Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05980, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05980
EGU General Assembly 2008

Evaluation of GRACE Measurements with Hydrologic Data.

H. Kindt (2), J. Riegger (2), A. Bárdossy (2), B. Devaraju (1) and N. Sneeuw (1)

1 Institute of Geodesy Universität Stuttgart, 2 Institute for Hydraulic Engineering Universität Stuttgart, (contact: henry.kindt@iws.uni-stuttgart.de)

Measurements of the time-variable gravity field with GRACE provide an independent way to determine mass variations on the continents that are mainly caused by changes in the continental water storage. Thus, the new satellite data allow to close the large-scale water balance at monthly time resolution and to quantify the related water mass transport processes. However, prior to the use of GRACE data for the direct determination of actual evapotranspiration and its application to the estimation of runoff from ungauged catchments, there is a need to quantify the accuracy of GRACE mass change rates with terrestrial measurements at comparable spatial scales.

For an evaluation of GRACE signal error on catchment scales water storage changes, determined from ground based measurements, are used on climatologically selected catchments and time periods (boreal winter, deserts) where precipitation and/or actual evapotranspiration is negligible. This provides a space / time pattern for which storage changes can be constrained within the limits of hydrological data uncertainty. Statistical analysis on historical datasets allows us to determine a subarea of the global land surface of 25 percent with water storage changes below 15 mm/month RMS and 14 percent with even less than 7mm/month RMS. These areas can be used as a reference for the quantification of GRACE signal error.

Time series analysis of GRACE mass change rates and water storage change for these areas shows, that the GRACE signal RMS correlates linearly with RMS of water storage change (R^2=0.35) with an offset of about 10mm/month. As the hydrological signals and thus the mass changes on continents show a distinct annual behavior, the

sensitivity of the evaluation is improved by utilizing the deviation from the monthly mean i.e. monthly residuals for further statistical investigations. Comparing the time series of mass change from the specified areas shows that there is no systematic correlation between residuals from GRACE and Hydrology. Investigating the spatial structure of temporal correlations of residuals between catchments indicates that spatial correlations between GRACE signals are much higher than between hydrological signals. Spatial correlation patterns from GRACE residuals show a zonation aligned with latitude.