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Study on present deep crust deformation in northern and middle of the Red river fault zone by gravity method

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Multidisciplinary research shows the Red river fault zone's (RRFZ) present movement and deformation state has complex segmentation feature. In order to further reveal its deep deformation mode, firstly, we extract tectonic movement gravity change information from mobile gravity measurement data by remove water storage varation and Vertical movement gravity effect; Secondly, together crust density interfaces model with gravity change information, then we can get the NMRFZ's deformation mode of deep crust, which causes gravity variation.

The average effect with a 50km radius is calculated for the recent gravity change rate in the Sichuan-Yunnan region, then the background rate field and the residual gravity change rate field are obtained. The trend of -0.66μGal/yr gravity-low-speed change in Sichuan-Yunnan region indicates that there is an inheritance between the gravity field and the uplifting background of the southeastern Tibetan Plateau. The crustal uplift is an important reason for the negative surface gravity changes, but it is mainly related to the deep tectonic environment. There are local positive change zones in the block boundary area, with obvious lateral extrusion and deep mass accumulation. It reflects that under the dynamic environment of the eastward flow of the Tibetan Plateau, the crust of north and middle-south section of the RRFZ are extruded and the underground mass become densification which make the surface gravity raising. The positive gravity changes in up-middle crust are more obvious than lower crust and Moho in Sichuan-Yunnan area. The RRFZ also exhibits a strong demarcation feature as a plate boundary, and the northern segment is the dividing line of gravity positive and negative changes area, while the middle-southern segment and its two sides also showed a wide range of positive change trends, with deep mass continue accumulation.

The results of crustal deep deformation show that both the upper and the lower crust are obviously demarcated along the 101.5°E boundary, with the west side of the southwest Yunnan descending (moho: -0.05m/yr, upper-middle crust: -0.03m/yr) and east side of Sichuan-Yunnan block rising (moho 0.05m/yrupper-middle crust 0.02m/yr), which shows that the control effects in depth of the Kangdian crustal axis. The deformation rate of the deep crust in the RRFZ is the largest, the middle-south is next and the south the smallest. Gradual zone between the middle-south segment of the RRFZ and the Chuxiong-Jianshui fault zone shows strong activity and difference in the upper middle crust.