Examination of the finite fault model for the M_W 5.5 2017 Pohang earthquake with multi-segmented fault system

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The 15 November 2017 *M*w 5.5 Pohang earthquake produced strong ground motions in a city of Pohang, South Korea with damaged buildings and injured people. This earthquake was recorded as the largest earthquake in seismicity near enhanced geothermal systems. With its focal depth of 4 km, the earthquake generated a measurable static deformation, which gives an opportunity to quantify its source mechanism. In this study, we estimated the rupture process of the Pohang earthquake from regional seismograms by using multiple-time-window linear inversion and segmented fault geometry inferred from its aftershock distribution. The initiated rupture propagated southwest downward by 2 km and generated maximum peak slip up to ~30 cm. The rupture then propagated to the opposite direction, and slip patches located NE direction are sequentially reactivated over the potential barriers between two adjacent fault segments. Two largest aftershocks of M_W 4.3 and M_W 4.6 are located on the edge of the slip distribution, which represents the existence of local asperities. Rupture duration of 4 s and fault dimension of 40 km^2 suggest relatively low stress drops, which may be caused by the retardation of rupture propagation by patches with strong asperities with a high stress state. The complicated rupture process of the Pohang earthquake illustrates how the rupture evolves in a complex fault system with possible fluid interaction and reconciles the importance of seismic barriers that can control following aftershocks as well as the slip history.

Keywords: Pohang earthquake, Finite fault inversion, complex fault geometry

