XIII. GEOLOGICAL DEVELOPMENT IN THE JUNCTION OF THE SEINAN (SW) JAPAN AND RYUKYU ARCS —PRELIMINARY CONCLUDING REMARKS—

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The surveyed area is located in the junction of the Seinan (SW) Japan and Ryukyu Arcs. Many problems for the development of the arcs are remained as disolved in and around the junctions of the arcs. Some of them were noted as a triple junction of Trench-Trench Transform fault. However, most of the arc junctions are suggested to be the interseption of the continuous extension of arc systems as is discontinuous chains for the development of the systems, only slightly changed their distributional direction following with the direction of the plate motion. Some of them are intercalated by barrier of ridge or rise in the front of the arc, as is suggesting the cause for the separation of the arc systems.

The Kyushu-Palau ridge is intercalated on the front of the junction of the Ryukyu and Seinan Japan Arcs. The ridge is the boundary between the younger Shikoku Plate and older Philippine Plate. However, it is difficult to ascertain the cause for the arc separation in the Kyushu-Plau Ridge.

Western Offshore of the Kyushu Island

The Danjo Basin, a northern margin of the Okinawa Trough, is consisted of a Neogene and Quaternary sedimentary trap derived from both the Kyushu Island and Tsunghai Shelf. Pre-Tertiary basements make relative short ranged ridges whereon the Neogene and Quaternary sediments are folded and faulted in the Kyushu side, and wide ranged blocks of the sedimentary rocks and basements are suggested in the Tsunghai Shelf side, except along the outer margin of the Shelf where the uplifted volcanic and sedimentary basements are distributed with rather shortly ranged blocks overlain by the Pleistocene layers. Danjo Basin and its vicinity have been structurally active during Neogene and Quaternary. Generally, structural trends with NE–SW and NEE–SWW are dominant in the Danjo Basin and in the shallower part of the Kyushu side which are also postulated by KATSURA and NAGANO (1976) and SAKURAI and NAGANO (1976). Some of those structural trends are parallel to that in the northern Ryukyu Arc.

Tsushima Straits

Almost whole of the area are consisted of the continental shelf in the Straits. Goto Canyon runs with NW–SE direction in the southwest from the Goto Islands and is terminated in the northern end of the Danjo Basin. Northern extension of the Canyon is deviated in several channels toward NNE, N and NNW. Those channels are originated in the structural boundaries of the block movement and are developed by subaerial

erosion during late Pleistocene.

Tertiary and Quaternary sediments are widely distributed in the Straits. Folded layers of the Goto Group in upper Miocene and of the Taishu Group in upper Oligocene to lower Miocene are the constituents of the Cenozoic basements in the Straits. The former is dominantly distributed in and around the Goto Islands and the later is dominantly distributed in and around the Tsushima Islands. The Pliocene and Pleistocene sediments are horizontally distributed in almost whole of the Straits.

Regional block movements to make the boundaries along the today's channels have occurred during Miocene in the Straits and its adjacent area and then, it has been structurally rather quite during Pliocene and Pleistocene in the Straits.

San-in Shelf, Tsushima Basin and Korean Continental Borderland

A few of the block structures in the Tsushima Straits are extended to the western San-in Shelf.

The Neogene layers with structural trend of NEE–SWW horizontally overlain by the Pleistocene sediments are widely distributed in the San-in Shelf.

The Neogene and Quaternary sediments are horizontally distributed in the Tsushima Basin. A hyatus between the Neogene and the Quaternary sediments on the Shelf is not observed and both layer are continuously accumulated in the Tsushima Basin, neverthless, some deformation of the layers occurs on the foot of the slope caused by slumped structure of overberden pressure which is suggested in both the seismic reflection profiles and cored material.

The fact may suggest a regional subsidence in the Basin and structurally active movement in the Shelf during Neogene and seace of their activities since Quaternary, in contrast in the Danjo Basin off the western Kyushu where structurally strong movements have been taken the place during Neogene and Quaternary.

The Korea Continental Borderland (Korea Rise) of which southern margin is bordered by the Tsushima Basin is consisted of two blocks of the southern and northern ones and is extended toward NEE from the coast of the Korea Peninsula. The Borderland is consisted of the acoustic basement overlain by a few units of the layers which also are observed in the Japan Basin. A dreged hole of the basement was resulted amounts of granite with gneissocity, which suggests the cotinuation of the older rocks in the Korea Peninsula.

