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Investigation of plate converging variation off Boso region from multi-channel seismic reflection data

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Off Boso is southeastern offshore region subducting the Philippine Sea and the Pacific Plates respectively at the Sagami Trough and the Japan Trench, beneath the North-American Plate including the Boso Peninsula. Associated with the plate convergences, many earthquakes occurred off Boso region. Great and large earthquakes as the 1703 Genroku and the 1923 Taisho earthquakes occurred by the convergence at the Sagami Trough. The 1677 Enpo and the 1953 Boso earthquakes are thought to be occurred along the Japan Trench generating tsunamis (Hatori, 1975). On the other hand, slow-slip events were observed in every 5-7 year from the east of Boso Peninsula to off Boso region. The slow-slip events off Boso region occurred in the same depth with those of large earthquakes as the 1923 Taisho event. Seismicity off Boso region has changed after the 2011 off the Pacific coast of Tohoku Earthquake: the latest slow-slip event was observed in four-year interval which is shorter than usual. To understand the various seismic activities off Boso region, it is important to image the plate converging variation.

Japan Agency for Marine-Earth Science and Technology has conducted multi-channel seismic reflection survey for imaging the plate converging variation off Boso region. The acquired data was used to select the drill sites for an IODP proposal 'Kanto Asperity Project'. Seismic lines were NE-SW and NW-SE directions, and the latter lines are almost same with the migration of the Philippine Sea Plate. From the seismic data of the former direction, sediments and basements are recognized before subduction of the Sagami Trough. Depth of the basement is about 2-km below sea floor at the southern end of the line. The sediments and basements are observed below thick (~3 km) sediments at the Sagami Trough and below the land plate. In the land plate, there are large amplitude events seemed to be spray faults branching from the top of the Philippine Sea Plate, which are connected to the Boso Escarpment. Around the Boso Escarpment, surface structure was disturbed thought to be caused by deformation of plate convergence. In the northeast of the spray faults, surface sediments (500-700 m) overlie on rugged basements. Drill sites for slow-slip observatory are selected below the basement of which P-wave velocity is about 2 km/s. The top of the Philippine Sea Plate is recognized to the NE end of the seismic line. Amplitude of the reflection is large around the 12-km depth below sea level, which is coincident with the slow-slip region. From the NW-SE profiles, the top of the Philippine Sea Plate is also large amplitude in the slow-slip region, whereas those of the southeast of the slow-slip region are small amplitude. From the observation, the distribution of large amplitude reflection of top of the Philippine Sea Plate is correlated with the slow-slip area. Landward dipping events are observed in the shallow part of the land plate thought to be caused by deformation. However those events are not recognized in the vicinity of the Japan Trench. In this presentation, we will show variations and characteristics of the sediments, basements and plate boundary, and discuss the various seismic activities off Boso region.

Keywords: MCS, Off Boso, earthquake, Philippine Sea Plate, Slow slip