EGU21-847
https://doi.org/10.5194/egusphere-egu21-847
EGU General Assembly 2021

Long-term ventilation changes of Subpolar Mode Waters in the North Atlantic Ocean and its impact on the oxygen distribution

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In the subpolar North Atlantic Ocean, Subpolar Mode Waters (SPMWs) are formed during late winter convection following the cyclonic circulation of the subpolar gyre. SPMWs participate in the upper flow of the Atlantic overturning circulation (AMOC) and provide much of the water that is eventually transformed into several components of the North Atlantic deep water (NADW), the cold, deep part of the AMOC. In a warming climate, an increase in upper ocean stratification is expected to lead to a reduced ventilation and a loss of oxygen. Thus, understanding how mode waters are affected by ventilation changes will help us to better understand the variability in the AMOC. In particular, we would like to address how the volume occupied by SPMWs has varied over the last decades due to ventilation changes, and what are the aspects driving the subpolar mode water formation, their interannual variations as well as the impact of the variability in the mixing and subduction and vertical dynamics on ocean deoxygenation. For this purpose, we use two observation-based 3D products from Copernicus Marine Service (CMEMS), the ARMOR3D and the OMEGA3D datasets. The first consists of 3D temperature and salinity fields, from the surface to 1500 m depth, available weekly over a regular grid at 1/4° horizontal resolution from 1993 to present. The second consists of observation-based quasi-geostrophic vertical and horizontal ocean currents with the same temporal and spatial resolution as ARMOR3D.