

Site effect estimation Ulaanbaatar Basin

Lecturer: Odobaatar CHIMED

Affiliation: Research Centre of Astronomy and Geophysics
Mongolian Academy of Sciences

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Abstract:

The main active faults near the capital of Mongolia, Ulaanbaatar with about 1.2 M inhabitants, are located at less than 20 km and could produce large earthquakes with magnitude up to 7.5. The city is built on a sedimentary basin, of a thickness up to 100 meters, which may generate site effects. To quantify their impact on the amplitude and the duration of the ground motion, according to the frequency, we used weak motion, at 32 sites, and ambient noise records, at 104 sites. For that, I applied horizontal to vertical (HV) and sedimentary to rock site (SSR) spectral ratio. An analysis of the reliability of the results shows that the HV ratio amplitude varies in relation to the noise level and that when there is a particular local noise source the amplified frequency polarizes itself perpendicularly to the source direction.

A velocity structure of the basin, determined by 3 microtremor array measurements, and a 3D digital model of the basin were used to produce 1D and 2D simulations. The amplified frequency (HV) is well explained by the 1D simulation but the shape of the peak (SSR) fits better with the 2D simulation. The signal duration extension induced by the basin has been studied using methods based on Arias Intensity and time-frequency analysis. At certain sites of the basin, the duration increases between 20 to 160 %. The main increase of the duration of the ground motion is due to the 1D amplifications; a part seems to be related with 2D or 3D effects. Nevertheless, we need stronger ground motion to observe and study 2D and 3D effects.