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PSHAe (Probabilistic Seismic Hazard enhanced): the case of Istanbul.

Marco Stupazzini (1), Alexander Allmann (1), Maria Infantino (2), Martin Kaeser (1), Ilario Mazzieri (2), Roberto Paolucci (2), and Chiara Smerzini (2)

(1) Munich Re, Munich, Germany, (2) Politecnico di Milano, Milan, Italy

The Probabilistic Seismic Hazard Analysis (PSHA) only relying on GMPEs tends to be insufficiently constrained at short distances and data only partially account for the rupture process, seismic wave propagation and three-dimensional (3D) complex configurations. Given a large and representative set of numerical results from 3D scenarios, analysing the resulting database from a statistical point of view and implementing the results as a generalized attenuation function (GAF) into the classical PSHA might be an appealing way to deal with this problem (Villani et al., 2014).
Nonetheless, the limited amount of computational resources or time available tend to pose substantial constrains in a broad application of the previous method and, furthermore, the method is only partially suitable for taking into account the spatial correlation of ground motion as modelled by each forward physics-based simulation (PBS).
Given that, we envision a streamlined and alternative implementation of the previous approach, aiming at selecting a limited number of scenarios wisely chosen and associating them a probability of occurrence.
The experience gathered in the past year regarding 3D modelling of seismic wave propagation in complex alluvial basin (Pilz et al., 2011, Guidotti et al., 2011, Smerzini and Villani, 2012) allowed us to enhance the choice of simulated scenarios in order to explore the variability of ground motion, preserving the full spatial correlation necessary for risk modelling, on one hand and on the other the simulated losses for a given location and a given building stock.

3D numerical modelling of scenarios occurring the North Anatolian Fault in the proximity of Istanbul are carried out through the spectral element code SPEED (http://speed.mox.polimi.it). The results are introduced in a PSHA, exploiting the capabilities of the proposed methodology against a traditional approach based on GMPE.

References

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