

Seismicity in the central Ryukyu Trench by the Ocean Bottom Seismometers

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We investigated the seismicity in the central Ryukyu Trench from the island of Amami to Okinawa between January 2015 and September 2016. Five ocean-bottom seismometers (OBSs) and 20 short-period seismometers of the Japan Meteorological Agency (JMA) were used. We analyzed the events with JMA magnitude over 3.0, which occurred near the trench running from Amami to Okinawa. The P and S arrivals were selected using the WIN system.

Subsequently, we determined the hypocenters. To achieve this, we first revised the 1-D velocity structure model in this region. For the velocity structure in the island arc area, we calculated the 1-D velocity structure with the Joint Hypocenter Determination method using the software VELEST (Kissling et al., 1994). We implemented the original model (JMA2001) first, then we adopted the revised model for the calculation of the travel time to the JMA stations. For the velocity structure beneath the OBSs, we built the velocity model based on a refraction survey performed near Okinawa (Kodaira et al., 1996; Nishizawa et al., 2017). Subsequently, we selected the PS-P time differences at each OBS station and computed the sediment layer correction. Using these values, we adopted the hypocenter determination modifying the software hypomh.

In addition, we investigated the seismicity for the earthquake swarm that occurred near the trench axis from May to June 2016. The swarm began with a M 5.7 earthquake at 12:44 (JST) on May 27th, 2016. We identified the P-S time difference of the earthquakes which were recorded at the NS02 of the OBS station from April 1st to May 27th, 2016.

The relocated hypocenters were shallower compared to those in the JMA catalog by 20-30 km, on average. The change in the depth is larger (approximately 60 km) near the trench axis. The relocated epicenters changed slightly with respect to the JMA epicenters in almost area near the trench. However, the relocated epicenters in the south of Okinawa moved trench-ward compared with the JMA epicenters.

In the P-S time diagram of the period preceding the 2016 earthquake swarm, we identified events with short-duration of P-S times approximately 12 h before the start of the swarm. Although this would constitute a foreshock activity of the swarm, it had not been recorded by the JMA seismic network. This suggests that the earthquake swarm had a precursor activity.

Keywords: Ocean Bottom Seismometer, Ryukyu Trench, Earthquake Swarm