

The Sea of Japan as a trompe l'oeil: a brief review of the debate of the opening tectonics of the Sea of Japan

MASHIMA, Hidehisa^{1*}

¹Center for Obsidan and Lithic Studies, Meiji University

The opening tectonics of the Sea of Japan is a classic geological issue of Japanese geology. There are two extreme models proposed for this issue, the double-door opening (DDO) model and the pull-apart model, respectively. The pull-apart model could logically explain geological features of the Sea of Japan, such as structural features of the Tsushima basin and the Tsushima-Goto Fault, even paleomagnetic declinations if strike-slip components of earthquake vibration caused by strong mechanical coupling between the oceanic plates and Japan arcs are taken into account. Nevertheless, the DDO model was predominantly adopted by Japanese geologists to use as a basic assumption to explain Cenozoic Japanese tectonics, even magmatism and seismicity.

The present DDO model was proposed based on paleomagnetic declinations in SW Japan (e.g. Otofujii & Matsuda, 1983, 1984). Geological test of the model, however, is insufficient. For example, the DDO model advocates regard that the Pre-Cambrian Hida Zone in SW Japan is the northeastern extension of the Okchon Belt in Korea. Ichikawa (1972), however, had pointed out that it is the northern maximum of the reconstruction to regard the Oki (Hida) zone as an extension of the the Yeongnam Massif at the south of the Okchon Belt, since there is no Pre-Cambrian zone at the south of the Hida Zone. Ichikawa (1972) also mentioned that Matsumoto (1967) had implied that the Okchon Belt would not constitute to Japan. The DDO model advocates, however, did not pay any attention to these suggestions.

In fact, geological relationship between north Kyushu and SE Korea indicates that SW Japan did not significantly rotate with respect to fixed Korea. Faults oriented to NNE-SSW strike both in the Sangun granites in north Kyushu and in the Bulguksa granite in SE Korea (e.g. Inoue, 1982), which indicating that north Kyushu did not meaningfully rotate with respect to SE Korea. Pre-Cretaceous strata show arrangement oriented to E-W both in north Kyushu and in western Chugoku district (Matsumoto, 1951), which indicate that north Kyushu did not rotate against Honshu. Thus, SW Japan did not significantly rotate with respect to fixed Korea.

In spite of its geological incompleteness, why did Japanese geologists so predominantly adopt the DDO model? In fact, the present DDO model is a revival of the model originally proposed by Koto (1906) based on a rhomboidal shape of the Sea of Japan. Koto (1906) related bending of Honshu with the crotch of the Korean Peninsula and proposed southeastward migration of Japanese Arcs. Terada (1927) inherited this hypothesis in the context of the continental drift. Kobayashi (1941) also did. The model perpetuated as a paradigm by Japanese geologists, then was embroidered with paleomagnetic data in 1980's. There is theory-ladenness, when researchers consider the opening tectonic of the Sea of Japan, since Koto is the authority at the earlier stage of Japanese geological community.

Matsumoto (1949) pointed out that geologists tend to give weight to geologic phenomena observed their living place. In other word, geologists tend to depreciate geologic phenomena at unfamiliar places. This would be applicable to the adaptation of the DDO model. In the current plume debate, plume skeptics pointed of theory-ladenness and disparagement of geology for plume advocates (e.g Anderson and Natland, 2005). The debate of the opening tectonics of the Sea of Japan, therefore, can be regard as a typical geological controversy.

Keywords: the Sea of Japan, opening tectonics, theory-ladenness, paradigm