

Fault Distribution and Structural Characteristic in the northern Nansei-Shoto Islands, Japan

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The Nansei-Shoto Islands, located along the Ryukyu Trench which extends over 1,200 km from Kyushu, Japan to the Taiwan collision zone, had experienced less seismic history in comparison to the other subduction zone such as the Nankai Trough and the Japan Trench.

Over the past few hundred years, there were a dozen of M7+ class earthquakes had occurred within this subduction zone, and the most of them caused minor damages except the 1771 Great Yaeyama Tsunami and the 1911 Kikai Island Earthquake, the largest historic earthquake observed along the Nansei-Shoto subduction zone. Due to a large percentage of the population of an island lives in coastal region, earthquake generated tsunami is the most life threatening factor. Through decades, various studies had been done identifying offshore faults which could possibly cause an earthquake and tsunami.

In this project, as a part of “the Comprehensive evaluation of offshore fault information project” by the Ministry of Education, Culture, Sports, Science and Technology, JAMSTEC has carried out collecting seismic reflection data from various institutes and private companies combined with reflection/refraction data from JAMSTEC seismic projects. Also in order to obtain unifying high resolution seismic profile out of seismic data from different survey ages and various survey specifications, the original data were reprocessed by state-of-the-art data processing methods which capable of interpreting subsurface structures and fault morphology.

The forearc structure of the northern Nansei-Shoto subduction zone is very different to the southern subduction zone. In the southern subduction zone, the Philippine Sea plate subducts beneath the steep slope continental shelf with minimum volume of accretionary prism, while in the northern subduction zone, the extensive accretionary prism has been developed in front of the continental shelf. The factor of the difference is likely the amount of sediment supply from the incoming oceanic plate. Also the incoming oceanic plate shows a complicated morphology of ridges, sea mounts such as Amami Plateau and Kikai Sea Mount, and its high relief feature probably cause the complex faulting in the accretionary prism (Kasahara and Sato, 1997).

At the margin of the northern Okinawa Trough, there are numbers of normal faults develop in the thick continental shelf sediments, which exhibits the Trough increases its depth gradually without distinctive edges seen in the southern Okinawa Trough. Faults identified in the northern Okinawa Trough are classified into two types; normal faults resulted from the present trough's growing tectonics, and at the southwestern offshore of Kyushu where NW-SE extensional tectonics fields dominates, lateral transforming faults are identified which presumably continuous from Kyushu region.

Keywords: offshore fault, seismic reflection survey, Ryukyu Trench, Okinawa Trough