

Detection of shallow very low-frequency earthquake using a grid-based, fixed focal-mechanism method

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Recent observations of shallow very low-frequency earthquake (sVLFE) show the large-scale migration of activity and the simultaneous occurrence with shallow tremor, indicating sVLFE and shallow tremor are induced by background shallow slip event as is the case with the deep slow earthquakes (Asano et al. 2015; Yamashita et al. 2015). Understanding the relationship between the shallow slow earthquakes along the Nankai trough is important in view of occurrence of the future Nankai great earthquake.

In September 2006 a major activity of deep very low-frequency earthquake (dVLFE) and deep tremor occurred in the Bungo Channel and western Shikoku region. This activity is considered to be induced by a small long-term Bungo Channel slow slip event (SSE) because small surface displacements were also observed in GPS records. It is known that large long-term Bungo Channel SSE induces high sVLFE activity in the Hyuganada region (Hirose et al. 2010). Therefore sVLFE activity is expected to be observed also in Sept. 2006.

In this study we applied the grid-based, fixed focal-mechanism method (Suda et al. 2014) to detection of sVLFE in the Hyuganada region. We analyzed the F-net data from 33 stations between August 20 and September 30, 2006. We used only the F-net data because one purpose of this study is to check the feasibility of real-time monitoring of sVLFE using JDXnet data, which include no Hi-net accelerometer data.

We detected over 90 events in the analysis period. The main activity occurred in August 28-31 and only a small number of events occurred in September 7-21 when the activity of dVLFE and deep tremor occurred. This observation is in contrast to that the 2010 sVLFE activity in the Hyuganada region occurred in the acceleration stage of dVLFE and deep tremor activity in the Bungo Channel and western Shikoku region. The present observation suggests that a possible SSE that induced dVLFE and deep tremor in September 2006, if any, was not large enough to induce the high sVLFE activity in the Hyuganada region. The sVLFE activity observed in August might be due to a local shallow SSE.

Keywords: slow earthquake, shallow very low-frequency earthquake, Hyuganada