Geophysical Research Abstracts
Vol. 15, EGU2013-10266-1, 2013
EGU General Assembly 2013

Assimilation of GRACE and hydro-meteorological information for improving large-scale total water storage changes

Christof Lorenz (1), Harald Kunstmann (1,2), Balaji Devaraju (3), and Nico Sneeuw (3)

(1) Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research, Department of Atmospheric Environmental Research, Garmisch-Partenkirchen, Germany (christof.lorenz@kit.edu), (2) University of Augsburg, Institute of Geography, Regional Climate and Hydrology, Augsburg, Germany, (3) University of Stuttgart, Institute of Geodesy, Stuttgart, Germany

Due to a high noise content especially in the higher frequency part of the spherical harmonic spectrum, filter techniques have to be applied to data from the Gravity Recovery and Climate Experiment (GRACE) in order to reveal realistic patterns of terrestrial water storage changes (TWSC). However, as the spatial resolution of the filtered fields is poorer than 300 km, using GRACE data for local, regional and even basin-scale applications is still delicate, especially if the spatial distribution or patterns of TWSC is of interest. The objective of this study is the assimilation of GRACE-derived TWSC with other hydro-meteorological and hydrological (independent) data sources like atmospheric reanalysis models and/or global and regional hydrological models to improve the spatial resolution of basin-scale TWSC fields. As there are significant differences between the models and every model has its own advantages and disadvantages, respectively, we do not rely on a single model but use an ensemble-based estimate to obtain reliable information on the time-evolution and the stochastics of TWSC. These model estimates together with observation based data are then assimilated with GRACE derived TWSC in a Kalman-Smoother-Scheme. We assume that the advantages of GRACE is in the large-scale information of TWSC, while models can provide reliable small scale time-evolution estimates due to their physical origin. First investigations over the Mississippi basin show that the assimilated fields still contain the typical GRACE patterns, but also a significantly increased level of detail on smaller scales. An independent evaluation with observed soil moisture further shows that the assimilation improves the agreement with *in situ* observations in terms of correlation and RMSE. The resulting product provides important information on the spatial distribution of water storage variations on basin-scales and helps in further understanding the regional water cycle.