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Improving a joint inversion of GRACE, GPS and modelled ocean bottom pressure by using in-situ data.

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To investigate the changes in ocean bottom pressure (OBP) and ocean mass Rietbroek et al. (2009) performed a joint least square inversion of weekly GRACE solutions, patterns of large-scale deformation measured by a network of GPS stations and modelled OBP from the Finite Element Sea ice Ocean Model (FESOM). The correlation of this inversion with in-situ OBP ranges between 0.7 and 0.8 in some regions but for example in the tropical Atlantic the correlation is below 0.4. To improve the agreement of the inversion with in-situ data, a part of the in-situ data is included directly into the inversion. The in-situ OBP data was taken from the global OBP data base of Macrander et al. (2010) and averaged to weekly means. Depending on the weight put on the in-situ data, the correlation and regression increases significantly to a value larger than 0.9.
The variance of the system is locally reduced by almost 50% at the locations included into the inversion while the difference of the global ocean mean is on average below 10%. Furthermore the global ocean mean is used to compute a bias term for correcting the global ocean mean obtained by the FESOM model.