AOGS 2005


# The response changes of groundwater level in Yunnan province, China and their dynamical implication, due to the Dec.26, 2004 Sumatra strong Earthquake

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There were lots of reports on the groundwater level response changes due to strong earthquakes in the past decades. Most of them focused on single well's long history time series, and suggested that although local conditions affect the type and amplitude of response, a compilation of reported observations of hydrological response to earthquakes indicates that the maximum distance to response changes is related to earthquake magnitude (Montomery and Manga, 2003) and the contribution of static stress is rather small (Matsumoto, et al, 2003). But our observation of groundwater level and seismic response in Yunnan province induced by the Dec.26,2004 Sumatra strong earthquake, can not be well understood by this mechanism.

The continuous digital data of groundwater level of 28 wells with 1 per minute sampling frequence in Yunnan province are analyzed systematically. There were 27 wells responding to the Dec.26, 2004 Sumatra strong Earthquake with oscillations, step-like changes and/or step-like changes accompanied by oscillations. There are 10 step-like changes and/or step-like changes accompanied by oscillations found, where 6 water level jump changes are mostly in artesian wells while the going-down changes are mostly in non-artesian wells. The epicenters of all the responding wells are more than 2000km. The step-like changes always occurred 9 minutes or so after P wave arrival, and the shapes are very similar to each other. That means the step-like changes are correlated with ground motion induced by the seismic waves. There were also many small to moderate earthquakes and earthquake sequences induced in Yunnan province, China by the Sumatra strong earthquake. Comparing the distributions of step-like groundwater response and the seismic response, it is found that the induced earthquakes are correlated with wells with step-like groundwater level response changes in spacial. That means that the earthquakes and the groundwater level changes were all induced by the strong earthquakes via seismic waves propagating in different media.

We suggested that the groundwater changes induced by the Sumatra earthquake are more closely related to the seismic waves propagating, and the strong earthquake adjusted the stress/strain situation remotely during seismic wave propagating when a local area is in critical. The pore pressure changes can be as evidences, because earthquake is as critical and groundwater well-aquifer system can be as sensitive strain-meter.

Keywords: Groundwater level, Response changes, Sumatra earthquake