Stress Changes and Regional Seismicity from the 2008 Wenchuan Earthquake

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On 12 May 2008, the devastating Ms8.0 Wenchuan earthquake struck the eastern edge of the Tibetan plateau, killing tens of thousands of people in Sichuan province of China. According to inversion of seismic moment tensor and field survey after the 12 May earthquake it was revealed that the strong earthquake ruptured with more than 10m of coseismic displacement, and resulted in about 240km ruptures along the Longmenshan fault zone. After such a strong earthquake regional stress adjustment in the crust commonly affect subsequent seismicity.

Here we present calculations of the coseismic stress changes that resulted from the 12 May event using two models consisting of regional main faults with two kinds of rupture planes and their corresponding coseismic displacements. One is from Ji C.'s research result which shows a planar rupture surface and the other comes from Wang W.' result which gives us a double-listric finite-fault model and source rupture process by combined inverting the teleseismic waveforms and local coseismic displacement . Those faults in which strong earthquakes frequently occur, such as Kunlun fault and Xianshuihe fault, et al, are also included in the models, thus we can briefly estimate the influence of the Coulomb stress changes of the strong earthquake on seismicity of these regional faults.

The results indicate that the stress changes due to the main shock are in a large degree consistent with the distribution of aftershocks. Distributions of the coulomb stress changes for two models are similar especially when those receiver faults away from the main rupture plane are concerned. This indicates that the characteristics of strike-slip and thrust motion of the main rupture and two peak slip values distributed separately in northern and southern segments control the distribution of Coulomb stress changes. The calculating result from Wang W.' model is in some degree more reasonable for explaining why aftershocks of the northern region do not occur along the Qingchuang fault which is the extension of the main rupture swerving towards the northeast, but reveal a linear distribution consistent to the main rupture. Rock experiments with bending faults can interpret the relationship between stress changes and fault instability.

Keywords: models; Coulomb stress changes; regional seismicity.