

EGU23-8001, updated on 09 Dec 2023

<https://doi.org/10.5194/egusphere-egu23-8001>

EGU General Assembly 2023

© Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.



Revisiting the global mean ocean mass budget over 2005-2020

Anne Barnoud¹, Julia Pfeffer¹, Anny Cazenave^{1,2}, Robin Fraudeau¹, Victor Rousseau¹, and Michaël Ablain¹

¹Magellium, Earth Observation, Ramonville-Saint-Agne, France (anne.barnoud@magellium.fr)

²LEGOS, Toulouse, France

We investigate the performances of GRACE and GRACE Follow-On satellite gravimetry missions in assessing the ocean mass budget at global scale over 2005-2020. For that purpose, we focus on the last years of the record (2015-2020) when GRACE and GRACE Follow-On faced instrumental problems. We compare the global mean ocean mass estimates from GRACE and GRACE Follow-On to the sum of its contributions from Greenland, Antarctica, land glaciers, terrestrial water storage and atmospheric water content estimated with independent observations. Significant residuals are observed in the global mean ocean mass budget at interannual time scales. Our analyses suggest that the terrestrial water storage variations based on global hydrological model likely contributes to a large part to the misclosure of the global mean ocean mass budget at interannual time scales. We also compare the GRACE-based global mean ocean mass with the altimetry-based global mean sea level corrected for the Argo-based thermosteric contribution (an equivalent of global mean ocean mass). After correcting for the wet troposphere drift of the radiometer on-board the Jason-3 altimeter satellite, we find that mass budget misclosure is reduced but still significant. However, replacing the Argo-based thermosteric component by the ORAS5 ocean reanalysis or from CERES top of the atmosphere observations leads to closure of the mass budget over the 2015-2020 time span. We conclude that the two most likely sources of error in the global mean ocean mass budget are the thermosteric component based on Argo and the terrestrial water storage contribution based on global hydrological models. The GRACE and GRACE Follow-On data are unlikely to be responsible on their own for the non-closure of the global mean ocean mass budget.