

Tectonics of the Toyama Trough, a boundary between two major deformation zones in the Japan Sea

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The Northeast Japan Arc is characterized by wide cover of Neogene marine sediments and fold and thrust belts, whereas the Southwest Japan Arc is underlain by pre-Neogene basements and cut by strike-slip faults. The two arcs are clearly bounded by the Itoigawa-Shizuoka Tectonic Line. The continental slopes along the Japan Sea also show similar contrast of geologic structure between the Northeast and Southwest Japan Arc, though the boundary is not clear. The Toyama Trough is probably the boundary between the arcs. This report aims at reviewing the geologic structure in and around the Toyama Trough and discussing the tectonic significance of the trough.

The Toyama Trough is a topographic low trending N-S between Sado Island and Noto peninsula, and continues toward SW into Toyama Bay in the southern part of the trough. The dimensions of the trough are 30-40 km in width, 200 km in length and 1000-2000 m in depth. The trough floor is underlain by 2000-5000 m thick sediments and the depth of the acoustic basement is as deep as that of the Yamato Basin. The crustal thickness is estimated to be about 15 km, significantly thinner than that of the continental slope of Northeast Japan. They strongly suggest that the trough is a highly extended rift basin.

The northern part of Noto peninsula is composed mainly of Oligocene to Early Miocene volcanics, and faulting and folding are limited in some areas. In the northern offshore of the peninsula, a wide plateau extends for more than 60 km from the northern coast of the peninsula, and is inferred to be composed mainly of similar volcanics. In this area, two inverted rift basins in the ENE-WSW direction were formed. One of them developed along the northern coast of the peninsula and the other forms a gentle ridge including Hegura-jima Island. They consist of folded Neogene marine sediments above a thrust system grown mainly in late Miocene.

The southern part of the Noto peninsula is underlain by Neogene marine sediments. E-W trending late Miocene faults and folds have been superimposed by NE-SW trending Quaternary faults and folds. The Korosa Fault and the Hodatsu-san Uplift are distinct E-W trending structures, and the Ochi depression and Sekido-Hodatsu mountain are young NE-SW trending structure. A sedimentary basin, called the Hakui-oki basin extends western offshore of the southern part of Noto Peninsula. Neogene marine sequences in the basin form E-W trending anticlines, and one of them is the western extension of the Hodatsu uplift, indicating that the offshore E-W anticlines grew in late Miocene. Quaternary folds and thrusts in the basin trend in the NE-SW to NNE-SSW direction.

The E-W trending folds and faults can be regarded as an eastern extension of the Shinji fold zone, because they grown mainly in late Miocene by N-S compression. The folds zone discontinuously extends east from Shimane Peninsula along the northern offshore of the Tottori to Fukui area. The folds in the Noto Peninsula are probably the eastern margin of the fold zone, because no E-W trending anticline in late Miocene has not reported in the northeastern Japan Arc.

In contrast to the Noto Peninsula, NE-SW trending folds and faults have been growing in the eastern margin of the Japan Sea to the east of the Toyama Trough. The prominent structures disappear in the Toyama Trough. The trough is inferred to continue in the Toyama plain, and several active faults trending in NE-SW have developed along the western margin of the plain and a few active faults are known to the west near Kanazawa. These faults can be correlated to those in the eastern margin of the Japan Sea, but the dimensions of the structures are fairly smaller than those to the east.

These structural characteristics in and around Toyama Trough suggest that the trough has been hardly deformed and an obstacle to propagate the fold zones from west or east.