

## Relationship between the distribution of Normal-fault earthquakes within the oceanic crust and the horst-graben structure

# Yoshihiro Ito[1]; Keiji Kasahara[2]; Tetsuya Takeda[1]; Kazushige Obara[1]

[1] NIED; [2] N.I.E.D.

The occurrence of tsunamigenic earthquakes seaward of the Japan trench is rare. The mechanism of earthquakes occurring seaward of the trench has not been discussed in detail because their focal areas are usually distant from the landward seismic network. On the other hand, the well-developed horst-graben structures existing on the seaward slope are revealed by echo sounding and seismic profiles. In order to estimate the seismic potential of the occurrence of an earthquake seaward of the trench, it is important to know the relation between the distribution of the earthquake and the horst-graben structure.

Seismic swarm activities near the triple junction, which is located in the southeast off the Boso peninsula, Japan, were observed in two periods of January-March and July-September, 2005. More than 50 earthquakes with seismic magnitudes exceeding 4 occurred across 6 days between July 26 and 31, and 7 earthquakes with magnitudes exceeding 5 also occurred in same period.

In this paper, we first developed a new method to investigate the hypocenter and focal mechanism of earthquakes occurring far from the landward seismic network. Next, we apply the method to the swarm activities occurring near the triple junction in the southeast off the Boso peninsula. Finally, we discuss the relation between the seismicity and the horst-graben structure.

In this new method, we determined a hypocenter and focal mechanism by using both the observed waveform and travel times of P and S waves; this method is henceforth referred to as the hybrid method. First, we estimated the focal depth and focal mechanism at an initial epicenter by the moment tensor inversion method using waveforms observed at the NIED F-net broadband and Hi-net tiltmeter networks. Next, fixing the focal depth estimated by the moment tensor inversion method, we determined the epicenter by using the travel times obtained by the least square method. With regard to the hybrid method, we repeatedly used the moment tensor inversion method and the least square method.

The hypocenters calculated by the hybrid method were distributed seaward of the Izu-Ogasawara Trench at depths of 6-8 km. Their focal mechanisms indicate normal faulting. The swarm activity in 2005 resulted from two spatially different clusters of activities in the periods of January-March and July-September. These clusters form a northwest-striking zone in each focal area. Comparing the distribution of normal faulting earthquakes with the seafloor topography, we found that a majority of the earthquakes occurred beneath the seaward slope that bended downdip toward the trench, or that they were distributed beneath the well-developed horst-graben structure zone. This suggests that the seismic potential of normal-faulting earthquakes may be related to the bend of a seaward slope and the distribution of the horst-graben structure.