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Tectonic dynamics and correlation of major earthquake sequences of the Xiaojiang and Qujiang-Shiping fault systems, Yunnan, China

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The N-S trending Xiaojiang fault zone and the NW-SE trending Qujiang-Shiping fault zone are adjacent active fault systems and seismogenic zones associated with strong and major earthquakes in Yunnan, China. To understand the interaction of the two fault systems, and its probable influence on earthquake occurrences, we conduct a synthetic study based on data of active tectonics, historical earthquakes, relocated small earthquakes, GPS station velocities and focal mechanism resolutions. Our study makes several conclusions. (1) The active southward motion of the western side of the Xiaojiang fault zone (i.e. the side of the Sichuan-Yunnan block) has a persistent and intensive effect on the Qujiang-Shiping fault zone. The later fault zone has absorbed and transformed the southward motion of the western side of the former fault zone through dextral strike-slip/shearing as well as transverse shortening/thrusting. (2) Along the Xiaojiang fault zone, the present sinistral strike-slip/shearing rate decreases from 10 and 8 mm/a on the northern, central and central-southern segments to 4 mm/a on the southern segment. The decreased rate has been adjusted in the area along and surrounding the Qujiang-Shiping fault zone through reverse-dextral faulting and distributed shearing and shortening. (3) The tectonic-dynamic relation between the Xiaojiang fault zone and the Qujiang-Shiping fault zone is also manifested by a close correlation of earthquake occurrences on the two fault zones. From 1500 to 1850 a sequence of strong and major earthquakes occurred along the Xiaojiang fault zone and its northern neighbor, the Zemuhe fault zone, which was characterized by gradually accelerating strain release, gradually shortening intervals between $M \geq 7$ events, and major releases occurring in the mid to later stages of the sequence. As a response to this sequence, after an 88-year delay, another sequence of 383 years (from 1588 to 1970) of strong and major earthquakes occurred on the Qujiang-Shiping fault zone, and had the same features in accelerating strain release and its temporal course. Also, the seismic potential for major earthquakes occurring on the Xiaojiang fault zone has been analyzed in this study.
Key words: Active fault systems, fault interaction, fault motion transformation, tectonic dynamics, correlation of earthquake sequences