S044-006 Room: Convention B Time: May 29 15:00-15:15

The initial rupture process of 1994 Sanriku-Haruka-Oki earthquake

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Development of the waveform inversion methods enables us to clarify details of spatial and temporal slip distributions (especially, large slipped regions; asperity) on fault planes of large (M7) earthquakes. The rupture processes of large earthquakes are generally very complex: several asperities are surrounded by non-asperity regions. However, it is important to reveal rupture processes in non-asperity regions in order to understand physical processes hidden behind heterogeneous rupture process of large earthquakes.

In this study, we study the 1994 Sanriku-Haruka-Oki earthquake (Mw 7.7). Nakayama and Takeo (1997) showed that the main asperity of the 1994 event ruptured about 25 sec after the origin time. The asperity lies around meridian 143E, but no large moment release occurs in the east half of the fault plane. These facts imply that the differences of physical conditions might affect the rupture process. Thus, we focused on the initial stage of the 1994 Sanriku-Haruka-Oki earthquake, and revealed the details of rupture process employing empirical Green's functions and inversion analyses.

We estimate the source time functions in various directions by assuming a point source model to understand the overall characteristics of initial rupture process. In the next stage, we determine the spatio-temporal distribution of released moment employing a linear least-squares inversion method. We found that the first subevent occurred around the hypocenter at the initial rupture stage of the 1994 Sanriku-Haruka-Oki earthquake. The corresponding seismic moment is about 1.5 x 10^19 Nm (Mw 6.7), the source dimension is 20 km x 20km, and the source duration is 15 sec. The main rupture began about 25 sec after the origin time at about 50 km southwestward of the hypocenter, and expanded northward predominantly. The apparent rupture velocity between the first subevent and the main rupture region is estimated at about 2.0 km/s. We also examine the excitation of long-period seismic waves at the initial rupture stage, and found no slow rupture with the excitation of large long-period seismic waves between the first subevent and the main rupture region.