

## A water reservoir trigger for the great Sichuan earthquake?

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The Ms8.0 Wenchuan earthquake of 12 May 2008 at the northwestern margin of the Sichuan basin, China ranks as the largest inland event ever recorded by modern instrument in China. Since the epicenter of this great earthquake is very close to the Zippingpu water reservoir and the major source fault crosses the water reservoir, the question did the water reservoir played a role on triggering the earthquake has raised. In order to make a clear answer to this sensitive question, we propose a method for integrated studying regional/local seismicity and stress by both surface loading and pore pressure diffusion. Possible role of Zippingpu water reservoir on nearby seismicity was studied in detail.

On one hand, we quantitatively examined change of Coulomb Stress (dCFS) due to the impoundment of the water reservoir. Both weight loading and pore pressure diffusion resulted in significant dCFS on the underlying Yingshu-Beichuan and Guanxian-Mianzhu faults, which are the source fault of the great Sichuan earthquake. By assuming a fault zone diffusivity of  $c=0.15-0.3\text{m}^2/\text{s}$ , dCFS due to penetration of reservoir water may reach the order of 0.5bar at a depth of 10km and at the time of May 2008. This value is corresponding to about 25 year's tectonic loading.

On the other hand, several statistical properties including event rate ( $n$ ), cumulative energy release ( $E$ ), seismic b-value in the magnitude-frequency relation, and spatial correlation length (SCL) of earthquakes occurred in Zippingpu area from 2004.8 to 2008.5.11 was estimated in detail. Our results indicate that there are some signs of fluid-driven seismicity and some clear correlations between the local seismicity and stress change. Hence the impoundment of the Zippingpu water reservoir clearly affected the local seismicity. A firm conclusion is somehow premature, nevertheless, we suggest that diffusion of pore pressure within the fault and the reservoir decline between December 2007 and May 2008 are major factors associated with the nucleation of the great Sichuan earthquake.