

Stochastic modelling as a method for providing seismic hazard estimates of site effects over wide areas

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Numerical simulations of seismic site response require the characterization of the nonlinear behaviour of shallow subsoil and their mechanical characterization. When extensive evaluations are of concern, as in the case of seismic microzonation studies, funding problems prevent a systematic use of laboratory tests or S-waves velocity profiles to provide detailed evaluations.

For this purpose, we investigate the use of statistical laws for both the main mechanical and dynamic parameters. A statistical analysis of the data were carried out in previous studies (Romagnoli et al., 2021; Gaudiosi et al., 2023) with the aim of shedding light on the significant difference between the laboratory and in situ classification of samples and soils and the macroscopic/engineering geological one, provided during seismic microzonation studies.

Since the engineering geological classification plays a prominent role in extensive site response evaluations, the outcomes of the present work may be of help at least when preliminary seismic response estimates are of concern. The preliminary tests carried out in the framework of the PRIN SERENA Projects provide reference information that can serve as key data for large-scale hazard assessments in the Italian territory.

The variability of the synthetic hazard parameters may be modelled throughout the NC92 code (Acunzo et al., 2024) by considering the probability distributions obtained for each seismo-stratigraphy. These probability distributions may be combined in the frame of a Bayesian approach to determine a probabilistic estimate of the hazard parameters at output nodes, as well as its variability range.

References

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