



Emerging climate change signals in the interior ocean oxygen content

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Earth System Models (ESMs) indicate that human-induced climate change will introduce spatially heterogeneous modifications of dissolved oxygen in the North Atlantic. In the upper ocean, an increase (decrease) is predicted at low (high) latitude. Oxygen increase is driven by a reduction of the oxygen consumption for biological remineralization while warming-induced reduction in air-sea fluxes and increase in remineralization due to weaker overturning circulation lead to the projected decrease. In the interior ocean, modifications in the apparent oxygen utilization (AOU) dominate the overall oxygen changes. Moreover, for the southern subpolar gyre, both observations and model hindcast indicate a close relationship between interior ocean oxygen and the subpolar gyre index. Over the 21st century, all ESMs consistently project a steady weakening of this index and consequently the oxygen. Our finding shows that climate change-induced oxygen depletion in the interior has likely occurred and can already be detected. Nevertheless, considering the observational uncertainties, we show that in the proximity of southern subpolar gyre the projected interior trend is sufficiently large enough for early detection.