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2011 年東北沖地震後に発生した熊野灘沖の浅部超低周波地震
Very low frequency earthquakes in the shallow Nankai accretionary prism, following the 2011 Tohoku-Oki earthquake

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A large number of shallow low frequency events were recorded after the 2011 Mw 9.0 Tohoku-oki earthquake by the cabled network of broadband ocean bottom seismometers (DONET) deployed in the eastern part of the Nankai trough. This low frequency event activity was intense for the first few days after the great earthquake and gradually decreased. Signals of the events are most clearly visible at the frequency range around 2-8 Hz. Some of the events are accompanied by a very long frequency (VLF) signal, which is clearly observed at around 0.02-0.05 Hz. The magnitude and source duration estimated by waveform analysis for one of the largest very low frequency earthquakes (VLFEs) was 3.0 ˜3.5 and 17 s. This source duration is extremely long compared to ordinary earthquakes of comparable magnitude. These newly detected VLFEs are likely to be normal fault earthquakes located at shallow depths within the accretionary prism, in contrast to the previously reported VLFEs that were explained by a low angle thrusting along the decollement zone. On the other hand, the low frequency events with no clear VLF signal were previously regarded as being low frequency tremors (LFTs). We show that events with and without the VLF signal likely represent the same phenomenon, and the VLF signal is only observed when a large magnitude event occurs near the station. The waveforms of VLFEs are characterized by the coexistence of long source duration and high-frequency radiation of signals, and such features were previously explained by the co-occurrence of shear failure and hydrofractures under the influence of fluid brought into the decollement zone. Our result indicates that the stress state and the mechanical environment, which promote the occurrence of VLFEs, exist not only along the decollement zone but also in the shallower part of the accretionary prism.

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