

Gravity Variation Before Six Large Earthquakes in Mainland China, 2008-2017



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Abstracts: From 2008-2017, Wenchuan Ms8.0 earthquake and Yutian Ms7.3 earthquake in 2008, Yushu Ms7.1 earthquake in 2010, Lushan Ms7.0 earthquake in 2013, Yutian earthquake Ms7.3 in 2014 and Jiuzhaigou Ms7.0 earthquake in 2017 occurred continuously in mainland China. Before these earthquakes, the China Earthquake Administration (CEA) has carried out several periods of mobile gravity observation near the epicenter, the reliable gravity change with the time has been obtained. The relation between the gravity variation and six big earthquakes has analyzed by using the absolute and relative gravity observation. The results show that: ① Strong earthquake easily occurred in the turning site of the high gradient zone of gravity variation. Structural deformation discontinuity of tectonic active fault zone was strongest because of its strong differential movement. Therefore, it was easy to produce sharp gravity changes, which is most conducive to the accumulation of stress and the preparation of earthquakes. ② Wenchuan Ms8.0 earthquake in 2008 and Lushan Ms7.0 earthquake in 2013 occurred in the high gradient and the junction of the Longmenshan fault zone (Zhu, et al, 2010, 2013), the two Yutian earthquakes in 2008 and 2014 occurred at the turning site of the high gradient zone of gravity variation along with the Altun fault zone, which is near the zero value line (Zhu, et al, 2010, 2013), Yushu Ms7.1 earthquake in 2010 occurred in the high gradient and the junction of the Ganzi-Yushu fault zone (Zhu et al, 2012), Jiuzhaigou Ms7.0 earthquake in 2017 occurred near the Tazang and Minjiang faults with significant gravity variations. These two faults were well related to the earthquake (Zhu et al, 2017). ③ Gravity data have a good reflection on these 6 earthquakes with magnitude 7 or above occurred in the mainland of China since 2008. Obvious regional gravity anomalies and high gradient zones were observed in the epicenter area and its vicinity before earthquakes, which may be the gravity precursor information observed in the process of earthquake preparation. The author made a medium-term forecast before Yutian Ms7.3 earthquake in 2008, Wenchuan Ms8.0 earthquake in 2008, Lushan Ms7.0 earthquake in 2013, Yutian Ms7.3 earthquake in 2014 and Jiuzhaigou Ms7.0 earthquake in 2017, especially made a forecast for the locality of earthquake based on the anomaly gravity variations. These five earthquakes occurred in the forecast region (Zhu et al, 2013, 2015, 2017, 2018a; Zhang et al, 2018b). ④ It is necessary to strengthen mobile gravity observation in seismically active region in China, establishing more intensive observation network near tectonic active faults to obtain high spatial and temporal resolution information of gravity field variation can provide important basis for reasonable judgment of

strong earthquake location in the future.

Key words: Wenchuan earthquake, Yushu earthquake, Lushan earthquake, Yutian earthquake, Jiuzhaigou earthquake, Gravity variation, Tectonic activity

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