



## **GRACE captures basin mass dynamic changes in China based on a multi-basin inversion method**

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Complex landform, miscellaneous climate and enormous population have enriched China with geophysical phenomena ranging from water depletion in the underground to glaciers retreat on the high mountains and have aroused large scientific interests. This paper, utilizing gravity observations 2003–2014 from the Gravity Recovery and Climate Experiment (GRACE), intends to make a comprehensive estimation of mass status in 16 drainage basins in the whole region. We proposed a multi-basin inversion method, which is featured by resistance to the stripe noise and ability to alleviate signal attenuation due to truncation and smoothing of GRACE data. The results show both positive and negative trends: there is a tremendous mass accumulation spreading from the Tibetan plateau ( $12.2 \pm 0.6$  Gt/yr) to the Yangtze River ( $7.6 \pm 1.3$  Gt/yr), and further to the southeast coastal areas, which is suggested to involve an increase in the ground water storage, lake and reservoir water volume and likely materials flowed in by tectonic process; a mass loss is occurring in Huang-Huai-Hai-Liao River Basin ( $-10.5 \pm 0.8$  Gt/yr), as well as the Brahmaputra-Nujiang-Lancang River Basin ( $-15.0 \pm 0.9$  Gt/yr) and Tianshan Mountain ( $-4.1 \pm 0.3$  Gt/yr), which is a result of groundwater pumping and glacier melting. The groundwater depletion area is well consistent with the distribution of land subsidence in North China. In the end, we find intensified precipitation can alter the local water supply and GRACE is proficient to capture this dynamics, which could be instructive for the South-to-North Water Diversion—one China's giant hydrologic project.