

Seismic swarms before the 2008 Wenchuan mainshock and its relationship with the Zipingpu reservoir

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The relationship between the 2008 M7.9 Wenchuan earthquake and the Zipingpu reservoir impoundment is still in debate. In this study, we calculate the change of shear stress, normal stress and pore pressure along the Longmenshan fault zone due to the impoundment and subsequent water-level changes of the Zipingpu reservoir. We focus on three seismic swarms before the Wenchuan mainshock and its relationship with stress changes with the reservoir. Furthermore, we adopt a forward modeling method to simulate earthquakes in nearby area of the Zipingpu Reservoir, and compare the simulated catalog with the observed one. In the forward modeling process, the hydraulic diffusivity D is the most important parameters controlling the fluid propagation speed. We obtain the best-fitting D value by comparing simulated seismicity with the observed one. We find that subsurface stress changes shows some consistency with actual seismicity rate changes, and the simulated catalog also supports this inference to some extent. These results are consistent with a recent study (Peng et al., AGU, 2017) showing that the Wenchuan mainshock might start at much shallower depth (i.e., 6-9 km), suggesting a possible triggering relationship between the reservoir impoundment and the Wenchuan mainshock. Our next step is to compare our simulations with a more complete catalog from waveform matching method (Yao et al., 2018) to improve our understanding of reservoir induced seismicity in this region. Updated results will be presented in the meeting.

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