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MPS19: the updated Italian Seismic Hazard model

Carlo Meletti (1), Warner Marzocchi (2), Vera D'amico (1), Lucia Luzi (1), Francesco Martinelli (1), Bruno Pace (3), Andrea Rovida (1), Francesco Visini (1), and Mps16 Working Group (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Pisa, Italy (carlo.meletti@ingv.it), (2) Earth Science Department, The University of Naples Federico II, Naples, Italy (warner.marzocchi@unina.it, (3) Dipartimento di Scienze Psicologiche della Salute del Territorio, University of Chieti-Pescara, Chieti, Italy (bruno.pace@unich.it)

In 2015 the Seismic Hazard Centre (Centro Pericolosità Sismica – CPS) of the National Institute of Geophysics and Volcanology (INGV) was commissioned to coordinate the national scientific community with the aim of elaborating a new reference seismic hazard model. The main requirements were defined together with experts in earthquake engineering that will then participate to the revision of the building code. The CPS outlined a roadmap to release a significantly renewed PSHA model, with regard to both the updated input elements and the strategies to be followed.

From the beginning, CPS fixed some key constraints that had to be respected in order to guarantee a large participation and consensus: (i) the use of international standards for PSHA (e.g. SHAAC, 1993); (ii) open and transparent procedures that totally guarantee reproducible outcomes; (iii) the involvement of a large Italian scientific community when proposing data, models and approaches; (iv) a full exploration and representation of the epistemic uncertainty in the final seismic hazard model; (v) the implementation of a robust testing phase, in addition to the elicitation session with national and international independent experts.

Following a public call, about 150 people from different universities and research institutions have been involved in the project.

The activities were organized in 6 tasks: T1) project management, T2) input data, T3) seismicity models, T4) ground motion and intensity predictive equations (GMPEs and IPEs), T5) computation and rendering, T6) testing.

T1 planned the activities and managed the other 5 tasks to ensure the achievement of the Project scopes.

T2 selected the most updated information about historical and instrumental seismicity, seismogenic faults, and deformation.

T3 elaborated the seismicity models in terms of classic source areas, fault sources and gridded seismicity based on different approaches, with associated seismicity rates. Each earthquake rate model has to be reproducible, according to a full description of its "making of". Moreover, modellers have to explore the epistemic uncertainty related to their model; this step is crucial to estimate an overall epistemic uncertainty of the final model.

T4 selected the most recent models accounting for their tectonic suitability and forecasting performance. The forecasting performance of each GMPE has been evaluated through the comparison with accelerometric records available in the Italian (itaca.mi.ingv.it) and European (esm.mi.ingv.it) strong-motion databases. In this way, each GMPE has been ranked according to different specific metrics, so that the best performing GMPEs can be identified.

T5 identified the code OpenQuake (www.openquake.org) for calculation. It is an open source software, therefore we had a large interaction with the developing team in order to integrate the code with new, dedicated functions.

T6 performed statistical procedures to test, with the available data, the whole seismic hazard models, and single components such as the seismicity models and the GMPEs. T6 also organised the elicitation session and finally weighted the different models.

Finally, the MPS16 model was implemented also according to the suggestions of a revision panel (composed of 5 Italian experts selected by DPC). The release of the final model is scheduled for spring 2019.