The enigmatic tectonics of the Jurassic Pacific plate

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We present the tectonic history of the Pacific plate in Jurassic by magnetic anomaly lineations and seafloor spreading fabric. The Pacific Plate is the largest oceanic plate. It was born as a microplate around a ridge-ridge-ridge triple junction in Early Jurassic within the super ocean, Panthalassa Ocean (Nakanishi et al., 1992). The oldest portion of the Pacific plate is situated in the Pigafetta Basin, northwestern Pacific Ocean. The size of the Pacific plate around 190 Ma was nearly half that of the present Easter microplate in the East Pacific Rise. The oldest igneous rocks were collected at the Ocean Drilling Program Hole 801B in the Pigafetta Basin southeast lineation M29 (159 Ma). The radiometric age of the rocks is about167 Ma (Koppers et al, 2003) and consistent with the reconstruction model proposed by Nakanishi et al. (1992). The birth of the Pacific plate started at a point as a triple junction. This is an unusual tectonic event because most of the modern plates were formed by breakup of a preexisting plate by rifting as a continental rifting. Boschman and van Hinsbergen (2016) proposed that the birth of the Pacific plate to the plate reorganization due to the regional termination of intra-Panthalassa subduction. The detailed tectonics of the Jurassic Pacific plate is, however, still unknown because of insufficient multibeam data and geomagnetic data.

The Hydrographic and Oceanographic Department of the Japan Coast Guard conducted the dense bathymetric and geomagnetic survey around the Marcus Island for the Extended Continental Shelf Survey (e.g., Fujisawa, 2009). We compiled the data to reveal seafloor spreading fabric and to identify magnetic anomaly lineations. Additional data were obtained from the databases of National Oceanic and Atmospheric Administration/National Centers for Environmental Information (NOAA/NCEI) and Japan Agency for Marine-Earth Science and Technology (JAMSTEC). We also used unpublished data obtained by Ocean Research Institute, the University of Tokyo (ORI, UT). The study of the geomagnetic data is presented by Kakurai et al. (this session). In this presentation, we show the tectonic history of the Jurassic Pacific plate using our bathymetric and magnetic studies.

We found several curved abyssal hills and magnetic bights. The strikes of curved abyssal hills are consistent with those of magnetic anomaly lineations, implying the curved abyssal hills represents the configuration of the Pacific-Izanagi-Farallon triple junction. Our study concluded that the configuration of the Pacific-Izanagi-Farallon triple junction before the M29 was a ridge-ridge-ridge. Our study also revealed the discontinuous of the trajectory of the Pacific-Izanagi-Farallon triple, although previous studies assumed the continuity of the trajectory to build the tectonic history of the Pacific plate.

Keywords: Pacific Plate, magnetic anomaly lineations, bathymetry

