Source process of the 2001 Peru earthquake inferred from teleseismic body waves

Hajime Nagano[1], Hiroshi Takenaka[2], # Yushiro Fujii[3]

[1] Earth and Planetary Sci.,Kyushu Univ, [2] Dept. Earth & Planet. Sci., Kyushu Univ., [3] Dept. Earth & Planet. Sci., Fac. Sci., Kyushu Univ.

On 23 June 2001, a large earthquake (Ms 7.9) occurred near coast of Peru. The source parameters determined by Tokyo University are as follows: epicenter=16.15 S, 73.40 W; depth = 30 km; the fault length = 200 km; the fault width = 100 km ;(strike, dip, slip) = (309, 21, 61). This earthquake is considered as a plate boundary type earthquake.

We performed a waveform inversion using teleseismic body wave data. The observed waveforms used for the inversion are broadband data collected by IRIS. Fixing the focal mechanism, we divided fault plane into 11 grids along the fault strike and 6 grids along the dip. The area of each subfault is 20 km x 20 km, in which 100 point sources are arranged. Layered structure is assumed to calculate Green's function for each point of the fault plane. We used Velocity Model Peru 85 (VMP85; Norabuena, 1992) as a near source structure. Model parameters are the slip-rate functions at the individual point source. We obtained the parameters by least-squares method under three smoothing constraints (temporal, spatial, nonnegative constraints) so that theoretical waveforms fit observed waveforms well. The inversions were performed for some cases in which the initial rupture point was located at the depth of 10 km, 20 km and 30 km, fixing the rupture velocity to 2.5 km/s. In all cases, the major asperity was located at about 200 km southeast from the initial rupture point. The derived source parameters are summarized as follows: the seismic moment = 3.8x10**21 Nm; the source duration = 105 s; the maximum slip = 8.6 m.