Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SSS38-P05 Room:Convention Hall Time:May 24 15:30-17:00

Relations of rupture area of great Kurile earthquakes estimated by tsunami waveform analysis

IOKI, Kei[1*], TANIOKA, Yuichiro[1]

[1]ISV, Hokkaido University

The Pacific plate subducts about 8cm per year under the Kurile Islands, so many great earthquakes occurred in the Kurile subduction zone. On 13 October 1963, great Kurile earthquake (Mw 8.5, Mt 8.4) occurred off the Etorofu Island. This event was an underthrsut earthquake. The epicenter of the 1963 earthquake is located at 44.8N, 149.5E, depth = 60 km. Also the largest aftershock (Ms 7.2, Mt 7.9) occurred on 20 October 1963. This aftershock generated an unusually large tsunami relative to the size of the seismic waves. The epicenter of the 1963 aftershock is located at 44.7N, 150.7E, depth = 10 km. The 2006 Kurile earthquake occurred northeast of the 1963 Kurile earthquake. The epicenter of the 2006 earthquake is located at 46.6N, 153.2E, depth = 30 km. To examine whether seismic gap exist between 1963 and 2006 earthquakes and to understand source processes of the 1963 main shock and the largest aftershock, slip distributions of the 1963 great earthquake and the largest aftershock were estimated using tsunami waveforms recorded at tide gauges along Pacific Ocean and Okhotsk Sea coast. In the case of the main shock, the total seismic moment was estimated to be 2.4∗10∗∗21 Nm (Mw 8.2). The 2006 earthquake occurred just next to the 1963 earthquake and no seismic gap exists between source areas of the 1963 and 2006 earthquakes. In the case of the largest aftershock, large slip amounts were found at the shallow plate interface near the trench. This largest aftershock was a tsunami earthquake. The seismic moment was estimated to be 1.0∗10∗∗21 Nm (Mw 7.9). On 6 November 1958, the great Etorofu earthquake (Mw 8.3) occurred southwest of the 1963 Kurile earthquake. The epicenter of the 1958 earthquake is located at 44.4N, 148.6E, depth = 80 km. The 1958 great earthquake was defined as a slab event. In this study, dip, depth, slip amount of the earthquake were estimated by tsunami waveforms analysis. Strike and rake of the fault model were fixed. We found that a slab earthquake model of dip = 40 degree, depth = 37.5 km best fit observed and computed tsunami waveforms. The seismic moment estimated by tsunami waveform inversion was 1.7∗10∗∗21 Nm (Mw 8.1). About the 1969 Hokkaido-Toho-Oki earthquake, the earthquake (Mw 8.2) occurred southwest of the 1963 earthquake. The epicenter of the 1969 earthquake is located at 43.2N, 147.5E, depth = 33 km. The 1969 event was an interplate earthquake with the same type event as the 1963 event, but the 1958 event was a slab earthquake. Slip distribution of the 1969 earthquake was estimated from tsunami waveform inversion to investigate relations of locations of the 1969 and 1963 and 1973 earthquake. 1973 Nemuro-Oki earthquake is underthrust earthquake and the epicenter of the earthquake is located at 43.0N, 146.0E, depth = 40 km. The seismic moment of the 1969 earthquake was estimated to be 1.1∗10∗∗21 Nm (Mw 8.0). The 1963 earthquake and 1973 earthquake occurred northeast and southwest of the 1969 earthquake and no seismic gap exists between source areas of these earthquakes.

Keywords: tsunami, great earthquake, Kurile trench