Geophysical Research Abstracts
Vol. 20, EGU2018-6649, 2018
EGU General Assembly 2018

Estimating global and regional sea level budgets by combining multi-mission altimetry, GRACE and Argo data in a joint inversion

Bernd Uebbing, Roelof Rietbroek, and Jürgen Kusche
Institue of Geodesy and Geoinformation, University of Bonn, Bonn, Germany (uebbing@geod.uni-bonn.de)

Although sea level itself is listed as an essential climate variable, the different contributions to it are currently not listed explicitly. In order to monitor and understand present day global and regional sea level changes as well as predict future impacts, it is important to separate the total sea level change into individual mass and steric related contributions. While total sea level change has been observed continuously since 1993 by satellite altimetry, the Gravity Recovery And Climate Experiment (GRACE) mission allowed to globally monitor time-variable ocean mass changes with unprecedented accuracy. In addition since the early 2000s, a global array of freely drifting Argo floats enables the measurement of temperature and salinity profiles of up to 2000m depth.

The global joint inversion method (Rietbroek et al., 2016) fits forward-modeled spatial fingerprints to a combination of GRACE gravity data and Jason-1/-2 satellite altimetry data. This enables us to separate altimetric sea level change into mass contributions from terrestrial hydrology, the melting of land glaciers and the ice-sheets in Greenland and Antarctica as well as contributions from steric sea level changes due to variations in ocean temperature and salinity.

Here, we extend the joint inversion method by (1) incorporating additional multi-mission altimetry (Envisat, Saral/Altika, ...) which leads to an increased spatial coverage and improved sea level budgets, especially in high latitude areas. Furthermore, (2) we have included individual Argo profile data as additional observations into the inversion which significantly influence the steric sea level estimates. In line with our earlier estimates, we find the global total sea level change to be separated into 1.1 mm/a of mass contribution and 1.4 mm/a of steric contribution. Our preliminary results suggest that it is possible to further separate the steric variations into a shallow steric (upper 700m) component and a significant deep steric contribution which amounts to roughly 40-50%.