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# Breaking down Global and Regional Sea Level Budgets: what Satellite Observations can tell us

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A thorough understanding of sea level rise requires the quantification of the underlying drivers. Using satellite gravimetry and radar altimetry we can split up the global mean sea level budget into components induced by mass changes (e.g. melting and water cycle variations) and volumetric changes (thermo and halosteric variations). But, is this also possible in terms of regional sea level budgets? Furthermore, can we resolve for even smaller contributions, such as, individual ice sheets, glacier groups, and dominant modes of terrestrial hydrology, and steric variations?

In this study, we use satellite gravimetry from GRACE and radar altimetry from Jason-1 and Jason-2 to break down the sea level budgets on both global and regional scales over the years 2002-2014. Auxiliary data from hydrological and ocean models are used to create time invariant patterns which are scaled by time series which are estimated from the data. The inversion scheme, ensures that the sea level budget closes in a consistent way, respecting geometry and mass conservation. The solution is then evaluated in terms of sea level rise and its variation. To investigate the contribution of the deeper ocean, we subtract an independent steric estimate (top 700m, ARGO) from the estimated steric contribution. In contrast to other studies, we find a significant deep ocean steric component below 700m in the order of 1.2 mm/yr over the years considered.