



## **A first observation driven estimate of Ocean Bottom Deformation: updating the Sea Level Budget**

Richard Westaway, Bramha Dutt Vishwakarma, Samantha Royston, and Jonathan L. Bamber  
University of Bristol, School of Geographical Sciences, Bristol Glaciology Center, Bristol, United Kingdom  
(bd.vishwakarma@bristol.ac.uk)

Sea Level Rise (SLR) is both an indicator and a serious consequence of climate change. To estimate the impact of SLR in the future, it is necessary that we monitor and understand the contemporary SLR. Partitioning SLR into its contributors, conventionally understood to be mass change and steric change, is known as Sea Level Budget (SLB). In the last few decades, we have been able to monitor changes in sea surface height, ocean mass, and steric heights with unprecedented accuracy. However, we are able to close the SLB only within most pessimistic uncertainties of its components. The SLB equation assumes the ocean bottom to be static, which is likely not the case in recent past because the ocean mass is increasing rapidly, and it invites an elastic solid Earth response. Therefore, we revisit the SLB with a mass-volume model that allows ocean bottom to deform. We find that the SLB equation requires additional solid Earth term: Ocean Bottom Deformation (OBD). The mathematical derivation illustrates that OBD will be picked up by global observations of sea surface heights and ocean mass change from GRACE. We use global observations of sea surface height anomaly, ocean mass anomaly and steric changes to obtain a first observation driven estimate of OBD:  $[-0.12 \pm 0.01]mm/yr$ , which is very close to that obtained by another study using an Earth-system model.