# Inferred probabilities of the type of 1933 Sanriku Earthquake

# Yo Iwabuchi[1]

[1] JHD

1. Introduction

It is well known that 1933 Sanriku earthquake is caused by normal fault on the oceanic plate. This type of earthquakes occurred a few times in the world during 20th century. Thus, this type is regarded as very rare. However, the frequency is not studied except for one attempt by Chapple and Forsyth (1979). I infer the probability of the earthquakes from detailed topography of horsts and grabens.

2. Premise

Probability of the earthquakes is inferred on the premise as follows.

(1) Plate motion is almost continuous during since one million years.
(2) Oceanic plate is homogeneous around the Japan trench.
(3) 1933 Sanriku earthquake is standard size at the ocean ward slope of the Japan trench.
(4) Fault scarps on the ocean ward was formed at earthquakes, no creep motion.
(5) Topography on the ocean floor is not eroded.

3. Topographic features

Horsts and grabens are prominent on the ocean ward slope of the Japan trench. These are formed according to the bendings of the Pacific plates. Faults are parallel to the trench axis, and are distributed to 80 to 100 km east of the trench. The relative height of the fault scarpments becomes larger to westward. It suggests that the scarpments of the fault have been developing.

4. Origin of topographic features

Strain of the oceanic plate is increasing with plate bendings. If the oceanic plate is homogeneous and the bending rate of the plate is continuos during the last one million years, faults are formed at the 80 to 100 km east of the trench. The faults are developing according to the plate motion. Tension of the upper surface of the oceanic plate is exposed as vertical and horizontal components of the faults. Horsts and grabens on the ocean ward slope of the trench are accumulation of fault movements.

5. Inference of activities of the faults

If the fault movement of the 1933 Sanriku Earthquake appeared on the ocean floor, the scarps are grown to 3.3 to 7.4 m at the time. It is difficult to know that the scarpments within 80 to 100 km to the east of trench, are formed by one fault plain or several fault plains. However, I suppose that all the faults within 80 to 100 km move at the same. One topographic profile shows that the accumulations of west-down components are about 2850 m, besides, east-down components are about 750 m. If slip angle of the fault is 45 degree, the probability of the type of 1933 Sanriku earthquake is inferred as 1000 to 3500 years. It is the same or slightly high than the estimation by Chapple and Forsyth (1973).