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Quality of the baseline climatologies for oxygen and nutrients for inventory studies

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Quantifying ocean variability requires baseline observations of known quality on relevant spatial and temporal scales. The World Ocean Database (WOD) is the largest digital collection of freely accessible, uniformly formatted, and quality controlled historical and modern in situ ocean profile data. These data are the basis for developing the World Ocean Atlas (WOA) series. We compared the data quality of WOA 2013 version 2 (WOA13v2) and the Global Ocean Data Analysis Project version-2 (GLODAPv2). WOA13v2 objectively analyzed fields are based on quality-controlled data for the period 1955-2012 using ~15 million profiles from multiple observing systems. GLODAPv2 was derived from measurements collected during 700+ research cruises from 1972-2013. While the observations used in these climatologies underwent different levels of quality control and objective mapping, average differences (WOA-GLODAP) are small when compared to the uncertainty of measurements on the global scale below ~500 m depth for temperature (0.003 ± 0.160 °C), salinity (0.000 ± 0.015), oxygen (0.4 ± 4.7 $\mu\text{mol/kg}$), silicate (-0.3 ± 3.8 $\mu\text{mol/kg}$), nitrate+nitrite (-0.22 ± 0.95 $\mu\text{mol/kg}$), and phosphate (-0.02 ± 0.07 $\mu\text{mol/kg}$). Above about 500 m depth, there are significant differences likely related to summer dominated seasonal bias in the GLODAPv2. WOA 2018 is planned for September 2018 and will contain much additional data. We plan to develop an additional experimental O₂ ($\mu\text{mol/kg}$) hybrid climatology using both in situ and sensor-based data from bio Argo, CTD, and gliders corrected for calibration depth offsets. Using sensor-based O₂ data from floats, gliders, and CTD could potentially add an additional ~0.5 million profiles to the ~0.9 in situ O₂ profiles in the WOA18 O₂ climatology. What remains is a concerted community effort to help add available O₂ and nutrient data not found in WOD that would enable a common high-quality WOD O₂ dataset for the international research community to use.

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