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Why Does Coseismic Change of Well Water Temperature in Tangshan Well Always Decrease?

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A 207 m deep well is located in Tangshan city right above the fault of 1976 M7.8 great Tangshan earthquake. The well is cased to depth of 154 m, reaches a confined aquifer of Ordovician limestone. Observation of water level (varies at depth of about 60 m) and water temperature (at 125 m depth) has been carried out for more than 25 years. The water level of the well is very sensitive to recording seismic waves. And every time an earthquake is recorded in the water level fluctuation, the water temperature has a drop. The amplitude of water level oscillation ranges from 1 m to 0.001 m usually, and the temperature decrease ranges 0.01 to 0.001C correspondingly, the temperature recovers to the original level within 1 to 10 hours. We tried to explain the interesting phenomena. Conductive heat transfer equation is solved to get the steady-state temperature of the well. Advective-disperse equation is solved to simulate temperature changes when well water oscillates as seismic waves arrive. The dispersion coefficient is proportional to the square of average vertical water oscillation velocity, which can be estimated from the well structure and amplitude of oscillation. The recovery of temperature to steady state is calculated by transient heat conduction. It is found that oscillation produced dispersion can explain the coseismic temperature, and heat conduction can explain the recovery time.