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Validation of constrained regional solutions of water mass change derived from GRACE KBRR data

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Multi-year time series of 2-degree and 10-day regional grids of water mass storage have been produced by inversion of accurate GRACE K-Band Range rate (KBRR) residuals. These latter on-track data are obtained after least-square orbit adjustment of daily Level-1 GRACE measurements using the GRGS GINS software. They are corrected from known a priori gravitational accelerations during this process, so that the residuals represent mainly changes in continental hydrology. Because the classical gravimetry inverse problem remains ill-posed, we consider spatial constraints (i.e. isotropic « exponential » correlations versus geographical distance between elementary surfaces) for regularizing the linear system to be solved. Regional solutions of continental water storage reveal hydrological events of small scales, like sudden important floods and extreme droughts. For validation, our regional estimates and averages over large drainage systems, such as the Amazon basin, are compared to other GRACE-based products such as global GRACE solutions and NASA « mascons », global hydrology models, as well as in situ water level measurements.