Gravity Changes before and after the Earthquake with Ms8.1 in the West to Kunlun Mountain Pass

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On November 14, 2001, an unusual strong earthquake of Ms8.1 occurred near the Eastern Kunlun Fault in the north of Qinghai-Tibet Plateau. The epicenter is around the peak of the Bukadaban Mountain and the surface ruptures stretch out about 425 kilometers along NWW direction. The fault-mode of the earthquake is mainly left-lateral strike-slip and somehow with dip-slip. The dynamic mechanism of the strong earthquake's come-into-being and occurrence, the influence to the block movement of the Mainland of China and that to the earthquake trend in the future have roused strong interest and attention among scientists at home and abroad. Based on the gravimetry data, combined with the results of seism, GPS, leveling, geology and etc, this paper tries to study and analyze the mechanism of this strong earthquake.

In order to obtain the pictures which reflect the real gravity changes better, the temporal gravity changes of the Mainland from 1998 to 2000 and those of the central-west of China from 2000 to 2002 are simulated with bi-cubic spline interpolation function and with gravity data measured in CMONOC (Crustal Movement Observation Network of China). During the process, the borders of geologic structure are considered fully. The temporal gravity changes of the Mainland have three important features as follows: a) From 1998 to 2000 the large-scaled and negative gravity changes emerged over the whole Qinghai-Tibet Plateau. Among them, those around Kunlun Mountain were the largest. b) From 2000 to 2002, the gravity changes of the whole center-western China assumed quadrant characters. c) The probabilities of earthquake occurrence in the near future are high where the gravity changes are large.

As to the area around epicenter, four campaigns gravimetrical data measured before and after the earthquake are collected and systematically analyzed, and then the dynamic gravity changes were gained. The most important feature of the changes is: the dynamic gravity changes were large and negative from 1998 to 2000. The closer the place is to epicenter, the larger the changes are. The changes were commonly beyond 50 microCals and the biggest ones came up to more than 100 microCals. After the earthquake the changes were positive except Wudaoliang and Dameigou. In addition, the lithersphere around Wudaoliang might have been losing before and after the earthquake.

In order to study the gravity changes raised by the earthquake, the dislocation surface parameters of the earthquake in the west to Kunlun Mountain pass are gained with the results of seism, geology, GPS and so on. With the theories of gravity changes raised by dislocations, the gravity changes raised by the earthquake are calculated. By comparing the seismic gravity changes with the ones that analyzed from gravity data, it can be concluded easily that the two are the same on the whole, as they both assume quadrant characters. All this shows the reasonableness to simulate the epicentre by the fault-mode. Meanwhile, they both are much different from each other in space scale and change scope, which shows the limitation of the fault-mode and the complicated information contained in the gravity data as well.

In light of the knowledge above, the mechanism of the earthquake of Ms8.1 in the west to Kunlun Mountain pass is discussed briefly at the end of this paper. It is regarded that the earthquake is the result of active fault's instantaneous slip and the process of earthquake pregnancy is that of aseismic dislocation's come-into-being and maturity.