

# How to solve controversies in Cenozoic tectonics in western Pacific margin

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Tectonics and their geodynamic backgrounds are difficult theme and keep controversial. Cenozoic tectonics in the western Pacific margin are of them. 1) Oceanic ridge subduction, 2) Back-arc spreading, 3) interaction between the Philippine Sea Plate and SW Japan, 4) collision and bending of the Japanese islands, 5) onset of present tectonic and dynamic frameworks, and 6) dynamic background of the earthquakes and volcanic eruption are key events but controversial.

To solve these controversies, a classic geological philosophy of “uniformitarianism” is significant. It means “the present is the key to the past” .

1. To solve the controversy of the Izanagi-Pacific Ridge subduction in early Cenozoic, a comparative study with modern examples of the ridge subduction at the Chile triple junction, Woodlark Basin and Middle America trench with a new data set and simulation is a key.
2. To solve the back arc spreading controversy of Kuril and Japan Basins and Okinawa Trough, the promotion of International collaboration to acquire a new data set is necessary together with a comparative study among the modern backarc spreading. A classic controversy of double door opening vs pull-apart spreading will be progressed by comparison with progressed modern examples. A large scale perspective beyond the back-arc basins themselves is also necessary for geodynamic solution for the back-arc spreading.
3. To solve the controversy of the interaction between the Philippine Sea Plate and SW Japan; switch from the Pacific plate to Philippine Sea Plate at ~15Ma vs ~12Ma- 6Ma, detailed tomographic study with new perspectives and data sets from on-and geology and geophysics is necessary with simulation.
4. To solve the controversy of the collision and bending of the Japanese islands, not only the geological data set but more comprehensive data set of geophysics and geochemistry with simulation are necessary. Differentiation between the hypothesis and fact promotes a constructive controversy. In geology, data reliability and re-productability is the most significance part of science.
5. To solve the controversy of onset of present tectonic and dynamic frameworks is the most essential part of “uniformitarianism” . The definition of “present” depends on the scientific field even in geoscience, Seismological “present” is a moment to minutes, days and month scale, That of geodesy is ~10s to 100 years. Geomorphology combined with geology is 100s to 10<sup>4</sup> scale. That of most geology is beyond 10<sup>4</sup> scale. Establishment of seamless “uniformitarianism” with seamless space perspective is a key to understand this controversy.
6. To solve dynamic background of the earthquakes and volcanic eruption, I like to emphasize the viewpoint of evolving effect of hysteresis. A final trigger of earthquakes and volcanic eruption is no doubt of physical consequence resulted from long and short term hysteresis.

Keywords: western Pacific, ridge subduction, back-arc spreading, collision, subduction, Japanese islands