Similar earthquake activity in the northern part of the Ryukyu subduction zone observed by onshore and offshore seismic data

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In the northern part of the Nansei Islands, regular and slow earthquake activities associated with subduction of the Philippine Sea plate have been observed by onshore seismic and geodetic network. By contrast, no earthquakes with magnitude 7 or more have occurred since the 1911 Kikaijima earthquake of magnitude 8.0. In comparison with other subduction zones around Japan, spatial patterns of regular and slow earthquakes and relationship between seismic gaps and past large earthquakes are less well understood in this region. The biggest reason is due to observational constraints; seismic stations are located only at the islands that are linearly arranged along the arc and far away from the Ryukyu Trench. We have conducted annual repeating long-term ocean bottom seismographic observation off the northern part of the Nansei Islands over the past five years. By integrating six ocean bottom seismometers data with station interval of 40-60 km, the accuracy of hypocenters, especially in focal depths, has been improved and geometry of the subducting plate interface is becoming clear. In addition, shallow low-frequency tremors have been also detected which may show a complementary spatial distribution to active seismic regions.
In this study, we investigate similar earthquakes which occur along the plate interface using both onshore and offshore seismic data. In order to obtain small-magnitude offshore earthquakes, we apply a matched-filter technique to continuous waveform data. As a result of the year 2017, we identify three types of similar earthquake families; repeating-type, burst-type, and mixed-type. These similar earthquake families occur at around 20 km depth of the plate interface. This result suggests the similar earthquake activity locates on the down-dip side of the observed tremor activity. In this presentation, we extend the analytical period and discuss the characteristics of the similar earthquake families.

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