

Twisting of the Deeper Part of Eastward-subducting South China Sea Lithosphere and its implications on Incipient Taiwan Orogeny: A Sismological Study

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Abstract

From literature, it is known that the Taiwan island, situated at the northeastern corner of the Philippine Sea plate, propagates southwestward as a tectonic solitary wave. The incipient Taiwan orogeny is thus of interest because the offshore area of southern Taiwan will uplifted to be the main part of the Taiwan island. In this paper, hypocentral distribution and focal mechanisms of earthquakes in the Taiwan-Luzon region are examined to understand the relationship of the incipient Taiwan orogeny with the status of the eastward subduction of the South China Sea lithosphere beneath the Philippine Sea plate. In this region, the hypocentral distribution is simple to show a clear Watadi-Benioff zone below 80 km in depth, while it is too complicated above this depth to clearly identify this seismic zone.

The deeper part of the Watadi-Benioff zone can only be observed between 80 km and 220 km in depth and between 19.5N and 23N in latitude, where the Manila subduction zone trends northwest-southeast. The Watadi-Benioff zone indicates that this part of the subduction slab has been twisted downward with greater dip angle toward north. The Watadi-Benioff zone currently exists only beneath the Luzon arc which becomes narrower toward north, thus the twisting of the subducting slab causes the narrowing of the Luzon arc and formation of the Huatung basin as the subsided Luzon arc as well. The narrowing of the Luzon arc is accompanied by the growing of the Hengchun accretionary prism behind it to maintain the width of the whole Manila subduction zone almost the same. It is therefore inferred that the downward twisting of the subducting slab results in redistribution of material behind the slab to produce upward stress. This upward stress uplifts the Hengchun accretionary prism to become the main part of the Taiwan island.

Key word:

Seismological study, Watadi-Benioff zone, Subducting slab, Hengchun accretionary prism, Luzon are, Incipient Taiwan orogeny