Geometry of the upper surface of the Philippine Sea slab beneath southwest Japan (preliminaries)

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We propose a preliminary model for the geometry of the upper surface of the seismic slab of the Philippine Sea plate (PHS) subducted beneath southwest Japan based on hypocentral distribution of slab earthquakes.

We used JMA's integrated hypocenter data published on its FTP site. We selected well-determined hypocenters for the period from Oct. 1997 to Sept. 2001. Firstly, we made depth slice hypocenter distribution maps for every 5km depth and drew a first-trial isodepth contour of the upper surface of the PHS slab for each depth at the edge of the hypocenter distribution. Here, we assume that the upper boundary of slab hypocenter distribution roughly coincide the slab upper surface. Then, in many areas we made vertical sections of hypocenter distribution in the direction of inferred dip-direction of the slab, and revised isodepth contours. Our target area is mainly from the western Tokai district to western Shikoku district.

Our main results are as follows: (1) In the region of the east to Biwa Lake gently-dipping shallow PHS slab reaches around the depth of 35 km, being subducted from southeast direction. Its northeastern part continues to the slab beneath the central Tokai district, but its southwestern part may be separated from the slab beneath the eastern Kii Peninsula. (2) There is a remarkable slab earthquake distribution beneath the middle part of the Kii Peninsula, which looks like double seismic zones. We interpret this feature as the slab here is torn into two parts, with the southwestern part being underlying beneath the northeastern part. There remains another possibility that this feature is an indication of actual double seismic zone including crustal and mantle earthquakes within undistorted slab. (3) In the west part of the Kii Peninsula no slab earthquake is occurring deeper than 45 km, whereas just above this area remarkable shallow crustal swarm earthquakes around Wakayama exits. (4) Beneath Shikoku the slab is being subducted with gentle dip angle and forms a broad ridge. The slab looks continuous from Shikoku to Kyushu at least in the depth range shallower than 45 km, although the seismicity is low beneath the west part of Shikoku.

The problem where slab earthquakes are actually occurring, within the oceanic crust or slab mantle, in each region is very important because it is directly related to the identification of slab upper surface based on slab earthquake hypocenter distributions. In the next step we should examine slab upper surface by means of reflected or converted seismic waves, perform absolute/relative relocation of slab earthquakes accurately, check later phases carefully in order to solve this important problem.