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Active Faults along the Japan Trench and Large Earthquakes

Takashi Nakata^{1*}, Hideaki Goto¹, Mitsuhsa Watanabe², Yasuhiro Suzuki³, Azusa Nishizawa⁴, Noriaki Izumi⁴, Koji Ito⁴

¹Hiroshima University, ²Toyo University, ³Nagoya University, ⁴Japan Coast Guard

It is very much regretful that we could not start our project on submarine active faults along the Japan trench before the devastating 311 Earthquake. Fundamental information for prediction of large earthquakes such as the detailed distribution of active faults was not well known mainly due to lack of data regarding submarine topography. To make a more precise submarine active fault map along the trench, we have made detailed submarine topographic images based on 0.002 degree (about 200m) DEM processed from the original data obtained by Japan Coast Guard.

Then we have made stereo-pair copies of topographic images for interpretation of active faults, similar in manner to how we use air-photo stereo sets for inland active fault interpretation.

Active fault distribution along and around the Japan trench is rather simple compared with that of the Nankai trough or/and the southwestern part of the Kuril trench. As mapped by a previous work (Research Group for Active Faults of Japan, 2001), there are trench-parallel north-dipping thrusts. One of the extensive thrusts extends from off-Sanriku to off-Ibaraki for over 500km, and is probably related to the source fault of the 311 Earthquake. source fault for Meiji Sanriku earthquake may be related to a 200km-long active fault along the trench off Sanriku.

Numerous normal faults are depicted on the outer-rise slope and they are generally short, and may cause M7 class earthquakes. The 1933 Sanriku earthquake is believed as one of the outer-rise earthquakes, but around the presumed source area we do not find any long normal fault that matches to a M8 class earthquake. One of the aftershocks of the 311 Earthquake probably took place along a long NNE-SSW normal fault on the outer rise off Fukushima. Normal faults densely distributed on the uplifted zone by extensive thrusting along the west of the trench, may suggest the site of asperity on the thrust.

Keywords: Japan trench, submarine fault, active fault, large earthquake