

Historical And Modern Deep-Sea Transmissometry Data In World Ocean Database – Its Status, Challenges, And Utilization.

A. Mishonov¹, M.J. Richardson², W. Gardner²

¹ CICS-MD, University of Maryland

² Department of Oceanography, Texas A&M University

Abstract

The World Ocean Database (WOD) contains more than 13 million profiles of major oceanographic hydrographic variables (temperature, salinity, pressure, etc.) with additional data added continually, and is available internationally without restriction. A subset of more than 24 thousand profiles include data from deep-sea transmissometers, instruments that measure the attenuation of a beam of red light over a fixed path length (typically 25 cm). Full water column transmissometer data collected along with standard hydrographic data can be applied to a variety of important scientific questions, e.g., why and how does primary production biomass change in the euphotic zone on decadal time scales? can sources of natural bottom nepheloid layers of resuspended sediment be differentiated from ‘industrial’ sources due to future deep-sea mining? what is the role of resuspended sediment in the biogeochemical cycles of trace elements in the deep sea? Transmissometer measurements were made over the past four decades during ~550 cruises throughout all the world’s ocean basins. We present a synopsis of these optical data collected during international, global programs such as the World Ocean Circulation Experiment (WOCE), Joint Global Ocean Flux Study (JGOFS), and Climate and Ocean – Variability, Predictability, and Change (CLIVAR). Some of the transects were intentionally repeated two-three times over 10-20 years to allow an assessment of the variability of hydrographic conditions on decadal time scales. The optical measurements (beam attenuation due to water and particles) throughout the entire water column made over recent decades along with the hydrographic data allow us to understand how optical conditions might be affected by climate change. Transmissometer data have also been collected in many regional programs, e.g. South Atlantic Ventilation Experiment in the late 80’s, and Atlantic Meridional Transect beginning in the mid-90’s and continuing to today. Transmissometer data held in WOD has been acquired using different instruments by different research teams and this brings some challenges to data post-processing and comparison. The majority of data now in WOD have been post-processed by our team, but incomplete metadata and methodology documentation have added to the difficulty of mining the historical data. New data collected on CLIVAR and GEOTRACES (an ongoing international study of the marine biogeochemical cycles of trace elements and their isotopes) cruises are being post-processed and coming to WOD on a regular basis. We encourage others who are making hydrographic measurements to include transmissometer measurements and submit data to WOD along with complete metadata / methodology to maximize the use of these valuable measurements.
