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Seismic soil class map for Italy according to European and Italian codes map

Giovanni Forte[1], **Eugenio Chioccarelli**[2], Melania De Falco[1], Pasquale Cito[3], Antonio Santo[2], and Iunio Iervolino[3]

[1]DICEA, Dipartimento d'Ingegneria Civile, Edile e Ambientale; Università degli Studi di Napoli Federico II, Napoli, Italy
[2]Dipartimento di Ingegneria Civile, dell'Energia, dell'Ambiente e dei Materiali; Università degli Studi Mediterranea, Reggio Calabria, Italy
[3]DIST, Dipartimento di Strutture per l'Ingegneria e l'Architettura; Università degli Studi di Napoli Federico II, Napoli (Italy)

Soil conditions affect ground motion amplification. Thus, seismic site classification is a critical issue to predict ground motion parameters in the context of both probabilistic seismic hazard analysis and real-time generation of shaking maps. Especially on large areas, simplified procedures for estimating the seismic soil amplification can be advantageous. In order to account for these local effects, some proxies which account for the soil behaviour can be identified; e.g., the average shear-wave velocity of the upper 30 m (VS,30), or the equivalent shear-wave velocity from the depth of the seismic bedrock (VS,eq).
In this study, two maps of seismic shallow soil classification for Italy according to Eurocode 8 (EC08) and the new Italian Building Code (ItBC2018) are presented. The methodology from which the maps are derived is described in Forte et al. (2019) and accounts for two sources of information: site-specific measurements and large-scale geological maps. The soil maps are obtained via a four-step procedure:
(1) a database of about four-thousand shear-waves velocity (Vs) measurements coming from in-hole tests, surface geophysical tests and microtremors is built, covering (unevenly) the whole national territory;
(2) twenty geo-lithological complexes are identified from the available geological maps;
(3) the investigations are grouped as a function of the geo-lithological complex and the distribution of measured VS,30, VS,eq are derived;
(4) medians and standard deviations of such distributions are assumed to be representative of the corresponding complexes that are consequently associated to soil classes.
The EC08 soil class map and the available database of Vs measurements were compared with the seismic soil map provided by the USGS based on a topographic slope-proxy (Allen and Wald, 2007). The latter is obtained by the correlation between topographic slope and VS,30, assuming morphometrical characteristics of the terrain as representative of the lithology. The slope-based method appears less reliable than the proposed approach, because its predictions resulted in a slight but systematic overestimation of the measured soil classes. Therefore, the proposed map can be more suitable for large-scale seismic risk studies, despite it is not a substitute of seismic microzonation and local site response analyses.

To make the results of the study available, a stand-alone software “SSC-Italy” has been developed and is freely available at http://wpage. unina.it/iuniervo/SSC-Italy.zip.