

High-precision hypocenter determinations below the Kumano fore-arc basin based on DONET observations

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Along the Nankai trough, Tonankai and Nankai great earthquakes, which may cause great damages around western Japan, are anticipated to occur in the near future. Kumano fore-arc basin is above the source region of these earthquakes. In this region, various kinds of seismic activities are observed including non-volcanic tremor below the Kii peninsula and very-long-period earthquakes around the Nankai trough. In 2004, the off-Kii Peninsula earthquake (M7.4) occurred in the Philippine Sea plate subducting below the Kumano fore-arc basin. Investigations of seismic activities around this region may contribute to clarify the mechanisms of these earthquakes and tectonic settings along the Nankai trough.

Off the Kii peninsula, Dense Observation Network for Earthquake and Tsunami (DONET) has been developed by Japan Agency for Marine-Earth Science and Technology (JAMSTEC). DONET is a network of ocean-bottom seismic stations, aimed at improving the detection capability and earlier detection of earthquakes and tsunamis in this region. We have already installed 4 DONET stations by October, 2010, and four more stations have been installed in January, 2011. In this study, we determined the hypocenter locations of earthquakes that occurred around Kumano fore-arc basin.

We used data from DONET stations as well as on-line ocean-bottom seismic stations (OBS) installed by the Japan Meteorological Agency (JMA). We assumed a layered velocity structure for the hypocenter determination. The velocity structure is based on the investigation by the Research concerning Interaction between the Tokai, Tonankai and Nankai Earthquakes, a project of JAMSTEC. We picked P and S onsets manually and determined the hypocenter location by using the method of Hirata and Matsuura (1987, hypomh). We did not use data from land stations since the velocity structure is suitable for ocean-bottom seismic stations.

We analyzed data between middle of October 2010 and November 2011. We obtained hypocenters for more than 60 earthquakes which are not listed in the JMA earthquake catalogue. These earthquakes were distributed between the Kumano fore-arc basin and the Nankai trough. This region corresponds to the source region of the 2004 off Kii Peninsula earthquake (Obana et al., 2009). We could not find any significant seismic activity around this region during this period in the JMA catalogue.

The precision of the hypocenter location, especially of the depth, of present study is not enough since we only used data from the stations located close to the land. Adding data from stations located off the coast will improve more the earthquake detection capability and the precision of hypocenter location. Using a 3D velocity structure suitable for this region will also improve the accuracy of the hypocenter location. These improvements will produce an earthquake catalogue which may contribute to the investigations of seismic activity and tectonics around the Kumano fore-arc basin.

Keywords: Nankai trough, Tonankai earthquake, Ocean-bottom seismic observations