

Fault Distribution and Structural Characteristic in the Nankai Trough Area, Japan

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As part of “The Comprehensive Evaluation of Offshore Fault Information Project” by the Ministry of Education, Culture, Sports, Science and Technology, JAMSTEC has conducted collecting marine seismic reflection/refraction data, bathymetric data, well data acquired within the Japan EEZ and surrounding areas, and assembling a database to serve data for future scientific research.

Data includes 1) seismic reflection/refraction data acquired by JAMSTEC, AIST(Japan Geological Survey), and Japan Coastal Guard for purposes of geological investigation and research, and 2) seismic reflection data acquired for purposes of oil and gas exploration by Ministry of Economy, Trade and Industry and Japanese oil companies.

Since 2D multichannel seismic reflection were acquired and processed according to survey standards of the early era to the recent, the original data were re-processed by applying the state-of-the-art data processing methods to obtain unified high-quality seismic profile which capable of interpreting subsurface structures and fault morphology. Within the Nankai Trough and the Izu-Ogasawara area more than 180,000 km of 2D single/multichannel data and 4,800 km² of 3D multichannel data was collected to set for geological interpretation.

To identify a fault which caused earthquakes in geological history, a seismic profile must show not only geomorphological feature but also subsurface displacement or flexure in sedimentary layers and bed rocks. In order to determine the fault surface and morphology, the same structure must exist on other successive profiles, and bathymetric data also helps to trace lineament caused by fault activities. The Nankai Trough is a part of plate boundaries where the Philippine Sea Plate subducts beneath the overlying the Eurasian Plate, and seismic reflection/refraction studied have been conducted to reveal the structure of the plate boundary and to understand the mechanics of seismic hazards. This project allows to use widely acquired data from scientific purposes to economic purposes in the Nankai Trough area, and as a result, the preliminary fault distribution on the area has been mapped. Offshore of Hamamatsu, Shizuoka Pref., seismic reflection profile shows compressive structures of the two known fault zones, the Enshu fault system and the Kodaiba fault system, which extends to offshore of Shima, Mie pref. Seismic reflection profiles which cross the trough shows that the beneath the forearc basin deposits and the old accretional prism a seismic reflector that dips landward lies just above the oceanic crust. This reflector is known as the spray fault (e.g. Park et al., 2002) and can be traced in other profile, with length of more than 50km. Off the Shikoku island to Hyuganada, seismic reflection data show very complex structures such as subsiding of a seamounts and ridges or mud domes which form along faults.

Keywords: Nankai Trough, offshore fault, seismic reflection survey