

## Historical Ocean Ensemble Reanalyses

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The recent availability of historical atmosphere reanalyses (20CRv2) opens up the possibility of historical ocean reanalyses that could be used to study topics such as decadal-centennial climate variability and decadal predictability. There are several issues that need to be resolved before carrying out such a reanalysis. Among these issues is the impact of spatial and temporal inhomogeneities in the observations. To address this issue a series of “data-thinning” experiments has been carried out to investigate changes in the observational network. The data-thinning experiments show that although hydrographic data does not make an impact on the reanalysis until the late 1960s, the impact of SST data is important starting in the early 20<sup>th</sup> Century. Experiments also were conducted to explore the changing accuracy of the surface boundary conditions. These experiments show that in some regions, particularly in the tropical Pacific, there is sufficient surface boundary information throughout the 20<sup>th</sup> Century to capture the essential structure of ENSO.

An ensemble of ocean reanalyses that span the period from 1871 to 2008 has been completed using the SODA assimilation software. The reanalyses are used to explore the evolution of El Niño events over the past 140 years. The new reanalyses are based on the SODA methodology and use surface momentum fluxes from a recently completed ensemble of atmospheric reanalyses (20CRv2) that also span the period from 1871-2008. Atmospheric variables from the 20CRv2 runs are also used for the bulk formulae for heat and salt fluxes. Individual ensemble members from the atmosphere are used to force ensemble members for the ocean. The reanalyses sea surface temperature (SST) data from ICOADS 2.5, but do not use hydrographic or satellite data. The results indicate there is considerable decadal variability in the strength of events, with strong El Niño events at the beginning and end of the 20th Century but relatively weak El Niño events during the middle of the 20th Century. Although the reanalyses show prominent decadal variability in El Niño strength, there is no apparent long-term trend in El Niño strength. The reanalyses also show that the center of heating during an El Niño can vary considerably from the east Pacific to the central/west Pacific, however as for amplitude there is no clear indication of a trend in the location of El Niño events.

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