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Asperities in the Chishan Transfer Fault Zone (CTFZ), southwest Taiwan: Revealed by slip distributions of strong earthquakes and seismic b-value

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The highly populated southwest (SW) Taiwan is in the deformation front of vigorous mountain building as a result of plate collision between Eurasia and the Philippine Sea plate. Most earthquakes occurred in the upper crust and evaluating earthquake potential in SW Taiwan is an important and inevitable task. Despite several active faults in SW Taiwan, one noticeable feature is the Chishan Transfer Fault Zone (CTFZ) which is trending in NW-SE direction with left-lateral slip motion. The CTFZ has long been considered a more subtle seismogeneric structure due to dominating by micro-seismicity. Thus, to evaluate earthquake potential in the CTFZ becomes more challenge as comparing with that in the major thrust fault zones in Taiwan. However, there were three large inland earthquakes with magnitude greater than 6.0 occurred within the CTFZ in the year of 2010 (Jiasian earthquake, M6.4), 2012 (Wutai earthquake), M6.1 and 2016 (Meinong earthquake, M6.6). Particularly, the recent strike of the 2016 Meinong earthquake has caused great damage in SW Taiwan. The three strong earthquakes provided us a great opportunity to closely investigate the heterogeneity of stress distribution in the CTFZ by studying the spatial-temporal variations of seismic b-value prior and after the occurrence of each earthquake. Our results indicate that a NE trending interface with prominent contrast of seismic b-value is observed. In the northwest of this interface, a significant low seismic b-value area is overwhelmed. The above-mentioned interface may correlate with the Chishan fault. In addition, by carefully analyzing the spatial distribution of b-value from using aftershock sequence of each strong earthquake, we found positive correlation between seismic b-value and coseismic moment release on rupture plane. Our results clearly reveal the spatial distribution of asperities in the CTFZ, which provides new insights on the suggestion of high moment release and slip in future large earthquakes.