

Complementary distribution of very low-frequency earthquakes and the interplate-coupled area in the southwestern Ryukyu Trench

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We investigated the distribution of very low-frequency earthquakes (VLFs) in the southwestern Ryukyu Trench and clarified its relationship with interplate-coupled area. In the southwestern Ryukyu Trench, the cluster of VLFs is distributed from the south of the Yaeyama Islands to the east of Taiwan (Nakamura and Sunagawa, 2015). It is important to clarify the positional relationship between the region of slow earthquakes, interplate coupling region, and source regions of past earthquakes and tsunamis in the Ryukyu Trench, to understand the strain accumulation process. The western part (approximately 123°) of the VLF cluster overlaps the interplate coupling zone (Hsu et al., 2012). The source area of the 1771 Yaeyama tsunami is located in the east of the cluster (approximately 125°). However because of the inaccurate determination of the VLF epicenters, it was not previously possible to compare the positional relationships in detail. To clarify the relationship between the VLF distribution and the coupling region in the southwestern Ryukyu Trench, we performed a detailed epicenter determination of the VLFs. We used four stations of the National Research Institute for Earth Science and Disaster Resilience's F-net and seven stations of the Broadband Array in Taiwan for Seismology (BATS) from 2005 to 2013. The seismographs of the vertical component were 0.02–0.05 Hz band-pass filtered, and the waveforms at 2 or 3 neighboring stations were computed by semblance analysis to determine the epicenter. The results showed that the VLFs were distributed between south of Yonaguni Island and south of Miyako Island. The distribution of VLFs between south of Yonaguni Island and Iriomote Island was elongated east-west direction. However, the VLFs in the south of Ishigaki Island and south of Miyako Island formed the isolated clusters. The location of the VLF cluster corresponds to a slab depth of 10–15 km. The distribution of the VLFs were similar to that of the LFEs (Nakamura, 2017). The distribution of VLF did not overlap with the interplate coupling zone near Taiwan. Although moderate-size thrust-type earthquakes occur commonly in the down-dip part of the coupled area near Taiwan, there is no VLF activity in this area. This suggests that the distribution of VLFs is complementary to the cluster of moderate-size interplate earthquakes associated with the coupled zone.