Geometry of the seismic Philippine Sea slab and 3D velocity structure beneath eastern Taiwan-southwestern Ryukyu regions

Mamoru Nakamura (1), Cheng-Horng Lin (2), Yih-Min Wu (3), and Masataka Ando (4)

(1) Univ. Ryukyus, (2) Academia Sinica, (3) National Taiwan University, (4) Nagoya Univ.

E-mail: mnaka@sci.u-ryukyu.ac.jp

We estimated geometry of the subducting Philippine Sea slab and imaged the 3D seismic velocity anomaly in the junction area between northeast Taiwan and Ryukyu arc area. For relocation of the hypocenters, we adopted the double-difference (DD) method (Waldhauser and Ellsworth, 2000). This method used not only absolute travel times but also travel time differences nearby events at each station. We used arrival time data catalogued by central weather Bureau (CWB) in Taiwan and Japan meteorological agency (JMA) in Japan. In total, 71 stations were used. The average one-dimensional (1-D) model of the northeast Taiwan area (Rau and Wu, 1995) was used as the initial 1-D starting model in our inversion. We relocated 8070 events that occurred in the period January 1, 1996 to May 31, 2005. Depths of the selected events are at range of 0 to 200 km. Next we computed the three-dimensional seismic velocity tomography. The “simulps12” (Evans, 1994) was applied to inverse the Vp, Vs, and Vp/Vs structures. The 3-D velocity model including the high velocity slab was used as the initial model in our inversion. We used 8070 events. A total of 190,204 P wave and 140,148 S wave arrival times recorded by 71 stations were selected in this study.

The relocated hypocenters represent a steeper dipping slab at the west of 123ºE (70º) than at the east (50º). The Philippine Sea slab is bent (or torn) along north-south direction at the 122.5ºE and 123.0ºE. The depth of hypocenter at the 122.5-123.0ºE is 10-20 km deeper than the surrounding. The slab bending would be caused by the collision of Philippine Sea plate to Taiwan.

The low-velocity anomaly area is distributed along the plate interface in the depth range of 90 to 120 km. It is distributed away from the slab interface at the 122.1ºE and 24.8ºN in the depth range of 60-75 km. The deformation of the slab would affect the local convection at the mantle wedge.