Investigation of source parameters of the clustered earthquakes in the Seoul metropolitan area

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After the 2011 Mw9.0 Tohoku-Oki megathrust earthquake, the magnitude and frequency of earthquakes of the Korean Peninsula increased. The Seoul metropolitan area is a central region with a dense population and infrastructure. Moderate or large earthquakes in the Seoul metropolitan area may cause severe human and property damage. It is necessary to understand the earthquake properties to assess seismic hazard potentials. The microearthquakes are collected from the dense seismic array in the Seoul metropolitan area. The source parameters of 7 clustered earthquakes in the Seongbuk-gu from January 29, 2019 to March 23, 2019 and 13 clustered earthquakes in the Yeoncheon-gun from June 22, 2019 to October 1, 2020 are compared. The clustered earthquakes are consisted of micro-earthquakes and occurred near the Chugaryeong fault zone. The theoretical displacement spectra of P and S-waves are calculated using the Brune type source model, where high frequency amplitude decays with the frequency square. We apply a grid search algorithm to measure the corner frequency, long period amplitude, and path-averaged attenuation by minimizing the L2 norm of the log difference between the observed and theoretical spectra. We determine the seismic moment, stress drop, and seismic energy based on the measured parameters. The observations are expected to identify fault properties in the Seoul metropolitan area. The results in this study may contribute to seismic hazard mitigation.