Aftershock distribution of the 2005 off Miyagi Earthquake (M7.2) by ocean bottom seismographic data

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Interplate earthquakes (M˜7.5) have occurred along the subduction plate boundary of the Miyagi-Oki region, repeatedly at about 40 years intervals. In 2005, an interplate earthquake (M7.2) occurred in this area, considered to be re-rupturing of one of the asperities of the 1978 earthquake (M7.4) (Okada et al., 2005; Yaginuma et al., 2007). It is important to estimate the progress of stress redistribution and of aseismic slip along the plate boundary around the 2005 rupture area to predict the character of the next Miyagi-Oki earthquake; how the unbroken asperities would rupture, whether the 1981 asperity would also rupture at once.

We deployed pop-up type Ocean Bottom Seismographs (OBSs) in the Miyagi-Oki region from June 2002 repeatedly to monitor the seismic activity. By using these data we have shown the focal distribution of the 2005 mainshock and its aftershocks for 2.5 months after the mainshock occurrence (Hino et al., 2007). In this paper, we will report the aftershock activity after that by adding the data until November 2006. During this period, several large (magnitudes are greater than 6) aftershocks including the largest aftershock (M6.6, Dec. 2, 2005) occurred and the remarkable postseismic slip is observed by the GPS observation (Miura et al., 2007).

The size and location of the aftershock area defined by our epicenter distribution did not remarkably expand. The active seismicity is observed only the northeast of the asperity of the 1981 earthquake, where two large earthquakes (M6.3) occurred 24 and 31 Aug. 2005, except for the vicinity of the rupture area of the mainshock with large coseismic slip was estimated (Yaginuma et al., 2007). Aftershock activity is generally low to the east of the focal area of the 2005 earthquake, but we see a north-south trending zone of moderate seismicity along the western margin of the rupture zones of the 1981 Miyagi-Oki and the 2003 Fukushima-Oki earthquakes. The location of the seismic zone seems to match to the eastern limit of the postseismic slip distribution of the 2005 earthquake.

Among the aftershock along this region, there are many earthquakes having the focal mechanisms different from that of the mainshock (thrust fault type) as in the eastern edge of the rupture area of the 2005 mainshock. Therefore, we think that the distribution of the earthquakes having focal mechanisms dissimilar to the mainshock, probably occurred within the plates, may be indicative of spatial extent of the coseismic slip of the mainshock and that of the postseismic slip.