

Source depth and mechanism of the low-frequency tremor along the subduction zone of the Philippine Sea plate

Akio Katsumata[1], Noriko Kamaya[2]

[1] Meteorological College, JMA, [2] JMA

Continuous low-frequency tremors are observed in the region where the Philippine Sea plate reaches depths of 30-40 km (Nishide, 2000; Katsumata and Kamaya, 2001; Obara, 2001). The Japan Meteorological Agency estimates their locations routinely from onset times of waveforms with an ordinary hypocenter determination method. The estimated focal depths range from 20 to 40 km, which covers depths of the lower crust and the uppermost mantle. The resolution of the depth estimation is not considered good enough. In this study, we revise the source depths of the low-frequency tremors and discuss the source mechanism.

The magnitude of the low-frequency tremor is no more than about 1.0. The small amplitude and the continuous vibration of the tremor does not fit the ordinary hypocenter determination. But, onsets of P waves are identified at several stations in some cases, which help the estimation of the source depth. A method for array stations were also used to estimate the source depth of the tremor. The estimated depths ranged from 25 to 30 km. The estimated depth range of 25-30 km is shallower than the depth of the Moho discontinuity in the area of the low-frequency tremor activity.

Katsumata and Kamaya (2001) argued that the low-frequency tremor were related to water which was produced by dehydration of serpentine in the mantle wedge. Since the active region of the low-frequency tremor correspond to the 30-40 km iso-depth belt of the Philippine Sea plate, the substance related to the activity should come from the mantle wedge. It is inferred that the water produced in the mantle wedge goes up into the crust, and caused the tremor. The depth of 25-30 km might be related to the properties of the water at the depths.