

Variability of the ground motion in Northern Italy

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A qualified dataset of strong motion records has been recently built for Northern Italy, after the 2012 Emilia seismic sequence (MW 6.1), occurred within the Po plain basin. The dataset is compiled selecting events in the magnitude range 4.0 - 6.4, records with distances shorter than 200 km and focal depths shallower than 30 km and is composed of 2489 records relative to 300 stations and 94 events.

This dataset has been used to retrieve a local Ground Motion Prediction Equation (GMPE) tailored for this area (Lanzano et al. 2016), which accounts for: i) attenuation-rate dependent on distance ranges and geological domains; ii) enhancement of short period spectral ordinates, due to the reflection of S waves at the Moho discontinuity; iii) generation of surface waves inside Po plain basin. The GMPEs are developed for peak ground acceleration, peak ground velocity and 24 spectral acceleration in the period range 0.04-4s. The new model has a relevant impact on hazard assessment both in term of median values and standard deviations.

We exploit the dataset to study the ground-motion variability, applying the method proposed by Rodríguez-Marek et al. (2011). We separate the total residuals (Res) into different contributions related to the between-event (δBe), the site-to-site ($\delta S2S$) and the event- and site- corrected residuals ($\delta Wo,es$) and evaluate their standard deviations. The aim is to provide elements to implement the 'non-ergodic' approach in the Probabilistic Seismic Hazard Analysis (PSHA).

In order to investigate the causes of the largest standard deviations at single sites, a comparison between the sigma calculated for single and multiple source-to-site paths has been carried out.