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Research on the MASCON method for the determination of local surface mass flux with Satellite-Satellite Tracking technique

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Abstract The MASCON (Mass Concentration) method is an effective technique to study the mass flux of the shallow earth surface by using the GRACE satellite-satellite tracking (SST) technique directly. Compared with the Stokes spherical harmonic coefficient method, it can overcome the uncertainty problem of the filtering of time variable signals and effectively solve the problem of the North-South stripes in the solution of the GRACE earth gravity models. In this paper, the existing local MASCON method is improved, and the satellite precise orbit is introduced as the observations to solve for the parameters of MASCON and the relating dynamic models by combining the high-low SST and low-low SST measurements. To ensure the time variable signals be mainly derived from the inter-satellite range-rates, the variance component estimation method is used to determine a reasonable weight. By using the precise orbit as the absolute reference, a modified way to realize the MASCON is studied in this paper. Using the GRACE satellite gravity data in 2008, the water storage change in terms of equivalent water height (EWH) of Amazon basin is achieved. Compared with those computed from the GLDAS model, the time variable gravity models of the CSR Release 05 version and the MASCON solution by JPL, our results are confirmed to have good consistence, supporting the ideas on the method recommended in this article, which may provide a feasible way to study the local surface mass flux.

Keywords GRACE; MASCON; Dynamic method; Mass flux