

Search for the very-low-frequency earthquakes along the Sunda trench, Indonesia

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Recently, researchers focus on the non-volcanic tremor and very-low-frequency earthquakes (VLF) because these phenomena are considered to play one of the key role for the monitoring state of stress and strain at plate boundaries. VLF was first reported by Ishihara (2002), which occurred below the Kii peninsula. Ito et al. (2007) carried out intensive and systematic survey of VLF and reported the occurrence related to the non-volcanic tremor. Recently, Ando et al. (2009) reported VLF activity around the Ryukyu trench. To investigate the mechanism and activity of such events will improve our capability to monitor the state of plate boundary. To achieve this objective, we need to investigate the activity along the subduction zones all over the world.

We investigated the activity of VLF along the Sunda trench, by using data from the broad-band seismograph network in Indonesia. In recent years, more than 100 broad-band seismometers have been installed in Indonesia, which is a part of the Indonesia tsunami early warning system (InaTEWS). The observed velocity waveforms were integrated in time to obtain displacement, and band-pass filtered between 20 and 50 s. We plotted the waveforms and searched for any sign of VLF signal. We omitted signals which may correspond to earthquakes reported in the USGS PDE or GFZ earthquake catalogues. We applied the waveform inversion method of Nakano et al. (2008) to the signals. This method searches for the source centroid location, focal mechanism, and source-time function. The source-time function may help to identify VLF.

We investigated the seismograms between July and December 2009. The source location was unstable for most of the signals. Accordingly, such signals were considered as those originated from distant events too small to be listed in the catalogues. For some events, the source location was stably obtained off Sumatra or off Java, close to the Sunda trench. The magnitudes were about 4. The estimated source-time functions showed the source durations of these events were of the order of 10 s. The events showed various types of focal mechanisms, which might indicate the solution were unstable. This instability might arise from the small number of waveforms used in the inversions, because of low S/N ratio of the signals. Further careful investigations are needed to justify the signals are from VLF as reported by Ito et al. (2007). However, this study showed the possibility of VLF activity along the Sunda trench.

Keywords: non-volcanic tremor, JISNET, Sumatra, Java