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The numerical simulation on the seismogenic mechanism of the Lushan Ms 7.0 earthquake constrained by deformation observation

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We established a two-dimensional finite element model of the Lushan earthquake and its adjacent region. The model is based on the Natural seismic imaging, magnetotelluric sounding, artificial seismic sounding profile, precise aftershock location, focal rupture inversion, geological survey, GPS observation and tectonic stress field. Using the results of deformation observation of the Lushan Ms7.0 earthquake in April 20, 2013 as constrains, we explore some possible factors, such as Qinghai Tibet Plateau eastward extrusion, characters of regional topography, lower velocity zone, detachment surface, tectonic faults, et al, which control the earthquake preparation and the rupture character of the Lushan earthquake. The numerical results showed that, the movement rate of the material in the eastern part of the Qinghai Tibet Plateau increased after the Wenchuan earthquake, which is the main dynamic factor causing or accelerating the Lushan earthquake, the existence of low velocity zone and detachment surface in the upper middle crust of the Longmen mountain fault zone is an important condition for controlling the Lushan epicenter location, and the other factors are the dynamic factors of controlling the tectonic activity of the Longmen mountain fault zone in the long time scale. Also, this paper gives the simulated result of coseismic displacement caused by the complex “y”type rupture, which further supports the speculation on Lushan mainshock rupture surface which is the “y”type.