Water Level Changes Induced by the 2004 Sumatra Earthquake and Its Implication to the 2008 Wenchuan Earthquake

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The 2004 great Sumatra earthquake induced prominent water level steps in at least 50 wells of the earthquake monitoring network in Chinese mainland. We compiled the water level data and analyzed the amplitude of the water level by statistical approach. We found that (1) the wells with water level steps were located in the specific points of tectonic belt and (2) the amplitude of well water level changes was not consistent with the epicentral distance.

We standardized the water level steps by using earth tides information recorded by water level and named the standardized water level changes as equivalent strain. We found that the standardized amplitudes of water level steps showed prominent difference between the west and the east. The amplitudes in the west of China were larger than those in the east of China. The wells with largest standardized amplitudes were located in the area ranging from Zhaotong County in northeast of Yunnan to Pingliang County in southeast of Gansu, named as Longmenshan belt.

We compared the standardized water level steps with the apparent stress in China which was inferred from the NEIC broadband radiated energy catalogue and the Harvard CMT catalogue from January 1987 to December 1998 finished by Wu Zhongliang *et al*. in 2002. The amplitudes and their spatial distribution were well consistent with each other. That meant the co-seismic ground water steps were controlled by the tectonic stress state expressed by apparent stress, which could be considered as one of the mechanism of groundwater changes induced by remote earthquakes. Considering the equivalent strain meaning of standardized amplitude of water level steps induced by the 2004 Sumatra earthquake, the above results implied that (1) the stress state of Longmenshan tectonic belt had been in high level before the 2008 Wenchuan earthquake occurred and (2) the 2008 Wenchuan earthquake was probably triggered by the 2004 Sumatra earthquake via water level observation evidence.

This research is supported by National Science Foundation programs of contracts No. 40674024 and No. 40374019.