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A comparison of regional and global GRACE gravity field models for terrestrial water change monitoring

R. Klees (1), B. Gunter (1), X. Liu (1), T. Wittwer (1), R. Tenzer (1), E. Revtova (1), P. Ditmar (1), H.C. Winsemius (2), H.H.G. Savenije (2)

(1) Delft Institute of Earth Observation and Space Systems (DEOS), TU Delft, The Netherlands, (2) Department of Water Management, TU Delft, The Netherlands

The main objective of the GRACE satellite gravity mission is to map the time-varying gravity field of the Earth with unprecedented spatial and temporal resolution. Terrestrial water storage change is one of the most important processes generating time variations in the gravity field detectable by GRACE. Monthly global gravity field models form the backbone of the analysis, and are provided by the GRACE science data system teams at several major research centers in Europe and the United States. In addition, a number of other research groups, including the Delft Institute of Earth Observation and Space Systems (DEOS), have begun developing regional gravity field modeling techniques that target smaller, more specific regions. These regional solutions are often computed using alternative parameterizations and solution methods, and are expected to be more precise than global ones for the areas they cover.

In this presentation, we compare the time series of monthly global GRACE gravity field models produced by the various centers with regional solutions computed at DEOS from GRACE KBR data using space-localizing parameterizations. The models are evaluated with respect to independent data sets of terrestrial water storage change for various regions. The following questions will be addressed: 1) how large are the differences between global and regional solutions; 2) are the observed differences statistically significant; 3) which monthly GRACE gravity field models fit best regional hydrological data; 4) what is the optimal post-processing strategy to be applied to the monthly global models; 5) how significant is the improvement offered by regional GRACE-based models with respect to the global models.