Characterized source model of the 2013 Lushan earthquake (Mw6.6), China

*Hao Wu[1], Kojiro Irikura[2]

1. Geo-Research Institute, 2. Aichi Institute of Technology

The 2013 Lushan earthquake (Mw6.6) occurred on Aug. 2, 2013, in Lushan county of Sichuan province, China. The fault type of mainshock was an interplate blind-thrust. The largest PGA approached to 1g at BXD station closest to the epicenter. Several researches succeeded in explaining the long period ground motions with source models developed by joint inversion of strong motion data, teleseimic data and geodetic data. However, few studies on the source were implemented to explain the short-period ground motions of the mainshock. We constructed the characterized source model of the mainshock using the empirical Green’ s function method (EGFM), and then investigated whether the source parameters follow the empirical scaling relations. Finally we discussed the directivity effect on the strong motion at BXD station near the source region with our source model.

We select the records from one of the aftershocks as EGF by the following considerations: the focal mechanism and hypocenter of this Mw4.7 aftershock occurring 1 hour later than the mainshock are similar to the mainshock; the source spectral ratio of this small event averaged at some stations show a small variation. As many studies on the source rupture process from joint inversion of strong motion data and teleseismic data reach an agreement that the relatively large slips concentrate around the hypocenter, we just locate one strong motion generation area (SMGA) in the area with large slips on the fault plane. Next, we search the source parameters with the simulated annealing method, so that the synthesized ground motions match well with the observed ones near the source region from the mainshock. These source parameters include C (ratio of stress drops between large and small event), the length (= the width) of subfault, rise time of slip function, rupture starting point and rupture velocity within the SMGA. We find some of these source parameters, such as Mo versus area of SMGA, generally follow the conventionally empirical scaling relations used in the strong motion prediction recipe. Finally, we find the directivity effect is responsible for the strong motion of the mainshock at BXD station.

Keywords: Lushan Earthquake, characterized source model, strong motion

