Geophysical Research Abstracts
Vol. 20, EGU2018-18162-1, 2018
EGU General Assembly 2018

Uncertainty analysis for isolating daily evapotranspiration signals from high precision gravity observations

Marvin Reich, Michal Mikolaj, and Andreas Güntner
German Research Centre for Geosciences, Hydrology, Potsdam, Germany (mreich@gfz-potsdam.de)

In this study, we examine the main error sources when reducing high precision gravity measurements for resolving mass changes caused by evapotranspiration, i.e. the transfer of water mass from below the Earth surface to the atmosphere. While evapotranspiration is a main process in the water cycle, it is difficult to measure. Rates of water mass transfer by evapotranspiration are small, both at hourly and daily time scale. Due to the integrative nature of gravity measurements, the quantification of evapotranspiration rates requires the correction of the observed gravity time series for all unwanted geophysical signal components. These include Earth and ocean tides, non-tidal ocean loading, polar motion, atmosphere, and global hydrology. In order to estimate the uncertainty of individual signal components and to determine the resulting precision and the accuracy of the variable of interest (evapotranspiration), we evaluated different scenarios of gravity signal correction at different sites. We considered several available models for standard gravity corrections and observation data sets for precipitation and discharge to assess the uncertainties in the correction process. Various test locations were chosen to cover a large range of different climate zones, topographies, and distances of the sites to the ocean. Attention was paid to data availability in order to maintain the same data sources for all sites and scenarious. We quantify (1) the sensitivity of the gravity-based evapotranspiration rates to signal corrections and (2) the residual error when separating a local hydrological process from gravity observations by latest correction models.