



What can we learn from the inter-comparison of global ocean observing systems from an Argo perspective?

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One of the Argo Program's most important contributions to climate science is an improvement in estimations of heat stored by the oceans and its associated volume changes, which is a key factor to gauge global warming and gain a better understanding of the mechanisms behind rising mean sea level. High precision and quality of these global ocean climate indicators are necessary to observe the ocean's role in the Earth's climate system. Data from the global Argo array, from satellite altimetry (AVISO) and satellite derived ocean mass (GRACE) are used here during the period January 2005 to December 2010 to assess the quality of Argo climate indicators. The up-dated Argo Global Ocean Indicators (GOIs) for the period 2005.0-2011.0 reveal a 7-year rate of 0.5 ± 0.1 W/m² (1-standard error) for global ocean heat content (GOHC) and 0.4 ± 0.2 mm/year for global steric sea level (GSSL). Although we can close the global sea level budget within the uncertainty intervals during the years 2005-2010 a significant positive trend of the residual is observed relative to the residual variance - even when we reduce Argo sampling issues. This must be due to systematic biases in or more of the observations with a smaller portion possibly coming from thermosteric changes below 1500m depth. We could identify and reduce with our method a systematic bias introduced by lower Argo sampling in some parts of the tropical ocean sector, in particular in the Indonesian Archipelago region. Uncertainties of the global observing systems are still too large to allow us to 'open a window' enabling to infer deep ocean warming changes from the global sea level budget. The role of salinity changes for global and regional sea level changes, as well as their contribution to the global sea level budget is also assessed.