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Coulomb Stress Changes from a Viscoelastic Model: Stress Changes after Lamjung (Nepal) Earthquake

Xu Cheng
Institute of Earthquake Science,China Earthquake Administration, Beijing, China (chengxu126@126.com)

On 25 April 2015, the devastating magnitude 7.8 (Nepal) earthquake struck the Nepal Himalaya, collapsing buildings and killing more than eight thousands people in Nepal. A magnitude 7.3 earthquake broke on 12 May at a distance of ∼130km SEE of the M7.8 earthquake, whose focus mechanism is similar with the main shock. We consider the Mw7.3 is the largest aftershock of the main Mw7.8 earthquake due to the focus depth and the spatio-temporal relationship for them. In our calculation, a 3D Finite Element Method was combined with Discontinuous Deformation Analysis (DDA+FEM) to study the influence of the Lamjung (Nepal) earthquake on the stress evolution process of the boundary faults of a tectonic blocks system under a viscoelastic model. With constraints from GPS data and focal mechanisms, we first calculated the velocity and stress fields of the region, in order to make up a suitable background tectonic setting. Then, we numerically simulated the rupture process of the seismogenic fault of the Mw7.8 earthquake in overthrust form. We then studied the influence of the earthquake on the stress state of the boundary faults. The numerical simulation indicates that the Lamjung earthquake causes the Coulomb failure stresses on the boundary faults of the tectonic blocks in our study zone to different extents. We set the MHT(Main Himalaya Thrust) between 5 to 20km depth around the focus as the seismogenic fault according to tectonic structure. Our result show that significant stress increase appear at some position of the seismogenic fault, and some boundary faults of blocks system also have increased stress state. We calculate the Coulomb stress changes of these boundary faults of our tectonic blocks system and give a trial to find out the effect of the big earthquake on some certain faults about stress, providing information that can be used in earthquake research.