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Satellite-based estimates of the Mass variations over Tibet-plateau

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Abstract: Tibet-plateau is located in the Southwestern China, covering all the Tibet autonomous Region and Qinghai Province, western Sichuan, southern Xinjiang Uygur Autonomous Region and the parts of Gansu and Yunnan Provinces. Tibet-plateau is the main distribution area of the modern glacier in China, and covers 83% of the overall glaciers. It is of great significant for ecological environment and global or regional climate changes to study the mass variations over Tibet-plateau. The mass variations over the Tibet-plateau region are recovered from the 95 monthly GRACE (Gravity Recovery and Climate Experiment) earth's gravity field models for the period from April 2004 to June 2011 in the paper, and then the characteristics of the mass variations are analyzed. The results show that the mass variations in the Tibet plateau region, including water storage changes and snow water variations, have notable seasonal features. The amplitude of the annual variations is approximately 5.3cm in terms of equivalent water height, and achieves the maximum in March and August each year. The long-term mass variation rates of the Tibet-plateau region change from 1cm/year in southeastern to -1cm/year in northwestern. Comparing the mass variations from GRACE to those from CPC (Climate Prediction Center) hydrological model, the similarities are shown well and the annual amplitude difference is less than 0.3cm. Finally, the time series of mass variations in three different areas are analyzed, which are the source of three rivers in eastern Tibet, Ngari in northern Tibet and Brahmaputra in southwestern Tibet. And by analyzing the spatial distribution of monthly precipitation from Tropical Rainfall Measuring Mission (TRMM) over the research regions, the results reveal that monthly precipitation is the main cause of the seasonal changes of terrestrial water storage.

Key words: temporal gravity field, GRACE, hybrid filtering scheme, mass variation

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