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Application of the stress evolutionary model along the Xiaojiang fault zone in Yunnan Province, Southeast China

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A b s t r a c t

The Xiaojiang fault zone constitutes part of the major Xianshuihe–Xiaojiang left lateral structure that bounds the rhombic-shaped block of Yunnan–Sichuan to the east. Long strike slip fault zones that have repeatedly accommodated intense seismic activity, constitute a basic feature of southeast China. Known historical earthquakes to have struck the study area are the 1713 Xundian of M6.8, 1725 Wanshou mountain of M6.8, the 1733 Dongchuan of M7.8, and the strongest one, the 1833 Songming of M8.0. Although instrumental record did not report events of this magnitude class, the 18th century clustering as well as the 19th century large event prompted the investigation of stress transfer along this fault zone. Coulomb stress changes were calculated assuming that earthquakes can be modeled as static dislocations in an elastic half-space, and taking into account both the coseismic slip in strong ($M \geq 6.8$) earthquakes and the slow tectonic stress buildup along the major fault segments. Geological and geodetic data are used to infer the geometry of these faults and long term slip rates on them, as well as for the fault segments that slipped. Evidence is presented that the strong historical events as well as the ones of smaller magnitude that occurred during the instrumental era, are located in areas where the static stress was enhanced. By extending the calculations up to present, possible sites for future strong events are identified.

Key words: historical earthquakes, Coulomb stress, seismic hazard.