35th General Assembly of the
European Seismological Commission

4-10 September 2016   Trieste

Response-Spectrum Compatible Earthquake Record Selection for Nonlinear Structural Analysis

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Nonlinear dynamic analysis is gaining more importance among structural engineers for determining the seismic behavior of structures with the applied input ground motions (GMs). Nonlinear analyses are typically very sensitive to selected input GMs (e.g., seismic loading); however, there has not been a consensus among engineers and seismologists on how to select and scale GMs for nonlinear analysis. This study is a part of the on-going PhD project having a broader goal of quantifying the effects of different input GMs–such as real, stochastic, seismic-source based, and matched GMs–on nonlinear structural responses of simple and complex models.

Of the broader project scope, the part explained herein examines the real record selection based on the spectrum compatible method. The effects of different elements on spectrum compatible selection are evaluated and discussed such as the use of Pan-European and worldwide databases, the use of different matching conditions, and the use of different ground motion prediction equations (GMPEs) representing the same earthquake scenario. Then the selected real records are used as inputs to the single degree of freedom (SDOF) models in order to compare variation in the input records and also in the resulting structural responses.