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Dynamic rupture simulations performed on the Xiaojiang fault system, Yunnan, China

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As one of the most active and complex fault system in China, the Xiaojiang fault system consists of three main branches, the eastern, the western and the northern branch. All of them are parts of the southeastern boundary of the Sichuan-Yunnan block. Each of these fault branches is more than 150km in length and consisted of many sub-fault segments and special fault combinations, such as step-over fault and parallel fault. This fault system mainly strikes along north-south direction, with some changes in the fault strike direction. Some perturbations in strike may even control the rupture propagation. The typical earthquake recorded on the western branch is the 1833 M8.0 Songming earthquake, while the 1500 Yiliang M7 3/4 was occurred on the eastern branch, and the 1733 Dongchuan M7 3/4 was documented on the northern branch. Since this fault system has been posing a severe risk to the nearby region, such as Kunming, devastating earthquakes occurring on this fault system must be evaluated. Using the curved grid finite difference method (CG-FDM), we first simulated the above three typical earthquakes and compared the synthetic surface displacement, magnitude and seismic intensity distribution with the documented data, to quantify the modeling parameters, such as maximum principle stress orientation, effective friction coefficients μs and μd. Then we tested different nucleation points and initial stress states on these fault branches, to evaluate the possibility of earthquake scenarios that may happen in the future. Our preliminary simulation results show that the three above mentioned earthquakes are all characterized by sinistral slip, with a maximum slip of 10m, 10m and 8m, respectively. And our modeling illustrates that the rupture nucleated on the western branch and on the eastern branch can't propagate to the southern fault segment where there is a sharp change in strike, while the northern branch presents a thoroughgoing rupture.