

Improvement of tectonic tremor detecting and locating methods: Case study in western Shikoku and central Kyushu

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Recent findings of triggered tectonic tremor in recently discovered regions in Hokkaido (Obara, GRL, 2012), Kyushu, and Kanto (Chao and Obara, AGU Meeting, 2012) provide an ideal dataset with which we can test the clock-advanced model, which predicts the occurrence of triggered tremor in regions where ambient tremor occurs. Obtaining accurate tremor sources in time and space is important because it provides essential information that reveals the mechanism of tremor activity. In this study, we improve upon two existing tremor detecting and locating methods: 1) the WECC (Waveform Envelope Correlation and Clustering) auto-detecting algorithm (Wech and Creager, GRL, 2008), which auto-detects tremor episodes, and 2) the improved conventional envelope cross-correlation technique (Obara, Science, 2002; Chao et al., BSSA, 2013), which accurately pinpoints the locations of short duration tremor sources in space. Using WECC, we detected tremor episodes in western Shikoku and compared the results with existing NIED tremor catalogs (Maeda and Obara, JGR 2009; Obara et al., GRL, 2010). Our preliminary results indicate that during testing period, the WECC was able to successfully auto-detect the same ambient tremor episodes listed in the NIED tremor catalogs. Our next step will be to apply the WECC to the entire dataset to determine whether it can successfully detect all tremor episodes while minimizing noise. Using the modified envelope cross-correlation technique, we plan to conduct a 3D grid search to locate accurate triggered tremor sources in central Kyushu following several teleseismic earthquakes. This modified technique has been used to locate micro-earthquakes ($M \leq 0.5$) in western Shikoku, and a comparison of the hypocenter of these micro-earthquakes with those from the JMA earthquake catalog showed that they were located within 5km of one another. We plan to apply the WECC to search for potential ambient tremor in central Kyushu and present the updated results at an upcoming meeting. The improved tremor detecting and locating techniques, which combine the strengths of various algorithms, will be instrumental in the construction of an accurate tremor catalog in Japan.

Keywords: non-volcanic tremor, tremor locating/detecting methods, central Kyushu, Shikoku tremor zone