

Revisiting spatio-temporal characteristics of tectonic tremors in southern Central Range, Taiwan

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By updating the tremor catalog from 2007 to 2017, we attempt to establish spatio-temporal characteristics of tectonic tremors in Taiwan. During these 11 years, 2013 tremor events with durations ranging from 100 to 3053 seconds were identified and located. The spectral analysis of the tremor occurrence times reveals several sharp peaks that correlate with the annual, semidiurnal, and diurnal constituents, indicating a strong tidal and seasonal modulation, as previously documented. In order to measure the sensitivity to tidal stress, the tidal induced shear and normal stress distribution at the time of tremor are performed, following the method proposed by Yabe et al. (2015). As the tidal sensitivity represented by a constant a ranging from 0 to 1 (higher sensitivity, higher a), we found that the tremors in Taiwan reveal high a around 0.7. Comparing with other areas such as Nankai and Cascadia ($a = 0.41$ and 0.38 , respectively), our result suggest a specific physical environment allowing the strong tidal modulation. With high correlation with temporal distribution of precipitation, groundwater, and air pressure, we found the tremor in Taiwan is not only sensitive to tidal stress change but also hydrological and meteorological change. More than 80% of tremors occurred during the period of lower-than-average precipitation, while similar correlation is also observed in air pressure (63.71%) and groundwater level (63.59%). We also established that 61.11 % earthquake swarms coincide with short-lasting tremor events, indicating the need of establishing fluid flow behavior (as the common mechanism of tremor and swarm activities) in the future.

Keywords: ambient tremor; Southern Central Range; tidal sensitivity; earthquake swarm