Distribution of very low-frequency earthquakes in the Miyako Strait, central Ryukyu Trench

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The distribution of very low frequency earthquakes (VLFEs), which are one type of slow earthquake, illuminates the heterogeneous stress accumulation at the subducting plate interface. VLFEs are known to occur in the Ryukyu Trench (Ando et al., 2012); however, their detailed distribution has not been clarified because there are few broadband seismic stations along the Ryukyu arc. In particular, the detection ability is poor in the Miyako Strait, between Miyako Island and Okinawa Island, where the spacing of seismic stations is 300 km. In this study, we determined the epicenters of the VLFEs in the Miyako Strait using waveform data from temporary stations in the central Ryukyu Islands. We used the F-net stations of the National Research Institute for Earth Science and Disaster Resilience and temporary stations on Okinoerabu Island, Kume Island, Miyako Island, Tarama Island, and Hateruma Island, which were set up by the Association for the Development of Earthquake Prediction. We performed band-pass filtering at a frequency range of 0.05–0.1 Hz for the seismogram using Seismic Analysis Code software. We then determined the epicenters of the VLFEs using the template matching method described by Asano et al. (2015). For the template, we selected the thrust events of regular earthquakes near Ryukyu Trench in the Miyako Strait. We determined the epicenters of VLFEs that occurred between January 2017 and December 2017. The results showed that the epicenters formed one cluster near the Ryukyu Trench. Although the locations were similar to the results of Nakamura and Sunagawa (2015), the VLFE epicenters of each cluster were concentrated in a narrow area. The characteristics of the spot-like distribution of the VLFEs are similar to those observed around Okinawa Island and the Yaeyama Islands. The VLFE cluster in the center of the Miyako Strait was distributed apart from the cluster of regular interplate earthquakes, without overlapping. The location of the VLFE cluster corresponds to a slab depth of 15 km. This suggests that the distribution of VLFEs is similar to that of regular earthquakes. However, VLFE activity was activated in this cluster during the activated period of regular earthquakes (January-March 2017). This suggests that the VLFE activity was triggered by stress changes caused by the regular earthquakes.

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