

A comparison of ocean deoxygenation between CMIP5 models and an observational dataset

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Recent studies revealed that the ocean deoxygenation has been accelerating since the 1980s over the global oceans (Schmidtko et al. 2017; Ito et al. 2017), and the observed trend in the last half-century appears to be much larger than the model simulations conducted for CMIP5 (Bopp et al. 2013). This discrepancy is an important issue of the ocean deoxygenation researches as highlighted by a review paper published in the last year (Oschlies et al. 2018).

In order to understand better the relations of oxygen variations between CMIP5 models and observations, we compare oxygen concentration simulated by CMIP5 models and gridded oxygen anomaly dataset used by Ito et al. (2017). For the global oceans, the observed oxygen reduction rate for the historical experiment period appears to be within uncertainty of the models, though this result can be sensitive to the choice of the analysis period associated with the rapid recent oxygen reduction. We also closely examined the two basins that are relatively well sampled, i.e., the North Pacific and the North Atlantic. It is found that the observed North Pacific oxygen reduction is much stronger than the simulated ones, but such a strong reduction of observed oxygen does not occur in the North Atlantic. These results suggest that there are substantial spatio-temporal variations of oxygen concentration on decadal timescales and their mechanism in each basin should be explored in future studies.

Keywords: North Pacific, North Atlantic