Source Process of the 2018 Hokkaido Eastern Iburi Earthquake Inferred from Strong Motion Data and Green's Functions Based on Three-Dimensional Velocity Structure Model

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The source rupture process of the 2018 Hokkaido Eastern Iburi earthquake (M_{JMA} 6.7) was analyzed by the kinematic waveform inversion using strong motion data. Since this earthquake occurred close to the Hidaka Collision Zone and the Ishikari Lowland, the crustal and sedimentary basin structure of surrounding region is rather complex. Thus, we tried to use a three-dimensional velocity structure model to compute theoretical Green's functions. We used the Japan Integrated Velocity Structure Model (JIVSM; Koketsu *et al.*, 2012), and the Green's functions were computed by the three-dimensional finite difference method. The source fault model with strike-angle variation was set by referring to the spatial distribution of early aftershocks and the Global CMT solution. The source rupture process was estimated by the multiple time-window kinematic waveform inversion method (e.g., Hartzell and Heaton, 1983). The observed data for the inversion was strong-motion velocity waveforms in 0.04–0.5 Hz at K-NET, KiK-net and F-net stations. The rupture starting point was assumed to be at the hypocenter located by JMA at a depth of 37 km. The strong motion stations were selected based on the result of forward ground motion simulation of an Mw 4.1 aftershock occurring on September 14, 2018.
The estimated source model has small slip in the vicinity of the hypocenter, but significant slip is found in the depth range from about 22 km to 32 km. The rupture mainly propagated toward shallow and southwest direction. Considering crustal structure in this region (e.g., Iwasaki et al., 2004; Kita et al., 2012), the large slip area (asperity) is located in the middle-to-lower crust, and its rupture does not reach the upper crust. The depth range of significant slip is consistent with the spatial distribution of early aftershocks. Later aftershocks occurring in shallower depth are thought to occur outside the mainshock's source fault.

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