Selection and weighing of ground motion prediction equations for the new seismic hazard model of Italy (MPS19)

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In the framework of the project for the update of the national seismic hazard model (MPS19), a task was devoted to selecting and weighing the predictive equations for the ground motion parameters and the macroseismic intensity to be used in the different seismotectonic contexts in Italy. To this purpose, from many available recent Ground Motion Prediction Equations (GMPEs) at global, European and regional/local scale, we pre-selected sixteen models for shallow active crustal regions, three for subduction zones to be applied to the Calabrian arc, and two for volcanic areas to be applied to Mount Etna, Aeolian islands and Neapolitan volcanoes. Each pre-selected GMPE was scored according to a specific metric using the strong-motion recordings available at the Italian accelerometric archive (itaca.mi.ingv.it) and the Engineering strong-motion database (esm.mi.ingv.it). In particular, three proper metrics were used, i.e. the log-likelihood, the parimutuel gambling score, and the quantile score, which give emphasis on different aspects of the forecasting performance. For shallow active crustal regions, we finally selected only three GMPEs, which show the best forecasting skill and also use different metrics for the distance and cover different spatial domains of the calibration dataset (national, European, and global). A weight was then assigned to each selected GMPE by combining two different evaluations: a weight based on the scoring using the observed accelerometric data and a weight derived by experts' judgment. Since the MPS19 model will also produce seismic hazard estimates in terms of macroseismic intensity, a similar procedure is being applied to select and weight the most recent Intensity Prediction Equations (IPEs) using the Italian macroseismic dataset (emidius.mi.ingv.it/CPTI15-DBMI15/).