Possible uncertainty in CMIP5 projections of low-oxygen water volume in the Eastern Tropical Pacific

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Using the results from nine Earth system models submitted to the Coupled Model Intercomparison Project Phase 5 (CMIP5), we identify the Eastern Tropical Pacific (ETP) as the region with the greatest uncertainty of future changes in oxygen-deficient ($< 30\,\mu$M) water volumes, since different models variously project both positive and negative changes in the oxygen-deficient volume and export flux there. We investigate the factors controlling future changes in oxygen-deficient volume in the ETP with global warming, using a single offline biogeochemical model. Oxygen budget analysis clarifies that the Equatorial Undercurrent (EUC) is the key mechanism controlling future variations in the oxygen-deficient volume in the ETP in our model. From the outputs of all of the CMIP5 models, we identify a significant negative relationship between changes in the EUC volume transport and the oxygen-deficient water volume from the present to the end of the 21st century, which indicates that the response of the EUC to global warming leads to one possible uncertainty in future projections of oxygen-deficient volume in the ETP.

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