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SIGMA2: OUTCOMES AND IMPACT ON FUTURE PRACTICE IN SEISMIC HAZARD ASSESSMENT

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INTRODUCTION

Current safety regulations require that critical infrastructures, such as nuclear power plants, prove their resilience to very-low-probability seismic hazard levels. For this purpose, a particular effort has been made by seismologists and seismic engineers to develop sound seismic source models and sophisticated approaches which account for a representative range of epistemic uncertainties. In addition, the crucial importance of safety and financial stakes associated with nuclear facilities require a special attention to local site conditions.

THE SIGMA2 RESEARCH PROGRAM

Our objective is here to present outcomes of the SIGMA2 (2017-2022) program for seismic hazard assessment and their impact in future practice for nuclear facilities. SIGMA2 (i.e. “SeIsmic Ground Motion Assessment, 2nd edition”) is a Research & Development program that was built upon the former SIGMA project (2011-2016) legacy. It promotes new approaches, with a particular emphasis on site-specific approaches and low-seismicity areas. More than 50 research actions have been conducted with academic and private scientific partners. With the ambition to provide a more realistic representation of seismic ground motions, adapted to site conditions; to reduce uncertainties, by improving input data and models; and, to introduce feedback loops and testing methods to evaluate models against observations.

We will present new-generation non-ergodic seismic ground-motion models developed by several teams, and their implications on earthquake engineering practice in the future. We will also present different approaches for the testing of models against observations and discuss their potential interest to identify over-conservatism. Finally, we will illustrate how several actions in the program found a sound application, with the recent occurrence of the M4.9 Le Teil, France, earthquake, less than 20 km from an operating nuclear power-plant.