Probabilistic estimation of site class for strong motion network stations of Iran using horizontal to vertical ratio of PGA and PSAs

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Keywords	Extended Abstract

Summary
This study is planned to estimate site class of strong motion network stations in Iran. Site classes can be used in different seismic issues such as ground-motion prediction equations. This is carried out using a statistical method. To achieve this goal, after applying our constraints and filters for the entire database (1975-2018) of strong-motion of the Road, Housing and Urban Development Center (BHRC), 3828 records from 1636 events, recorded in 893 unique stations, were handled to determine site class of stations. To that end, for those stations with determined Vs (30) (388 stations), normal distribution, probability density function (PDF) and cumulative density function (CDF) of natural logarithm of horizontal-to-vertical ratio (H/V) of PGA and PSAs at 24 periods were acquired, which fulfilled as the foundation of the classification of the rest 505 stations.

Introduction
Site class can be a basic and major parameter in assessing the dynamic characteristics of soils and is widely manipulated in different seismic and geotechnical matters. The Iranian plateau is noticed as one of the very seismically active areas of the world that is located on the Alpine–Himalayan orogenic belt, and is tectonically complex with structures that are different in density, velocity, etc. To circumvent the trouble of soil sampling problems and avert the requirement of boreholes, here in this research, further procedure of estimating site class is suggested that is built on probabilistic prediction.

Methodology and Approaches
HVSR (horizontal to vertical spectral ratio) of earthquake motions is related to soil status. The natural logarithm of horizontal-to-vertical ratio of PGAs and PSAs at several periods that is supposed to be a random variable and normally scattered, was used in this study. The correctness of this presumption was also examined. After classification of sites with known Vs (30), in accordance with existing Vs (30), a lognormal distribution of PGA and PSAs, their probability density functions (PDFs) and cumulative density functions (CDFs) were acquired in each class and period. Using this information, the classification was carried out for those sites with unspecified Vs (30).

Results and Conclusions
Based on a probabilistic procedure, site classification of Iranian strong ground motion stations was made. As a conclusion, 505 sites with unknown Vs (30) considered in this study were grouped in four classes: 34 sites were placed into class A, 406 sites into class B, 48 sites into class C and 16 sites were placed into class D. Estimated Vs (30) range of these 505 stations was from 258 m/s to 2142 m/s.