



The Role of the Oceans in the Global Energy Budget

John Church (1), Didier Monselesan (1), Jeff Dunn (1), Catia Domingues (2), and Susan Wijffels (1)

(1) Centre for Australian Weather and Climate Research, Centre for Australian Weather and Climate Research, Hobart, Australia (john.church@csiro.au), (2) Antarctic Climate and Ecosystems CRC

Ocean global mean steric sea-level and heat content are critical in balancing the Earth's sea-level and energy budget and important in attributing relative changes to natural or anthropogenic sources. Therefore, it is important to quantify mapping uncertainties in these estimates. With 3500 (as by 18-March-2012) autonomous Argo floats currently deployed, simultaneous salinity-temperature-pressure profiles from the ocean surface to 2000 dbars are now available in near real-time providing an unprecedented spatio-temporal distribution of observations when compared to conventional ship/mooring/buoy platforms. Based solely on Argo measurements over the 2004 to 2011 period, we reconstruct regional and global steric and heat content estimates of the upper ocean using Reduced Space Optimal Interpolation (RSOI) techniques applied to Argo anomalies (differences from climatologies spanning the periods 2004-2011 based on Argo observations only, and based on a wider set of observations). We investigate the sensitivity of RSOI reconstructions to the choice of the underlying climatology, and apriori covariance fields derived from altimetry, ocean reanalysis products and ocean models and compare our results with other analyses. Furthermore, RSOI global mean steric and heat content time series vary as function of land/ocean/ice mask extent. RSOI solutions can be extrapolated into marginal seas, ice zones and shallow water, but are poorly constrained there because of lack of regional Argo data. A conservative choice of land/ocean mask, relying on Argo observational footprint and discarding shallow water, probably underestimates the global mean metrics. We will attempt to separate out the differences in the reconstructions due to choice of basis data set versus the masking issue. The size of error in global budgets due to the poorly sampled regions will inform any cost/benefit of expanding the Argo global climate mission into the seasonal ice zones and the marginal seas for the purposes of tracking global budgets.