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The GlobalCDA Project - Understanding the global freshwater system by combining geodetic and remote sensing information with modelling, using a calibration/data assimilation approach

Juergen Kusche (1), Petra Döll (2), Tobias Bolch (3), Tonie van Dam (4), Denise Dettmering (5), Annette Eicker (6), Olga Engels (1), Laura Foglia (7), Ursula Geßner (8), Andreas Güntner (9), Claudia Künzer (8), Hannes Müller Schmied (2), Florian Seitz (5), Nico Sneeuw (10), and Mohammad Tourian (10)

(1) Bonn University, Astronomical, Physical and Mathematical Geodesy, Bonn, Germany (kusche@uni-bonn.de), (2) University of Frankfurt, (3) University of Zurich, (4) University of Luxemburg, (5) TU Munich (DGFI-TUM), (6) HafenCity University Hamburg, (7) University of California, Davis, (8) German Aerospace Center - DLR, (9) GFZ Potsdam, (10) University of Stuttgart

Hydrological models aim at understanding and predicting water storage and flux. From a hydrology point of view, they allow simulating lateral and vertical partitioning of precipitation into surface/subsurface storages, evapotranspiration and runoff, providing a basis for managing water resources and assessing the effects of climate change and anthropogenic modifications. From a geodesy perspective, they aid in separating time-variable gravity and space-geodetic time series into different contributions. However, current models have problems due to data biases and limitations in process representation, and they fail to reproduce many signals observed, e.g., by GRACE or in GNSS time series.

In the GlobalCDA project, several geodetic (GRACE, GRACE-FO, multi-mission river and lakes radar altimetry, ice altimetry, GNSS time series) and remote sensing (water and snow extent, DEM differencing) will be integrated with the WaterGAP Global Hydrological Model (WGHM) and in-situ streamflow observations through ensemble data assimilation and Pareto-optimal calibration approaches. As its final result, the project strives at creating a consistent global reanalysis of terrestrial water storages and fluxes with 50 km resolution, which is closer to observations than current products. New data products such as surface water volume changes or glacier mass balance will be developed with quality measures. At the same time, GlobalCDA will work towards improved process representation in WaterGAP.

GlobalCDA has been selected to be funded by the German Research Foundation (DFG), involving nine institutions and commencing in 2018. The presentation will provide an overview on its research aims and possible applications in geodesy and hydrology.