Geophysical Research Abstracts
Vol. 21, EGU2019-6118, 2019
EGU General Assembly 2019

Continental-Scale Site Response Maps

Harold Magistrale and Sait Ahmet Binselam
FM Global, Research Division, Norwood, United States (harold.magistrale@fmglobal.com)

In support of development of our global earthquake risk zone maps, we create regional- and continental-scale site response maps. 'Site response' refers to the amplification of earthquake ground motions by various types of soil. The site response map shows the distribution of National Earthquake Hazard Reduction Program (NEHRP) site categories. The NEHRP site categories are defined in terms of Vs30, the average S-wave velocity in the upper 30 m of the earth.
For the development of continental-scale site response maps, site categories are not defined directly from Vs30 measurements, but are determined from the proxy of surface geology. The California Geological Survey (CGS) has associated many geologic units mapped in the state to measured Vs30 values, and thus site response categories. The geologic units span a range of ages and rock and soil types, so the geology-Vs30 associations can be used elsewhere for similar geologies. For geologic types that are not well sampled in the CGS work (e.g., glacial deposits or limestones) we use Vs30 values from the literature. We use the associations to assign site response categories to geologic units contained in digital geologic maps. In some cases we digitize analog geology maps.
We do not believe that we can reliably distinguish categories A and B from the geology proxy, so we collapse the two categories into a single category B. ASCE 7 specifies that, if site category B is established without the use of on-site Vs30 measurements (as is the case here because we use a proxy), then it is considered to have the reference site condition amplification of 1.0. Similarly, we lack the site-specific evaluations required for site category F, so we do not distinguish site categories E and F, and assign category E to the candidate sites. Therefore, the site response maps show the distribution of site categories B, C, D, and E.
Artificial fill or reclaimed land, if present, is assigned category E because it commonly performs poorly during earthquake motions. It is identified by inspection of historical maps and air photos, and from changes in reflectance (water to land) in satellite imagery acquired during the past $\sim$30 years.
The site response categories are typically stored at 1 km spacing. We can accommodate variable spacing; for example, we can embed urban microzonation results into a large-scale site response map.