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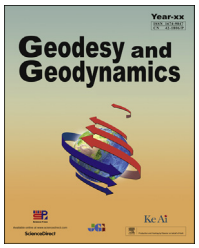

Gravity variations before the Menyuan Ms6.4 earthquake

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ARTICLE INFO

Article history:
Received 2 April 2016
Accepted 28 April 2016
Available online 7 July 2016

Keywords:
Mid-eastern of Qilian Mountain
Gravity changes
Menyuan Ms6.4 earthquake
Lenglongling Fault
Hexi

ABSTRACT

In order to study the relationship between gravity variation and Menyuan Ms6.4 earthquake, gravity variation characteristics in mid-eastern of Qilian Mountain were analyzed based on the 2012–2015 relative gravity datasets. The results indicated that the gravity changes in mid-eastern of Qilian Mountain increased gradually, while gravity changes around Menyuan remarkably. Besides, great positive-negative gravity changing gradients appeared along the Lenglongling Fault which was located at the north of Menyuan, and the 2016 Menyuan Ms6.4 earthquake occurred near the junction of positive and negative gravity changes.

How to cite this article: Liang W, et al., Gravity variations before the Menyuan Ms6.4 earthquake, Geodesy and Geodynamics (2016), 7, 223–229, http://dx.doi.org/10.1016/j.geog.2016.04.013.

1. Introduction

As we all know, earthquakes usually occurs along with mass transfer and gravity variations. This phenomenon has been demonstrated by many researches, e.g. 1964 Niigata earthquake in Japan [1], 1964 Alaska earthquake in USA [2], and the 1968 Inangahua earthquake in New Zealand [3]. Since the 1980s, many domestic scholars have been studying on the relationship between active faults and earthquakes based on the gravity data, and many gratifying results have been obtained: Wang et al. [4] studied the gravity changes of active faults around Beijing, and the results showed approximately 100×10^{-8} ms^{-2} gravity changes, induced by the Tangshan earthquake, along the NNE and NS faults. The temporal and spatial distribution patterns of gravity field provided basis for predicting the time and location of strong earthquake by repeated gravity measurements. Sun et al. [5] studied the gravity changing characteristics in Xianshuihe Fault, finding that there were obvious gravity anomaly

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Peer review under responsibility of Institute of Seismology, China Earthquake Administration.

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http://dx.doi.org/10.1016/j.geog.2016.04.013

before the Batang, Xiaojin, Lijiang earthquakes. Zhu et al. [6–10] analyzed the correlation between the gravity changing characteristics of Longmen Mountain Fault and the Wenchuan Ms8.0 earthquake, using the temporal and spatial patterns of regional relative gravity changes in many periods, to obtain a conclusion that there is a close relation between the gravity changes and the tectonic movements of Longmen Mountain Fault. Besides, the effects of gravity changes on the earth surface, caused by the mass transfer and tectonic deformation of active faults, were well reflected by the gravity surveying data.

Mid-eastern of Qilian Mountain (MEQM), located at the northeastern of Tibet Plateau block, is one of the regions with the most intense movement and high frequency of earthquakes in China. Since the 1900s, many great earthquakes have occurred around the mid-eastern of Qilian Mountain, e.g. Haiyuan Ms8.5 earthquake in 1920, Gulang Ms8.0 earthquake in 1927, the Shandan Ms7.25 and the Minqin Ms7.0 earthquake in 1954. Since 1990, there have been more than 10 great earthquakes (Ms > 5.0) occurred in this region, and many earthquakes with magnitudes reach Ms5.0 occurred in recently years.

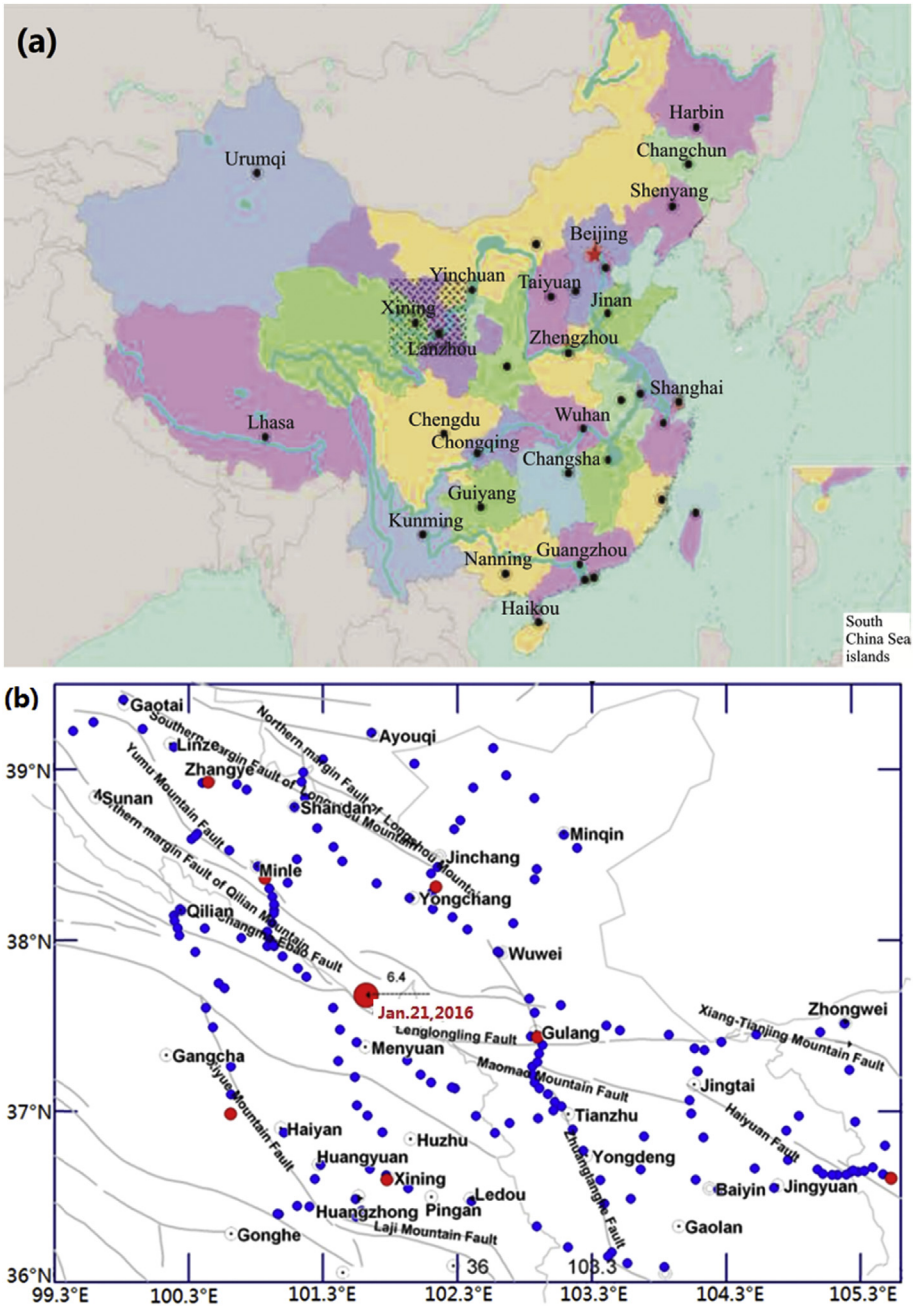

Fig. 1 – a: Hexi area in China; b: Distribution of relative gravity surveying points and tectonic structure in/near the mid-eastern of Qilian Mountain. (The blue dots represent the surveying points, the small red dots the stationary points, the grey lines the faults).