. This study provides the first observational evidence of the impact of the subpolar gyre decadal variability on the oxygen ventilation in the Irminger Sea and advocates for continuing the monitoring of oxygen concentration and content in the subpolar gyre to separate any possible warming-induced long-term changes from the large decadal natural variability.