Seismic monitoring in the northern source region of the 2011 Tohoku-oki earthquake by using long-term OBSs

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The 2011 off the Pacific coast of Tohoku earthquake occurred at the plate boundary between the Pacific plate and the landward plate on March 11, 2011, and many aftershocks followed the mainshock. To obtain a precise aftershock distribution is important for understanding of mechanism of the earthquake generation. In order to study the aftershock activity of this event, extensive seafloor aftershock observation using more than 100 ocean bottom seismometers (OBSs) was carried out just after the mainshock to September 2011. The OBS network covered the whole source region of the mainshock with average interval of 25 km. Events whose epicenter is located below the OBS network from the JMA earthquake catalog were selected, and P and S-wave arrival times were picked from the OBS data. Hypocenters were estimated by a maximum-likelihood estimation technique with one dimensional velocity structures. Thickness of sedimentary layer, which changes below each OBS was evaluated and the estimated travel times by the location program were adjusted. As a result of the urgent OBS observation, a precise aftershock distribution for approximately three months was obtained (Shinohara et al., 2011, 2012). Comparing hypocenter distribution to velocity structures by marine seismic surveys, there is few aftershocks along the plate boundary in the region off Miyagi, where a large slip during the mainshock is estimated. Activity of aftershocks within the landward plate above the source region is high and many aftershocks within the landward plate have normal fault type or strike-slip type mechanism. Within the subducting oceanic plate, most of earthquakes also have normal fault type or strike-slip type mechanism. After the urgent aftershock observation using OBSs, the observation using long-term OBSs was continued to monitor seismic activities in the source area. Forty long-term OBSs (LT-OBSs) in the whole source region were deployed in September 2011 and have completed recovery of the LT-OBSs until November, 2012. The 1 year data from September 2011 were processed using the same procedure as the urgent aftershock observation. Although a number of aftershock decreases with a time, there is no large spatial change of seismic activity in the northern source region. Seismic activity in a landward plate was high for the whole observation period, and focal mechanism was similar to that just after the mainshock. Before the mainshock, deep earthquakes under a landward slope were seen. However we obtain little seismic activity in such deep region after the mainshock.We deployed 30 LT-OBSs in the northern source region (off-Iwate region) in October 2013 to investigate spatiotemporal variation of the seismic activity. The LT-OBS has 3 component 1Hz velocity-type seismometers with a recording period of typical 1 year. The OBSs were successfully recovered in September or October 2014. We process the data from the 2013-2014 observation using the same procedure as before. We will report precise seismic activities in the northern source region with spatial and temporal variation. From preliminary analysis, a seismic activity in the off-Iwate region from 2013 to 2014 may be changed from the activity just after the mainshock.This study was supported by the Ministry

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