Rupture area of the 1958 Etorofu earthquake occurred in Kurile subduction zone estimated from tsunami waveforms

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The great Etorofu earthquake (Mw 8.3) occurred in Kurile-Kamchatka subduction zone on 6 November 1958. A location of the epicenter of the 1958 great earthquake is 44.38?N, 148.58?E, depth = 80 km. This earthquake was originally defined as an interplate earthquake although the depth was slightly deep. However, the earthquake was characterized by a high stress drop, a low aftershock activity at shallow depth, large high-frequency seismic waves, a large felt area, and a relatively small aftershock area. Therefore, the 1958 great earthquake was recently defined as a slab event. The 1963 great Kurile earthquake (Mw 8.5) occurred on the east of the 1958 earthquake. The 1969 great Kurile earthquake (Mw 8.2) and 1994 great Kurile earthquake (Mw 8.3) occurred on west of the 1958 earthquake. The 1963 and 1969 events were interplate earthquakes, but the 1994 event was a slab earthquake. The 1958 earthquake generated a tsunami which propagated through the Pacific Ocean. Maximum height of the observed tsunami was 4-5 m in Shikotan Island. In this paper, parameters (dip, depth, slip amount) of the 1958 great earthquake were estimated using tsunami waveforms recorded at 13 tide gauge stations along the Pacific Ocean. Strike and Rake of the fault model were fixed to be 225 and 90 degrees, respectively. A rupture area previously estimated from aftershocks within 3 days, 150 km$*$80 km, was used at first. The tsunami was numerically computed using interplate and slab earthquake model changing dip and depth. Parameters of the interplate earthquake model are dip = 20 degree, depth = 16 km. Parameters of slab earthquake models are dip = from 20 to 60 degree every 10 degree, depth = from 27.5 km to 47.5 km every 10 km. We found that a slab earthquake model of dip = 40 degree, depth = 37.5 km best fit observed and computed tsunami waveforms. Next, tsunami waveforms were calculated using various source models which have different rupture area at the same other parameters. However, the computed tsunami waveforms from the original rupture area, 150 km$*$80 km, best explained the observed tsunami waveforms. The seismic moment was calculated to be 1.5$*$10$**$21 Nm (Mw 8.1) assuming that the rigidity is 6.5$*$10$**$10 N/m$**$2.

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