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Assessing uncertainties of GRACE-derived terrestrial water-storage fields

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Space-borne sensors are producing many remotely sensed data and, consequently, different measurements of the same field are available to end users. Furthermore, different satellite processing centres are producing extensive products based on the data of only one mission. This is exactly the case with the Gravity Recovery and Climate Experiment (GRACE) mission, which has been monitoring terrestrial water storage (TWS) since April 2002, while the Centre for Space Research (CSR), the Jet Propulsion Laboratory (JPL), the *GeoForschungsZentrum* (GFZ), the *Groupe de Recherche de Géodésie Spatiale* (GRGS), among others, provide individual monthly solutions in the form of Stokes's coefficients. The inverted TWS maps from Stokes's coefficients are being used in many applications and, therefore, as no ground truth data exist, the uncertainties are unknown.

An assessment of the uncertainties associated with these different products is mandatory in order to guide data producers and support the users to choose the best dataset. However, the estimation of uncertainties of space-borne products often relies on ground truth data, and in the absence of such data, an assessment of their qualities is a challenge. A recent study (Ferreira et al. 2016) evaluates the quality of each processing centre (CSR, JPL, GFZ, and GRGS) by estimating their individual uncertainties using a generalised formulation of the three-cornered hat (TCH) method.

It was found that the TCH results for the study period of August 2002 to June 2014 indicate that on a global scale, the CSR, GFZ, GRGS, and JPL present uncertainties of 9.4, 13.7, 14.8, and 13.2 mm, respectively. On a basin scale, the overall good performance of the CSR is observed at 91 river basins. The TCH-based results are confirmed by a comparison with an ensemble solution from the four GRACE processing centres.

Reference

Ferreira VG, Montecino HDC, Yakubu CI and Heck B (2016) Uncertainties of the Gravity Recovery and Climate Experiment time-variable gravity-field solutions based on three-cornered hat method. *Journal of Applied Remote Sensing*, **10**(1), pp 015015-(1-20). doi: 10.1117/1.JRS.10.015015