



## Statuts and Challenges of a Research & Development Program on Seismic Ground Motion Assessment (SIGMA): Identification and Quantification of uncertainty in seismic hazard

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In recent years, attempts have been made to identify and quantify uncertainties in seismic hazard estimations for moderate seismicity countries. These studies have highlighted the lack of representative data generating seismic ground motion prediction with large uncertainties. These uncertainties create major difficulties for defining the design and verification levels, and can create different interpretations and divergent opinions among experts. In this framework, several industrial companies\* decided to elaborate an international research and development program on the characterisation and assessment of seismic ground motion in France, Italy and nearby countries (research program called SIGMA). The main objectives of SIGMA are to improve our knowledge of data, methodologies and tools to estimate the seismic hazard. The final aim is to better quantify and to reduce the epistemic uncertainty by improving the understanding and the characterization of all uncertainties. The research program is organised in five Work Packages (WPs), see figure 1 for a general illustration of the WPs, below we summarise the general framework of these five WPs.

WP1: Improve the knowledge of seismic sources: the main goals are to produce a homogeneous catalogue of earthquakes for the French territory that covers both the historical and instrumental periods, and to improve the knowledge of faults and geological structures that are potentially active in south-eastern quarter France and Po Plain.

WP2: Improve seismic ground motion models: the objective is to develop methods of ground motion prediction that are adapted to the French, Northern Italy and neighboring countries context, with a realistic characterization of aleatory and epistemic uncertainties.

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WP 3: Improve local site conditions representation: the goal is to develop methods and tools to evaluate sites potentially subjected to local site effects, and that are appropriate to be used in the seismic hazard calculation methods. The final objective is to build guidelines to account for site effects.

WP 4: Improve seismic hazard models: the goal is to better quantify and possible reduce uncertainties of seismic hazard models estimations. This WP integrates all the results coming from the other WPs and compares the results between standard practices and SIGMA improvements. The objective is to evaluate the benefits produced by SIGMA project on the seismic hazard assessment.

WP 5: Improve the characterization and exploitation of seismic ground motions: the objective is to ensure that results of the overall project fulfil the engineers and designers needs for the structure design and operations. The goal is to produce methods and tools for the development of the needed engineering parameter(s) of the seismic ground motion, for several return periods, and various levels of risk, adapted to the facilities.

The SIGMA researches started on January 2011 for a period of 5 years. The technical developments of almost all technical tasks defined in the program are in progress. Some tasks have produced the first tangible results. The objective of this paper is to present the technical content of the SIGMA project, the scientific progresses and the first interesting results, the structure and organisation.

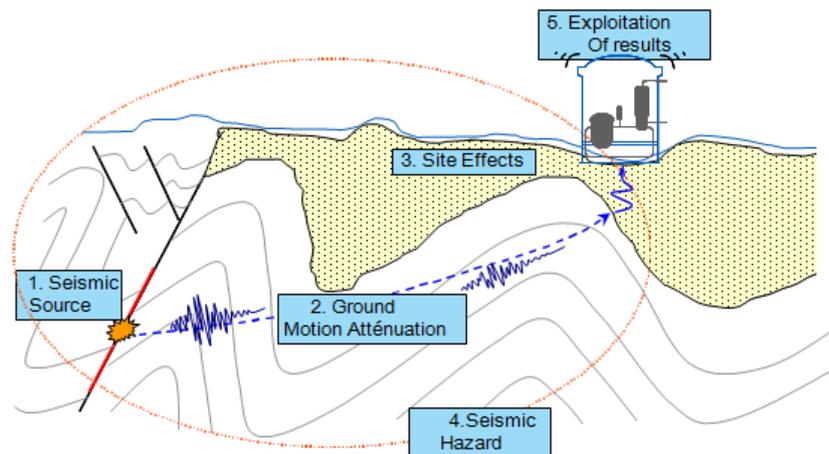


Figure 1: General representation of the five technical Work Packages of SIGMA project