Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

Projection of Global Ocean Deoxygenation with an Idealized Model of Ventilation and Biogeochemistry[1] BRITTNEY VROOM, Purdue University Northwest, Hammond, IN, USA, TAKAMITSU ITO, School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA, USA — There is a growing evidence that anthropogenic climate change caused deoxygenation of global oceans in the past fifty years. This project developed a two-box model to project the ocean deoxygenation of this century. The model represents the upper ocean ventilation and biological processes, whose sensitivities to climate warming play a central role in setting the oxygen loss through the end of the century. The sensitivity of ocean ventilation to climate warming and increasing ocean stratification is constrained by minimizing the mean square error of the model-observation misfit for subsurface temperature and oxygen observations for the last 60 years. The data-constrained box model is then used to project future oxygen loss under three separate warming scenarios compiled from the coupled climate simulations of CMIP6 models. Three scenarios are examined including SSP126, 245, 585 ranging from the case with strong reductions in GHG emissions to the one with business-as-usual fossil fuel emission. Our result suggests that the warming-induced reduction in ocean ventilation significantly increases the severity of ocean deoxygenation by more than a factor of two. These findings highlight the importance of understanding the sensitivity of ocean ventilation and the societal decisions to reduce carbon emissions to minimize the loss of oxygen and to protect marine habitats.

[1]NSF EAS REU Grant 1852040

Brittney Vroom
Purdue University Northwest

Date submitted: 11 Jan 2022 Electronic form version 1.4