

Observations for climate: Expanding to the deep ocean

Silvia Garzoli[†]; Gregory Johnson; Rik Wanninkhof; Bernadette Sloyan

[†] NOAA/AOML, USA

Leading author: Silvia.Garzoli@noaa.gov

Half of the ocean volume lies below 2000 m, but most of the components of the present ocean observing system are focused on the upper-ocean. This focus is adequate for climate studies on seasonal to interannual time-scales. However, the deep ocean is known to play a crucial role in many aspects of the climate system on longer time-scales. Furthermore, deep ocean observations are needed for an accurate quantification of the global energy uptake and its variability, as well as to better estimate and understand the different contributions to sea level rise. Better observing and understanding the deep ocean circulation would also provide, among others, information on variability of the deep and bottom branches of the meridional overturning circulation. Finally, an expanded deep ocean observing system would improve our quantification and understanding of long-term sequestration and redistribution of climatically relevant compounds such as carbon dioxide. Expanding the ocean observing system towards being truly global, that is, adequately measuring the half of the ocean volume below 2000 m depth, will be challenging. It requires an increased commitment to the design and implementation of technologies to withstand high pressures in remote environments for collecting deep ocean data in a cost-effective manner. Deep-ocean data that has been acquired, mostly on hydrographic surveys, over the past four decades should be (re-) analyzed with a focus on multi-parameter analyses for discerning climate trends in the small signals. The need to expand the observing system below 2000 m was the focus of a white paper submitted and discussed to the OeanObs09 conference in 2009 (Garzoli et al, 2010). This poster will describe recent advances on deep-ocean studies that follow the recommendations of the Conference. Some highlights of changes in deep ocean heat and carbon content will be shown as well as advances in observing deep ocean circulation. It will present what observations might be needed, how these observations could best be obtained, and a draft plan of recommended implementation locations to document deep-ocean changes.