Discussion

The Ryukyu Arc is suggested to begin its activity since early Miocene, which is followed by the subduction of the Philippine Plate along the trench, volcanism, deepening of the basins along the inner side of the older ridge accompanied by the opening of the Okinawa Trough (KONISHI and SUDO, 1975; HONZA, 1976). The Seinan Japan Arc has been also active since early Miocene which is suggested in the volcanism along the inner side of the Arc, neverthless, the subducted slub is not so deep as to reach under the volcanic front (FITCH and SHOLTZ, 1971) and no marginal opening is suggested along the inner side of the Arc. The Tsushima Basin is an older one which has not been followed by opening since Pleistocene, at least. However, some regional subsidence might have taken

the place during Neogene and Quaternary. The Tsushima Shelf has been under the tectonism of block movement during Neogene where no opening feature is noted. Refraction results show a little different constituents of the basements in both sides along the western depression of the Tsushima Island (LUDWIG *et al.*, 1975). It suggests that the tectonic boundary between the older Seinan Japan Arc and the Korea Continent is along the western depression of the Tsushima Islands with NNE–SWW direction and is turn to NEE–SWW along the northern margin of the Tsushima Basin.

Different tectonism is suggested in the Tsushima Basin as compared with in the Okinawa Trough. It is difficult to correlate the structural resemblance in the Okinawa Trough to that in the Tsushima Basin. The uplifted zone along the outer margin of the Tsunghai Shelf is terminated in the Danjo Islands. Therefore, it is better to use the ward "Taiwan-Danjo uplifted zone" instead of the ward "Taiwan-Shinji folded zone" proposed by NIINO and EMERY (1961), and WAGEMAN and others (1970).

Volcanic front in both the Seinan Japan and Ryukyu Arc is located in a little different zone (Fig. XIII–1). Tectonism in both Arcs during the older stage before the today's one is discussed as is well correlated (KONISHI, 1965). If the both Arcs were connected and were extended as in the same arc system, the difference of the tectonism in the last stage is caused by the difference of subduction condition under the arcs. One possibility is that the different material has subducted under the arcs, they are, the Philippine Plate and the Shikoku Plate of which the reason is based on the east ward sift of the Izu-Ogasawara Arc accompanied by the creation of the Shikoku Basin in back side (KARIG, 1975). The other possibility is that the difference is caused by the different directions of the subduction slub relatively toward the arcs. The reason is based on the west ward

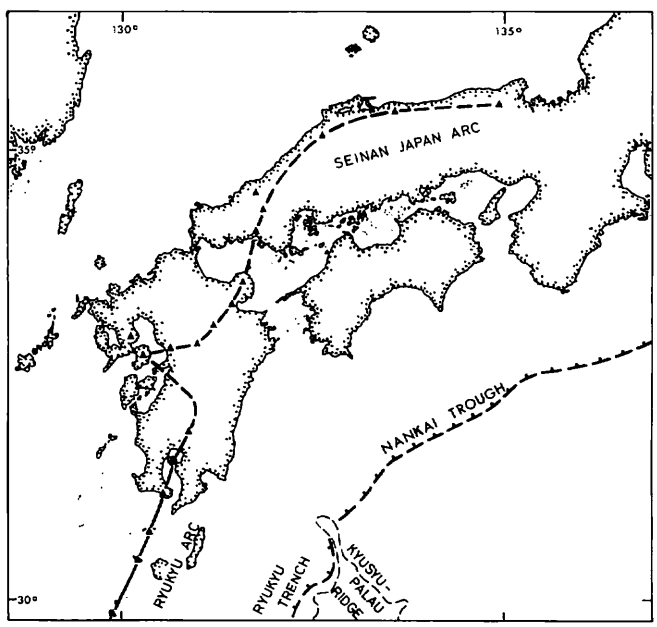

Fig. XIII–1 Volcanic front in the northern margin of the Ryukyu Arc and in the Seinan Japan Arc.

