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Oral

Global ocean heat uptake (OHU) comprises the largest portion of the Earth's energy imbalance, and estimates of its magnitude and variability vary greatly among observational data products and numerical model simulations. Much of the uncertainty in OHU results from data coverage gaps in sparsely-sampled portions of the ocean (especially the deep ocean). Satellites can not observe ocean warming directly, but satellite gravimetry observations from GRACE and GRACE-FO can be differenced with sea surface height observations from altimetry to directly quantify the steric expansion of the full-depth of the ocean. OHU from ocean heat content (OHC) changes can be inferred from steric height change if the thermal expansion coefficient (α) of the water column is known, but local values of α are dependent on temperature and pressure and thus vary greatly in the ocean. Thus the "effective" α (i.e., the ratio of full-depth steric expansion to vertical-mean temperature change) depends on where heat is being accumulated or removed in the water column.

In order to estimate OHU from satellite-based steric height estimates, this study has assembled multi-product ensembles of OHC and steric height from ocean state estimates and reanalyses, as well as gridded data products based on Argo, expendable bathythermograph (XBT) and other in-situ ocean data sources. Test reconstructions of OHC change using steric height and effective α estimates suggest that most of the global OHC time series can be recovered using regression-derived values of effective α, but the value of effective α varies considerably depending on the product(s) used to estimate it. Regions and time ranges that have particularly high ensemble spreads in OHU/OHC and effective α are identified, and a budget of effective α quantified to determine where and when OHU can most/least effectively be recovered from satellite-derived steric height anomalies.

Presentation file
delman-andrew.pdf
Meeting homepage
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