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Shallow subbottom structures of the eastern Sagami Bay obtained by seismic reflection surveys

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The Sagami Trough marks the boundary between two plates: the Philippine Sea Plate and the North American Plate. Highly oblique convergence of the Philippine Sea Plate causes very complicated geological history in this area (Ogawa, 2007). An accretionary prism is distributed in the adjacent Miura and the southern Boso peninsulas. Large-scale earthquakes have been occurred repeatedly in this area. Topography in this area is likely to be affected by the faulting because a tsunami hazard is reported accompanied by the Kanto Earthquake (Ikeda, 1925). Periodic occurrence of previous earthquakes suggests recurrence of large-scale earthquakes. The estimated seismogenic zone is adjacent to the Kanto metropolitan area. Thus, recurrence of earthquake would cause the catastrophic damage to the metropolitan area. However, detailed distributions of faults are not clear because there are only a few studies on subcrustal structure. Clarifying distribution of faults is important to estimate the damage of the earthquake and the magnitude of the tsunami. Kimura (1973) suggested the distribution of the Sagami Tectonic Line along southwestern rim of the Okinoyama Bank Chain. The Research group for Active faults of Japan (1980) suggested that the Sagami Tectonic Line connects to the Kozu-Matsuda fault on land. The objective of this study is to elucidate the distribution of shallow subcrustal structures such as fault and fold structures, using bathymetric map, sidescan sonar images and seismic reflection profiles.

In this study, I used the bathymetric map, IZANAGI backscattering image, and seismic reflection profiles. IZANAGI sidescan sonar imagery was obtained in this area by ORI, Univ. of Tokyo in 19 95. Single-channel seismic (SCS) reflection survey and multi-channel seismic (MCS) reflection survey were conducted in the area during the KY05-06 and KY06-01 cruises using R/V KAIYO of JAMSTEC in 2005 and 2006.

These surveys provided very clear subcrustal information down to 1 second in two-way travel time in this area. Faults distributed in this area are identified from seismic profiles and bathymetric map. Series of faults were identified along the southwestern rim of the Okinoyama Bank Chain. These faults separate the Sagami Though from the eastern Sagami Bay area, and correspond to the Sagami Tectonic Line named by Kimura (1973). These faults are thought to be reverse faults with dextral strike-slip component because vertical displacement and flower structures are identified. Tilting reflectors in the northeastern side of the Miura and Misaki Knolls suggest uplift of the Okinoyama Bank Chain due to vertical motion by these faults. Small anticlinal structures are found at the southwestern slope of the Sagami and Miura Knolls, which is likely to be formed by displacement of the Sagami Tectonic Line. There is a possibility that the offscraping has occurred in the slope areas of Sagami and Miura Knolls. In the southeastern side of the Miura and Okinoyama Knolls, reverse faults and anticlinal structures are identified. These structures also have a possibility of offscraping. Reverse faults in the trough fill sediment resemble the piggyback system. It is inferred that the stepwise forward-migration of faults is observed in the Sagami Trough, and these faults can be regarded as frontal thrusts. It is possible that the Sagami Tectonic Line is not a single fault plane but a fault zone with a considerable width.

Keywords: Sagami Bay,, Active fault, Collision zone, Accretionary Prism, Seismic reflection survey