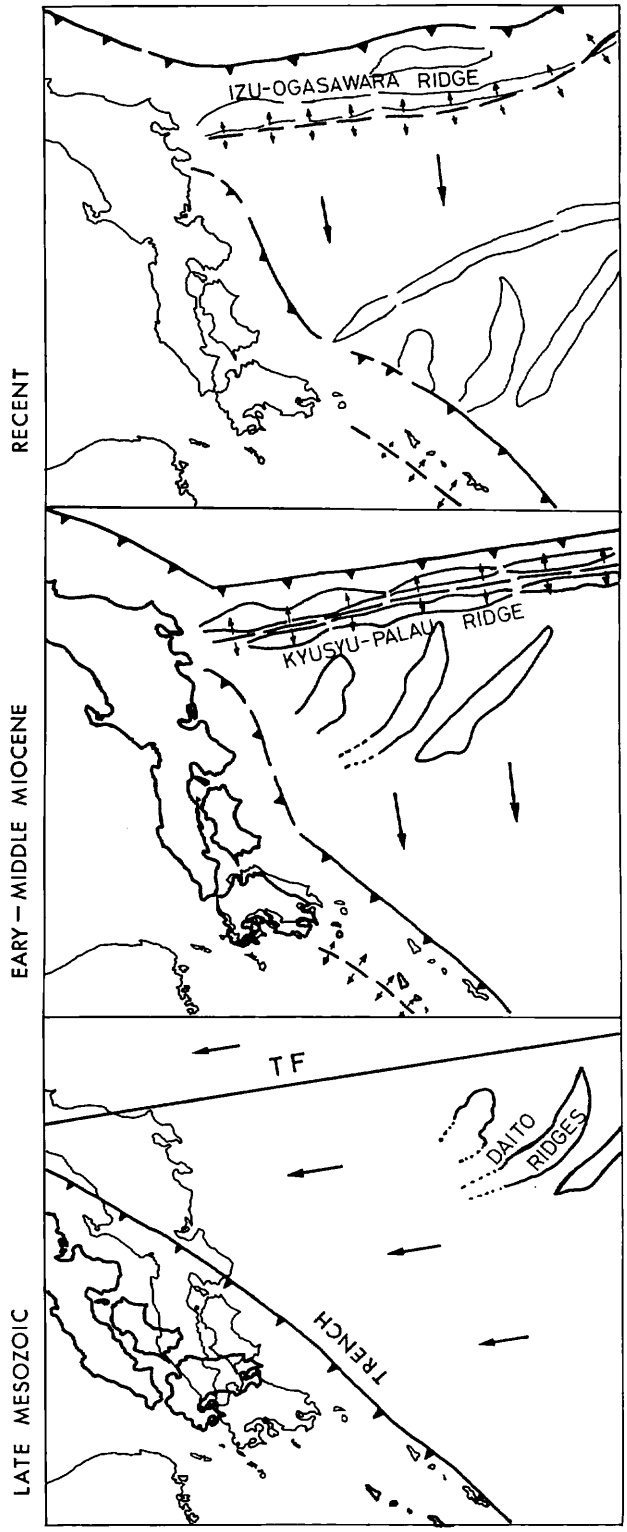

Fig. XIII-2 Plate revolution around the Shikoku Basin.

spread of the Shikoku Plate accompanied by the Philippine Plate to the east, but obliquely under the Seinan Japan Arc (Fig. XIII–2). Anyway, there is a possibility of the different subducting condition under the both arcs.

References Cited

FITCH, T. J. and SCHOLZ, C. H. (1971) Mechanism of underthrusting in southwest Japan: A model of convergent plate interactions. *Jour. Geophys. Res.*, vol. 76, p. 7260–7292.

HONZA, E, ed. (1976) Ryukyu Island (Nansei-Shoto) Arc, GH 75–1 and GH75–5 cruises. *Cruise Report*, no. 6, Geol. Surv. Japan, 81p.

KARIG, D. E. and MOORE, G. F. (1975) Tectonic complexities in the Bonin Arc System. *Tectonophysics*, vol. 27, p. 97–118.

KATSURA, T. and NAGANO, M. (1976) Geomorphology and tectonic movement of the sea floor, northwest off Kyushu, Japan. *Jour. Oceonogr. Soc. Japan*, vol. 32, p. 139–150.

KONISHI, K. (1965) Geotectonic framework of the Ryukyu Islands (Nansei-Shoto). *Jour. Geol. Soc. Japan*, vol. 71, p. 437–457.

KONISHI, K. and SUDO, K. (1972) From Ryukyu to Taiwan. *Kagaku*, vol. 42, p. 221–230.

LUDWIG, W. J., MURAUCHI, S. and HOUTZ, R. E. (1975) Sediments and structure of the Japan Sea. *Geol. Soc. Amer. Bull.*, vol. 86, p. 651–664.

NIINO, H. and EMERY, K. O. (1961) Sediments of shallow portions of the East China Sea and South China Sea. *Geol. Soc. Amer. Bull.*, vol. 72, p. 731–762.

SAKURAI, M. and NAGANO, M. (1976) Submarine topography and geological structure West of Kyushu, Japan. *Jour. Geograph. Soc. Japan*, vol. 85, p. 329–341.

WAGEMAN, J. M., HILDE, T. W. C. and EMERY, K. O. (1970) Structure framework of East China Sea and Yellow Sea. *Amer. Asso. Petl. Geol.*, vol. 54, p. 1611–1643.