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Probabilistic seismic risk analysis in the insurance industry: the University of Naples Federico II – AXA-MATRIX approach

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cState-of-the-art seismic risk assessment develops in a fully probabilistic framework due to the large uncertainties inherent to the earthquake characteristics and to the seismic response of civil structure/infrastructure. The consolidated approach is that of performance based-earthquake engineering (PBEE) in which the target is to compute the expected annual loss due to seismic damage (e.g., property damage, business interruption, fatalities, etc.) to a civil system of interest. Such a calculation is, for convenience, split in three phases the results of which eventually combined: (i) probabilistic seismic hazard analysis; (ii) seismic fragility assessment; (iii) consequence/loss modelling. The hazard is related to the seismicity of the site of interest and is only dependent on the tectonic environment; (ii) is the probabilistic characterization of the seismic vulnerability of the system of interest (e.g., a structure); (iii) is the probabilistic modelling of the value of the consequences of the seismic damage.

PBEE is the rational way to compute the seismic risk and can be applied to individual buildings as well as to spatially-distributed systems (e.g., utility distribution networks). It allows to consistently and quantitatively account for all the uncertainties involved.

The talk, will be devoted to illustrating the basic concepts of probabilistic seismic risk analysis and how it is going to find its way into the insurance industry. In particular, the Fragility-based Rapid seismic Risk AssessMEnt (FRAME) approach, developed by the University of Naples Federico II and funded by AXA-MATRIX Risk Consultants, is discussed. The main objective of FRAME is the worldwide assessment of structure-specific seismic risk, based on seismic hazard and fragility functions, for a number of structural typologies. To this aim, it relies on worldwide seismic hazard estimates, an expandable fragility curve inventory and damage-to-loss relationships, allowing to translate the structural damage into an expected loss for both direct damage and business interruption.

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