

The Comprehensive Analysis and Research of Recent gravity and the Crustal Deformation in Northeastern edge of the Tibetan Plateau

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In this study, we systematically analyzed the relationship between regional gravity changes, 3D crustal deformation, regional tectonic environment and strong earthquakes based on the relative gravity measurements (2011-2014), GPS data and the background vertical deformation from the leveling measurements conducted from 1970 to 2011. Subsequently, we further characterized the temporal-spatial patterns and discussed the mechanism of regional gravity changes and the crustal deformation. It can be summarized in the following: 1) The regional gravity changes, the GPS-derived horizontal deformation and the vertical deformational obtained from leveling data showed a intense spatial relationship: the gravity increasing along with the direction of horizontal movement, and the gravity decreasing with the crustal uplift and vice versa, which reflected the inherited characteristics of neotectonic activities. 2) The crustal deformation was closely related to the active faults. The contour lines of gravity changes and vertical deformation were generally along with the Qilian-Haiyuan fault (strike is NWW), and the crustal horizontal deformation showed left-lateral strike slip motion near the Qilian-Haiyuan fault. 3) The strong earthquakes usually occur in the active faults where the gravity changes intensely, as well as the vertical and/or horizontal deformation is intensely. The extrusion deformation, surface compression rate and gravity changes were obvious near the epicenter of 2016 Menyuan Earthquake. The 2013 Minxian Ms6.6 earthquake occurred in the direction-turning area of intense gravity gradient, and the transitional area of surface compression and vertical deformation. The first author of this paper has made a medium-term forecast before the Minxian and Menyuan earthquakes, especially the location of the earthquake. Based on the above understandings, we emphasized that: there are still possibilities of strong or huge earthquakes within medium-long term in parts of crustal deformation anomalies in the study area.

Keywords: Northeastern edge of the Tibetan Plateau, gravity change, leveling measurement, Tectonic activity