

Forman, B. A., R. H. Reichle, and M. Rodell:

"Assimilation of Terrestrial Water Storage from GRACE in a Snow-Dominated Basin"

Water Resources Research, in press, 2011.

Abstract:

Terrestrial water storage (TWS) information derived from Gravity Recovery and Climate Experiment (GRACE) measurements is assimilated into a land surface model over the Mackenzie River basin located in northwest Canada. Assimilation is conducted using an ensemble Kalman smoother (EnKS). Model estimates with and without assimilation are compared against independent observational data sets of snow water equivalent (SWE) and runoff. For SWE, modest improvements in mean difference (MD) and root mean squared difference (RMSD) are achieved as a result of the assimilation. No significant differences in temporal correlations of SWE resulted. Runoff statistics of MD remain relatively unchanged while RMSD statistics, in general, are improved in most of the sub-basins. Temporal correlations are degraded within the most upstream sub-basin, but are, in general, improved at the downstream locations, which are more representative of an integrated basin response. GRACE assimilation using an EnKS offers improvements in hydrologic state/flux estimation, though comparisons with observed runoff would be enhanced by the use of river routing and lake storage routines within the prognostic land surface model. Further, GRACE hydrology products would benefit from the inclusion of better constrained models of post-glacial rebound, which significantly affects GRACE estimates of interannual hydrologic variability in the Mackenzie River basin.