Mutual benefits of GRACE gravity field analysis and global hydrological modeling

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This contribution will present the joint results of the project REGHYDRO (in the framework of the German priority program "Mass transport and mass distribution in system Earth") which constitutes a cooperation between geodesists, hydrologists, and mathematicians to exploit the mutual benefits of GRACE gravity field analysis and hydrological modeling. On the one hand, the project aims at the improvement of global-scale hydrological modeling of water storage variations (and waterflows) using gravityfield variations from GRACE. On the other hand it is the goal to improve GRACE gravity field processing strategies using prior information derived from hydrological models, in particular the global hydrological model WGHM.

The WGHM model is currently being expanded to introduce floodplains of large river basins and withdrawal of groundwater into the model. This is the first time that either contribution is included into a global hydrological model. GRACE data is then be used to validate the results and adjust the assumptions made in the modeling.

In this project the interrelation between hydrologial information and GRACE gravity field analysis is also observed from the opposite point of view, by investigating how hydrological models can be used to improve GRACE solutions. In this context stochastical characteristics from the hydrological model are introduced as prior information into the GRACE analysis process. This leads to the determination of short-term gravity field variations using a Kalman smoother approach. In this presentation the application of the approach to specific river basins will be investigated.