G3P project at AIUB successfully completed

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After three years, the Global Gravity-based Groundwater Product (G3P) project has successfully ended with the publication of the global Groundwater Storage Anomaly (GWSA) maps developed by the project team. The Astronomical Institute of the University of Bern (AIUB) led work package 2 of the G3P project, which aimed at providing global maps of the Terrestrial Water Storage (TWS). This required the project partners GeoForschungsZentrum Potsdam (GFZ), Technische Universität Graz (TUG) and AIUB to compute monthly gravity fields of the Earth from observations of the GRACE and GRACE-FO satellite missions. Specifically, AIUB has provided improved GRACE monthly fields from the last years (2011-2017) observations of the GRACE mission, which are difficult to process due to numerous instrument artifacts. In addition, it has computed a completely revised time series of monthly gravity field solutions for the GRACE-FO mission period (as of June 2018), based on empirical error modeling and now benefiting from automated screening methods based on it.

The monthly gravity fields from all analysis centers were validated and combined as part of the Combination Service for Time-variable Gravity fields (COST-G), also led by AIUB. The combined global gravity field models form the basis of the monthly maps of the TWS calculated from them, from which the target groundwater was derived by reducing the compartments such as surface water, glacier ice, snow cover and soil moisture, which were also quantified within the G3P project. In addition to the individual elements of the hydrological cycle, the uncertainties of the individual compartments, which are important for further interpretation, were also determined. The resulting monthly GWSA maps are available with a spatial resolution of 0.5 degrees in NetCDF format via the GravIS portal for the international user community: http://gravis.gfz-potsdam.de/gws. The gain in accuracy achieved by revising the satellite gravimetric observations and combining them can be seen in the improvement in the signal-to-noise ratio for the Earth's large river basins (see figure).

Both TWS and groundwater are among the Essential Climate Variables (ECVs) defined by the Global Climate Observing System (GCOS) and thus form an important basis for understanding the processes that determine climate change. In contrast to the other elements of the hydrological cycle, groundwater cannot be observed directly over a wide area, but only in sum with all other mass variations in the Earth system using satellite gravimetry methods. The special merit of the G3P project lies in the coordination of a broad spectrum of experts both for satellite gravimetry and for the different elements of the hydrological cycle, which made the isolation of the groundwater component possible in the first place.

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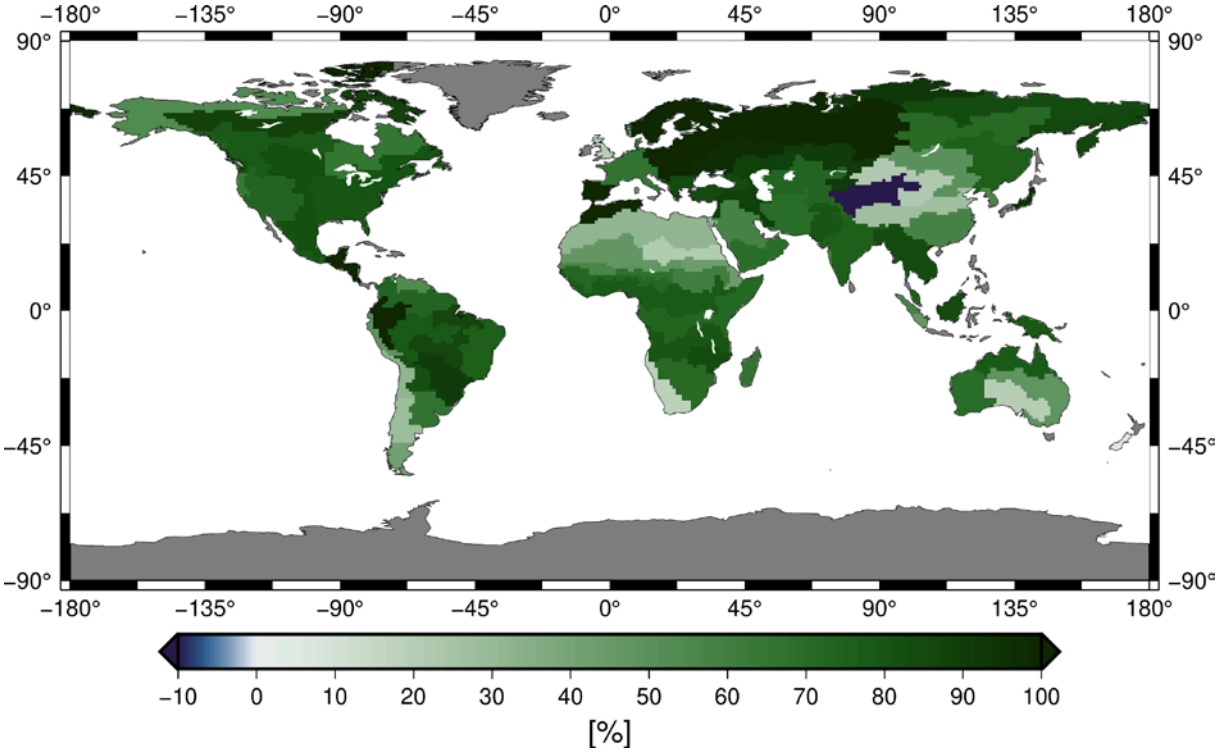

Improve signal-to-noise ratio (in percent) in large river basins.