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A New Estimate of Global Ocean Climatology

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The estimation of climatology is a key element for improving our understanding of the ocean state. Historical data sets available today enables an almost complete reconstruction of global ocean fields. In this study, a new global ocean climatological estimate of basic physical parameters such as temperature, salinity, density, dissolved oxygen, and apparent oxygen utilization is computed using the World Ocean Database (WOD18). The reliability of estimate is closely tied to the quality assurance of the in-situ observations and statistical interpolation schemes of the mapping. Therefore, in this context, WOD18 used for this study has gone through a non-linear quality control procedure developed by Shahzadi (2020) on a global domain. The mapping of resulting data is carried out using Data Interpolating Variational Analysis (DIVA). Sensitivity experiments are carried out to choose the key parameters of DIVA, namely the horizontal correlation lengths, and the Noise to Signal ratio (N/S). Furthermore, two new indices such as roughness index, and root mean square of residuals are designed to show the impact of the correlation length, and N/S ratio choices. For temperature and salinity, two different versions of the climatological estimates are produced: (i) a long-term (1900 to 2017) climatology using multiple platforms in-situ data, and (ii) a shorter time estimate (2003-2017) using data from ocean drifting platforms such as profiling floats. The two versions are intercompared and differences are evaluated. Similar procedures are applied for global mapping of Density, Oxygen, and Apparent Oxygen utilization. The new climatological estimates are compared with previous estimates such as World Ocean Atlas and World Argo Global Hydrographic climatological estimates, and thereby the differences are analysed.

Keywords: WOD18, temperature, salinity, apparent oxygen, DIVA, climatology, non-linear quality control.

Shahzadi, K., (2020): "A New Global Ocean Climatology", Ph.D. Thesis (under evaluation), University of Bologna, Italy, pp. (19-35. of pages)