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## GRACE observing a small scale ocean mass increase in the Bohai Sea

**Dapeng Mu** and Tianhe Xu

Shandong University, Weihai, China (mdp@sdu.edu.cn)

The Gravity Recovery and Climate Experiment (GRACE) satellite mission has profoundly advanced our knowledge of contemporary sea level change. Owing to the coarse spatial resolution and leakage issue across the land-ocean boundary, it is challenged for GRACE to detect mass changes over a region smaller than its spatial resolution, especially a semi-enclosed basin that is adjacent to land with significant mass variation. In this contribution, we find that GRACE is capable of recovering mass increase in the Bohai Sea, which is adjacent to the North China Plain that has been experiencing significant groundwater depletion. This water mass increase, only amounting to 0.45 Gt/yr, is demonstrated by a reconstruction that is implemented with multisource data, including altimeter observations, steric estimates, and hydrology model. The reconstructed mass signal rejects the detection of sediment accumulation by GRACE, but it does not exclude the possibility that sediment accumulation may occur at local scale. Compared with the “true” mass increase, the mass increase observed by GRACE spherical harmonic coefficients (SHCs) is seriously compromised (i.e., signal magnitudes are substantially reduced) due to leakage issue. Our reconstruction results exemplify that elaborate data-processing is necessary for specific cases. On the other hand, the recently released mascons, which are resolved with constraints and require no further processing, suggest improved seasonal cycles in the Bohai Sea that are in agreement with altimeter observations. However, the rates derived from the mascons cannot properly represent the real ocean mass increase for the Bohai Sea, because the mascons underestimate the rates or contain some artificial effect. Nevertheless, the mascons provide new insights into regional sea level change relative to the traditional SHCs.