STRUCTURE OF THE PHILIPPINE SEA PLATE AND SEISMIC ACTIVITY

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An onshore seismic survey was conducted along the Shingu-Maizuru line from the Pacific side to the Japan Sea side across the Kinki district under the Special Project on String Motion Estimation in Urban Areas. For the survey, 13 shots and 3 multi-sweeps of vibrators were used as sources of seismic waves along the line of about 200km. The waves were well-recorded at more than 2200 sites. The records have much denser station intervals so far for such kind of surveys, in Japan. From the data, subsurface structures have been well-constrained by refraction and wide-angle reflection methods. In particular, the oceanic Moho as well as the plate boundary of the subducting Philippine Sea plate (PSP) have been successfully determined under the Kii peninsula. It is for the first time that the internal plate structures ware revealed from onshore surveys.

Furthermore, thePhilippine Sea plate is found to extend beneath the northern Kinki district, where no mantle earthquakes occur. The shape of the PHP is not simple and the local strike or dip of plate varies to significant degree. Therefore, the discrepancies of the reflector on the profile are possibly the reflection of the complex figure, as the deep extension shows the plate subducting from east to west at a shallow angle. The reflectors are also detectable in the profiles, such as the Fujihashi-Kamigori line in 1989 and the Keihoku-Seidan line in 1995 conducted by the Research Group for Explosion Seismology. The same kind of reflector is found in the source area of the 2000 Western Tottori earthquake at depth of 45-60km.The depths of the reflectors are so shallow to directly extend from the Pacific side, that more surveys are needed for the detailed 3D structure of PHP. The double reflectors of PHP, showing the plate boundary and the oceanic Moho, is seen in the area of active seismicity of mantle earthquakes and seems to the lower one meet the upper one at the northern end of the seismicity. This shows the oceanic crust of the PHP only exists in the area of earthquake activity.

The mantle earthquakes occur under the oceanic Moho in the Kinki district, so the plate boundary is shallower than that determined from earthquake distribution by about 7-10km.This is also revealed in the Kanto area. However in Shikoku, mantle earthquakes are reported to occur in the oceanic crust, on the basis of the existence of channel waves propagated through the oceanic low velocity crust. In western Shikoku, earthquakes were reported to happen in the oceanic crust from tomography and receiver function studies. As the evidence is reliable, since the errors of depths both focal depths and discontinuity are not so large, the earthquake occurrences are not controlled by the plate structure but other factors, such as temperature, water contents of the regime and strain rate. Among them temperature seems to have priority. This is quite similar to the earthquakes in the upper crust.

The complicated figure of PHP has been obtained from earthquake distributions and from receiver function and seismic tomography. The change of PHP affects the focal mechanisms of strike-slip or normal fault types of mantle earthquakes. Normal fault-type events seem to occur at the tear of the plate and the P an T axes seem to be perpendicular and parallel to those of the local shape of PHP.