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A daily wetness index from satellite gravity for near-real time global monitoring of hydrological extremes

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Since April 2002, the Gravity Recovery and Climate Experiment (GRACE) satellite mission has been churning out water storage anomaly data, which has been shown to be a unique descriptor of large-scale hydrological extreme events. Nonetheless, efforts to assess the comprehensive information from GRACE on total water storage variations for near-real time flood or drought monitoring have been limited so far, primarily due to its coarse temporal (weekly to monthly) and spatial (> 150.000 km2) resolution and the latency of standard products of about 2 months,.

Pending the status of the aging GRACE satellite mission, the Horizon 2020 funded EGSIEM (European Gravity Service for Improved Emergency Management) project is scheduled to launch a 6 month duration near-real time test run of GRACE gravity field data from April 2017 onward, which will provide daily gridded data with a latency of 5 days. This fast availability allows the monitoring of total water storage variations related to hydrological extreme events, as they occur, as opposed to a 'confirmation after occurrence', which is the current situation.

This contribution proposes a global GRACE-derived gridded wetness indicator, expressed as a gravity anomaly in dimensionless units of standard deviation. Results of a retrospective evaluation (April 2002-December 2015) of the proposed index against databases of hydrological extremes will be presented. It is shown that signals for large extreme floods related to heavy/monsoonal rainfall are picked up really well in the Southern Hemisphere and lower Northern Hemisphere (Africa, S-America, Australia, S-Asia), while extreme floods in the Northern Hemisphere (Russia) related to snow melt are often not. The latter is possibly related to a lack of mass movement over longer distances, e.g. when melt water is not drained due to river ice blocking.