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Integrating fault and seismological data into a probabilistic seismic hazard model for Italy.

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We present the results of new probabilistic seismic hazard analysis (PSHA) for Italy based on active fault and seismological data. Combining seismic hazard from active fault with distributed seismic sources (where there are no data on active faults) is the backbone of this work. Far away from identifying a best procedure, currently adopted approaches combine active faults and background sources applying a threshold magnitude, generally between 5.5 and 7, over which seismicity is modelled by faults, and under which is modelled by distributed sources or area sources.
In our PSHA we (i) apply a new method for the treatment of geologic data of major active faults and (ii) propose a new approach to combine these data with historical seismicity to evaluate PSHA for Italy. Assuming that deformation is concentrated in correspondence of fault, we combine the earthquakes occurrences derived from the geometry and slip rates of the active faults with the earthquakes from the spatially smoothed earthquake sources. In the vicinity of an active fault, the smoothed seismic activity is gradually reduced by a fault-size driven factor.
Even if the range and gross spatial distribution of expected accelerations obtained in our work are comparable to the ones obtained through methods applying seismic catalogues and classical zonation models, the main difference is in the detailed spatial pattern of our PSHA model: our model is characterized by spots of more hazardous area, in correspondence of mapped active faults, while the previous models give expected accelerations almost uniformly distributed in large regions.
Finally, we investigate the impact due to the earthquake rates derived from two magnitude-frequency distribution (MFD) model for faults on the hazard result and in respect to the contribution of faults versus distributed seismic activity.