EURATOM METIS

INNOVATION IN METHODS AND TOOLS FOR SEISMIC RISK ASSESSMENT

METIS
Seismic Risk Assessment for Nuclear Safety

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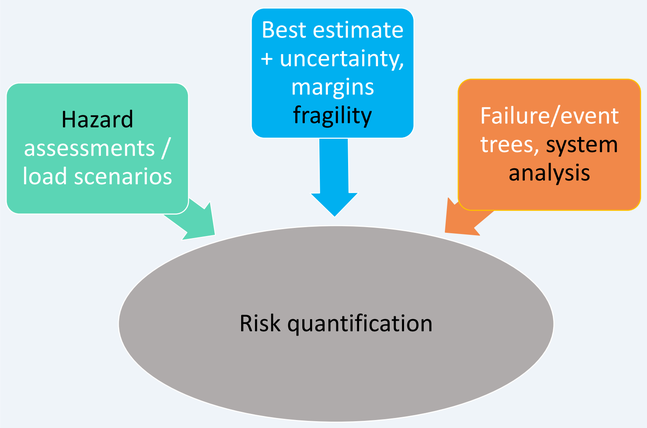
Overview & scope

- September 2020 – 2024 (4 years)
- Budget : 5 Mio (EU funds 4 Mio)
- 15 partners (12 EU, 2 USA, 1 Japan)

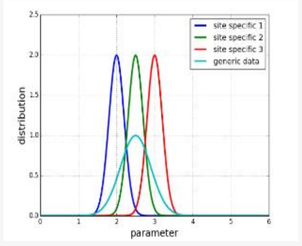


$$P_{tot} = \int P_f(\alpha)\, p(\alpha) d\alpha$$

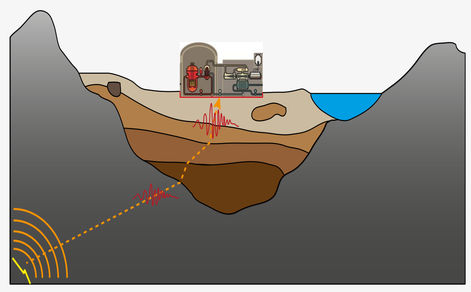
Partners

1 CONCEPT & OBJECTIVES

European consensus on best practice approaches for seismic risk assessments of nuclear installations



- Integrated approach from source to site and equipment response
- Realistic assessments of seismic load through site-specific and physics-based models and simulation .
- Uncertainty, quantification, propagation and communication
- Calibration
- Validation of models against data (observations, measurements) whenever possible
- Assessment of combined aggression due to aftershocks in the PRA



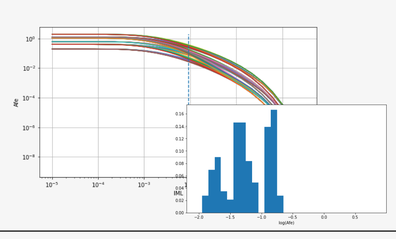
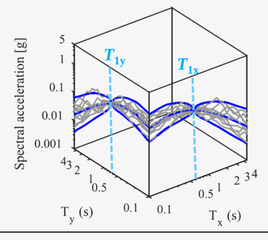
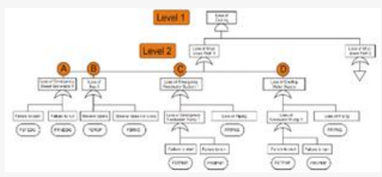
2 TOOLS

Dissemination of best practice methods through opensource tools

- Improve/update existing tools and develop new tools to cover the full analysis chain
- Develop examples and application guides

3 ACHIEVEMENTS

Recent advances

			
Seismic hazard at rock	**Site response and ground motion**	**SSCs response and fragility**	**Risk quantification**
• New methodology for declustering catalogues that optimises the tradeoff between number of mainshock left in the catalogue and their degree of being Poissonian in space and time • Propagation of epistemic uncertainty in OQ:LHS and methodology for propagating epistemic uncertainty that uses convolution and mixture models • Extended PSHA: implementation of CS approach, new VPSHA approach, methodologies to account for aftershocks in PSHA	• Development of tools for rock-hazard-consistent record selection in horizontal and vertical directions following several variants of the Conditional-Spectrum approach and based on different ground motion Intensity (Sa, averaged Sa) as conditioning variables • Analysis of ppropriateness of using rock-hazard-consistent ground motions that are either recorded at soil stations (rather than on rock), extensively scaled (rather than unscaled) or synthetic (rather than real) for structural response estimation' • Integrated approach for 1D probabilistic site response from bedrock to obtain input (ground motion time histories and degraded soil profiles) for SSI and floor response	• Definition and classification scheme of SSCs for specific and generic seismic fragility evaluation and application to the case study • Development of a verification and validation strategy for models and failure criteria based on experimental analysis and test data • Selection of failure relevant scalar and vector ground motion intensity measures • Simplified approaches for nonlinear floor response spectra • Bayesian framework for updating of fragility curves obtained by simplified analyses by means of reduced sets of nonlinear time history analyses	• New opensource tool for seismic risk assessment (SCRAM coupled to Andromeda) and data management tool to facilitate uncertainty propagation and parametric analysis • Approach to account for aftershocks in PRA

Assess benefit and feasibility of approaches through METS case study

REFERENCES & CONTACTS

www.metis-h2020.eu

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