Implications of Coseismic Groundwater Level Changes in Taiwan

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Abstract

Earthquake-related groundwater level changes have been recorded by a dense network of multiple-well monitoring stations in Taiwan. The coseismic water level changes fluctuate in wells of different depths at most stations. Well water level data recorded in the vicinity of the Chelungpu fault during the 1999 M7.6 Chi-Chi earthquake provide a preliminary framework of regional distribution of coseismic changes. We found that the magnitude of coseismic change is associated with characteristics, rather than depth, of the aquifer. The variation of coseismic changes in the vertical direction implies possible inconsistency between the observed water-level changes and the coseismic strains calculated from simple dislocation models. The coseismic change in the footwall of the ruptured segment of the fault was much greater than that of the unruptured segment, suggesting that fault displacement is a controlling factor in the abrupt change of pore pressure. Coseismic rise or fall correlates well with hypocentral distance in the vicinity of the ruptured fault. Poor correlation, however, is found for such changes further from the earthquake epicenter.