

Preliminary study on rupture dynamics of 2008 Wenchuan Earthquake

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There are quite a number of studies on the rupture process of 2008 Wenchuan earthquake by inversions of teleseismic waveforms or joint inversions of seismic waves and geodetic data (e.g., Zhang et al., 2008; Wang et al., 2008; Ji et al., 2009; Shen et al., 2009). Although these results show some obvious discrepancies, they show a common feature, i.e., there is a very good correlation between the heterogeneity of fault slip distribution and the heterogeneity of the fault geometry. For example, as shown in Shen et al. (2009), there are three most heavy slipping areas in the rupturing fault, i.e., Yingxiu, Beichuan and Nanba. Further geological surveys show that these maximum slipping areas are the geometrically discontinuous areas (bending or step over). To quantitatively understand such correlation, we employ our newly developed curved grid finite difference method (Zhang and Chen, 2006) which is capable to simulate the rupture dynamics of an arbitrary non-planar fault to investigate the equivalence between a non-planar fault model to an effective planar fault with heterogeneous source dynamic parameters. We then simulate the dynamic rupture process of 2008 Wenchuan earthquake, our results can reproduce the correlation between the heterogeneity of fault geometry and the heterogeneity of slip distribution.

Keywords: Wenchuan Earthquake, Rupture dynamics, non-planar faulting