

Effect of non-linear site response on earthquake hazard map

*Takao Kagawa¹

1. Tottori University Graduate School of Engineering

Various earthquake hazard maps are published by country and municipalities in Japan. It is better to consider non-linear site response for the hazard maps, however, simple frequency independent amplification of ground motion is frequently adopted. The site responses are generally evaluated from the data of microtremor or stationary earthquake observations; i.e. weak motion, therefore rigidity reduction and damping increase under strong ground motion are not considered in the responses. It is suspected that prolonged predominant period by non-linear site response and synchronized prolongation of residential natural period cause heavy building damages by the 2016 Kumamoto earthquake. It is also suspected that non-linear site response was one of triggers of slope failures and fill ground disaster through the 2018 Hokkaido eastern Iburi earthquake. The non-linear site response is an important issue to consider earthquake disaster by strong ground motion and also ground disaster.

Seismological community has noticed the effect from 1990s, however, evaluation methodology; i.e. program SHAKE, has been proposed in 1970s in engineering community. Latest methodologies have been introduced for modeling subsurface structures in seismological community such as microtremor survey, seismic interferometry, diffuse wave field theory and so on. Joint study across research fields beyond earth and planetary science is required for providing further realistic earthquake hazard map.

Keywords: Non-linear site response, Earthquake hazard map, Joint study across research fields