# Toyama Trough Shear Zone of Japan Sea and active tectonics along Japan margin of Amur Plate

*Akira Takeuchi[1]

1. Faculty of Science, University of Toyama

In Japan, crustal earthquakes continue to occur along strain-concentrating zones on the Japan Sea side and inland Honshu since the 1995 Hyogo-ken-Nanbu earthquake. In addition, following the occurrence of the 2011 off the Pacific coast of Tohoku Earthquake, trench-type interplate earthquakes and intraplate crustal earthquakes in the inner belt of the island arc have been discussed widely. Moreover, marine resource development based on the national Basic Plan on Ocean Policy, crustal structure survey integrating land and sea areas, earthquake / geodetic observation, etc. were carried out densely and data accumulated.

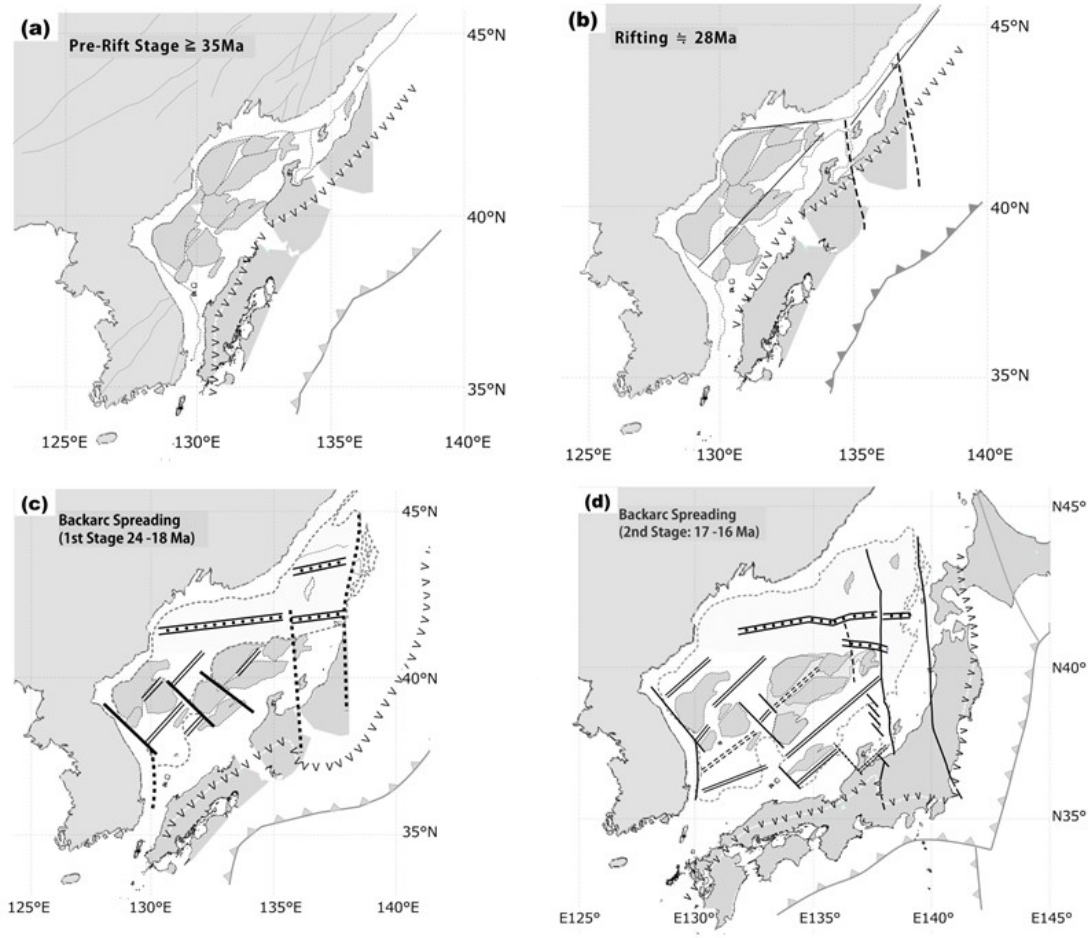
This paper re-analyzed and elucidated the geologic structure and its development along the eastern margin of Japan Sea, including the southeastern Japan Basin, the eastern Yamato Basin and Toyama Trough, based mainly on the recent data sets of seismic investigations for resource-exploring and earthquake disaster prevention. The obtained results corroborate a two-stage model of the back-arc spreading with large shear zone in a north-south trend along the eastern border of Japan Basin and Yamato Basin.

The new findings were as follows:
1) Regional geologic structure, including not only the present-day active faults but also the suspended Miocene faults, in the reactivated Honshu arc and its back-arc basin became clear.
2) The N-S striking system, one of three fault systems observed in the present Toyama Trough, was traced not only southerly along the Itoigawa-Shizuoka tectonic line, but also northerly up to the eastern termination of Yamato Basin.
3) During the time of a clockwise rotation at around 17 Ma in southwestern Japan, the 2nd stage of back-arc spreading occurred in and around Yamato Basin. The Toyama Trough shear zone was widespread with being accompanied by NW-SE trending left-lateral strike-slip faulting.
4) A shift to a convergent mode was revolutionary as neotectonics in Central Japan from a divergent mode in the Japan Sea. Such a conversion was different in style and occurring time: E-W trending folds occurred in the Late Miocene at Noto Peninsula on the Southwest Japan arc side, probably under the effect of subduction of Philippine Sea Plate. The NE-SW trending fault/fold structure characterizing the southern Toyama Trough and the Shin-Etsu sedimentary basin on the Northeast Japan arc side is further delayed to become conspicuous after 4Ma, probably due to commencement of eastward motion of Amur Plate.
5) Based on the aspect of relative movement along the plate boundary between Amur and Okhotsk, the diversity of fault distribution of the target area is regarded as a combination of the "colliding side" and the "passive side" among the domain of island arc-arc collision along the Toyama Trough shear zone. On the collided side, "Normal inversion" excels dominantly throughout the inner zone of Northeast Japan arc including the eastern margin of the Japan Sea Basin. While on the colliding side, "conversion-in-sense-of-faulting" occurs in the inland of the Southwest Japan arc associated with the reactivated late-Cretaceous faults, and "anti-inversion" is seen in the back-arc basin. In the Yamato Trough, re-activity of the Miocene normal faults involved in the sea floor spreading is not recognized.
6) The Present strain concentration belt in Honshu, the Niigata-Kobe tectonic zone, is observed extended over along the Japan Sea side on the Northeast Japan arc through an inland area of the Southwest Japan

arc, intersecting with the Itoigawa-Shizuoka tectonic line. Its manifestation in the late Quaternary time could be called as "revival Honshu arc" as a behavior of collision and coalesce of the two island arcs, Northeast and Southwest Japan arcs, concerning the interaction of the subducting Pacific Plate with the hanging two plates.

Keywords: Japan Sea, neotectonics, Toyama Trough, tectonic inversion, Amur Plate




A tectonic scenario explaining a progressive opening of Japan Sea and rotation of Southwest Japan