

Global glacier mass balances for the years 2002-2017 recovered with GRACE

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We present global mass balance estimates of large glacier systems based on GRACE satellite gravimetry data using forward-modelling inversion. First, we cluster the spatial distribution of glaciers obtained from a global glacier model to larger entities resolvable by GRACE. We then forward model the signal of these clusters, assuming a homogeneous distribution of mass change within each cluster. The forward models are then adjusted, in a least-squares sense, to the GRACE observations. The forward model and the GRACE data are filtered to minimize effect of far-field signal (leakage) and noise in mass balance estimates. Contributions from terrestrial water storage and glacial-isostatic adjustment are removed using hydrology and solid Earth deformation models, respectively. We experiment with the cluster dimension, the filtering, as well as with the distribution of mass change within each clustered entity. We analyse the temporal components in the mass balance time series. We infer regions, where long-term trends are significantly larger than the interannual variability, and discuss the related climatic drivers.