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Turning GRACE into a tool for hydrological monitoring

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Managing water resources is a critical issue because of scarcity and reduced reliability related to climate change. The GRACE mission has emerged as the first satellite able to measure total water storage variations and solve water budgets with sufficient accuracy and spatial sensitivity to monitor hydrological systems at spatial scales greater than 400 km. The objective of this study was to assess the use of GRACE satellite data for monitoring water storage changes in river basins globally and to provide increased access to the data to hydrologists through a Google Earth product. A global basin-scale GRACE dataset (including error estimates) was developed in this work, based on processing methods validated on the intensively monitored US High Plains Aquifer. A total of 218 river basins were delineated (156 basins and 62 sub-basins) based on the Total Runoff Integrating Pathways (TRIP) to cover all continents and compatible with GRACE resolution. GRACE data from two centers (CSR RL4 monthly data and GRGS RL2 10 day data) were processed for bias, leakage, and glacial isostatic adjustment to provide total water storage (TWS) changes from 2002 – 2010. The corrected GRACE time series are compared with water storage simulated by various Land Surface Schemes (LSM). The availability of GRACE data for river basins through Google Earth, along with analysis of errors, should greatly facilitate the use of GRACE data by hydrologists and advance our understanding of spatio-temporal variations in water storage in river basins globally. The highly-engineered Euphrates-Tigris basin will be shown as an example to highlight the significant interest of GRACE data for basin-scale water management.