

Lithospheric structures at the convergent margins in the Japanese island arc: Recent results of integrated seismic explorations

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Recent results of integrated seismic explorations have revealed the lithospheric structures at the convergent margins in the Japanese island arc, as follows.

1. Southwest Japan

(1) The Outer zone is characterized by the seaward verging structure of the accretionary complexes in the upper crust. The lower crust has not been developed because of poor volcanic activities.

(2) The Inner zone is characterized by the horizontal nappe structure in the upper crust. The lower crust has been well developed with the thick olivine cumulus in its lowermost part. The crust of the Inner zone has been matured much more than that of the Outer zone.

(3) The Median Tectonic Line (MTL) cuts the whole crust dipping at about 40 degrees. The upper crust of the hanging wall of the MTL is characterized by the chaotic texture of spotted reflective parts in its reflection profile. The lower crust near the lower termination of the MTL is thinner than the surroundings, because the Moho exhibits an upward convex in shape.

2. Arc-arc collision zones

(1) Hidaka collision zone

The Kuril arc is delaminated at the middle zone of the lower crust. The upper part of the delaminated Kuril arc thrusts over the Northeast Japan arc. The lower part descends down and is eroded by the Pacific plate beneath the Hidaka collision zone. The Hidaka collision zone is a factory of continental crust.

(2) Izu-Tanzawa collision zone

The Izu-Bonin arc has been intruding into the huge chasm formed by the South Fossa Magna. Buoyant volcanic island blocks were delaminated from the Philippine Sea Plate, an oceanic plate, and have filled the chasm successively. The Izu-Tanzawa collision zone provides one of the accretionary processes.

3. Answer to the debate between the strike-slip tectonics and the nappe tectonics

The MTL has been activated repeatedly as both dip- and strike-slips in motion along its fault plane dipping at 40 degrees northward. This provides the following answer to the debate between the strike-slip tectonics (Taira et al., 1981) and the nappe tectonics (Isozaki and Maruyama, 1991). The answer is that both tectonics has been coexistent in the structural evolution of the Japanese island arc.