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# Source process of the 1997 Northwestern Kagoshima earthquakes inferred from teleseismic body waves

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The 1997 Northwestern Kagoshima earthquakes are rare cases among inland large earthquakes, which the second mainshock (Mj6.3) occurred about one month and a half later after the first mainshock (Mj6.5). The second mainshock has almost the same magnitude as the first mainshock and is estimated to be a multiple shock which ruptured the E-W fault and the conjugate fault (N-S). Waveforms of the two mainshock are recorded not only at teleseismic stations but also at near source as strong motion data. We are able to elucidate the details of source process by analyzing those data.

We collected waveform data from IRIS, which are recorded at stations of the epicentral distances from 30 to 90 degrees. We selected the data which have high signal-to-noise ratio and in which P phase are detected clearly. Using these teleseismic body waves data, we performed a least-square waveform inversion to estimate the amount of slip, slip direction and slip velocity function at each subfault on the fault of fixed focal mechanism. In the inversion procedure, constraints we applied are as follows: 1) smoothness of the spatial slip distributions at adjoining subfaults; 2) smoothness of the source time functions at each subfault; 3) variation of rake angle is +-45 degrees from initial rake. We carried out eight-case inversions for the first mainshock with combinations of following three items: 1) constraints exist or not; 2) rupture velocity is fixed to 2.5 km/s or vary from 2.0 to 3.0 km/s; 3) used data are only P waves or P waves and SH waves. The slip distribution patterns are almost similar among all cases and elliptical stretching to east and west. The maximum slip is about 0.8 m and major asperity is located around the initial rupture point. Whereas the agreement between observed and synthetic seismograms are unvarying among all cases, large slip patterns tend to extend to western part in the cases of using SH waves. Comparing with the distributions of aftershocks, the asperity we found is corresponding to the inactive area of the aftershocks. The duration of rupture time was about 5 seconds. We can see from obtained slip-velocity functions that major dislocations occurred just after the arrival of rupture front on each subfaults.

The largest aftershock (M5.5) occurred on one week after the first mainshock and the initial rupture point is located at deeper and western part from the first mainshock. Fujii and Takenaka (2002) found that the rupture of the largest aftershock propagated downward and the largest moment was released at the deeper zone. Since the rupture areas of the largest aftershock and the first mainshock do not overlap each other, we speculate that the rupture front of the first mainshock had stopped above the initial rupture point of the largest aftershock.

We will also report the result of analysis about the second mainshock at the meeting.