



# **Workshop on Best Practices in Physics-Based Fault Rupture Models for Seismic Hazard Assessment of Nuclear Installations**

**IAEA Headquarters  
Vienna, Austria**

**18–20 November 2015**

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## **Information Sheet**

### **A. Background**

The main objective of seismic hazard analysis is the anticipation of ground motion at a given site; subsequent risk assessment evaluates the potential damage or losses to society caused by the ground motion anticipated in the hazard analysis. Therefore, reliable ground-motion prediction of future earthquakes is a key input to reduce uncertainties in seismic hazard analysis, and consequently in risk assessment as well.

Seismic hazard analysis has two main components: (1) earthquake forecasting, that is, evaluating the probability of all possible events, usually characterized by a magnitude in a given region and in a given time span; and (2) predicting the ground shaking level at a given distance from the earthquake source (fault) caused by the previously forecasted earthquake. In current practice, the ground shaking is mainly estimated from empirical ground motion prediction equations (GMPEs). However, the available dataset used to build such GMPEs is limited since it does not cover the whole magnitude range, and observed data, particularly near the source, are sparse. Therefore, potential effects of source complexity and wave propagation are not well constrained by sparse observations. On the other hand, recent developments in numerical simulation of earthquakes based on the physics of the causative source rupture and wave propagation have contributed to substantial advances in the ability to predict the variability of near source ground motion dominated by the source and/or wave propagation effects.

Therefore, seismologists and engineers need to rely on such physics-based synthetic earthquake ground motion data for meaningful extrapolation in areas where there are not sufficient observations, particularly for site-specific hazard assessment of critical infrastructures such as nuclear installations.

The main goal of the workshop is to initiate discussions towards the standardization and applicability of these advanced physics-based methodologies and to provide practical guidance for their use in seismic hazard analysis. It is clear that in order to reach such ambitious goals, this process has to take place at the level of a scientific and technical community that covers expertise in seismology and earthquake engineering, from practitioners to earthquake scientists. This community needs to sit around the same table to discuss the needs of practitioners and how the advanced methodologies developed by seismologists can be transferred and applied to practical use. In such a way, seismologists and practitioners can eventually achieve a common understanding of the scientific and technical features of the seismic hazard assessment and their applications. Building such a common understanding requires seamless and continuous cooperative efforts between the various groups that make up the community. With this aim in mind, the first phase of this process is the organization of two dedicated workshops on this topic. The second workshop is tentatively planned for the end of 2016 or early 2017.

## **B. Objectives, Topics and Format of the Workshop**

This workshop aims to gather experts in seismology and earthquake engineering, from practitioners to earthquake scientists, to discuss the applicability of the so called physics-based fault rupture models to generate synthetic earthquake ground motion data for meaningful extrapolation of ground motion prediction in areas where there are not sufficient observations and finally provide practical guidance for seismic hazard analysis. This is particularly important for site-specific hazard assessment of nuclear installations. The outcomes of this workshop will be used in the development of the Technical Documents of the Working Area 1 of ISSC-EBP.

### **Topics**

The workshop aims to discuss the state of the art of seismic hazard assessment for nuclear installations, covering the following topics within the framework of ground motion prediction of future earthquakes for hazard assessment:

- Current practice of simulation techniques for seismic hazard assessment in nuclear installations: Experience in Japan, USA and Europe related to the use of ground motion modelling for hazard assessment; why numerical models are needed.
- Physics-based dynamic rupture modelling: Stress and friction parameterization for dynamic rupture modelling, how to constrain modelling with observed data; the role of fault geometry in rupture dynamics and ground motion.
- Ground motion simulation: The role of kinematic and dynamic approaches in ground motion prediction; the upper frequency limit of physics based synthetic ground motion; source characterization for strong ground motion prediction; broadband ground motion modelling.
- Fault displacement assessment: Experience of fault displacement evaluation and why it is needed for seismic hazard assessment; fault displacement modelling and variability.

- Expectations from end users with regard to ground motion prediction: Discussion of the practitioners' needs and how the advanced seismological models developed by seismologists can be transferred into engineering practice; understanding of the scientific and technical features of the seismic hazard assessment and their applications.

This workshop will be supported by invited presentations specially dedicated to the topics mentioned above. Key speakers are:

- Norm Abrahamson (University of California, Berkeley/Pacific Gas and Electric Company, USA)
- Jean Paul Ampuero (California Institute of Technology, USA)
- Hideo Aochi (BRGM, Office of Geological and Mining Research, France)
- Luis A. Dalguer (swissnuclear, Switzerland)
- Steven Day (San Diego State University, USA)
- Satoshi Ide (University of Tokyo, Japan)
- Kojiro Irikura (Aichi Institute of Technology, Japan)
- Martin Mai (King Abdullah University of Science and Technology, Saudi Arabia)
- Hiroe Miyake (Earthquake Research Institute, University of Tokyo, Japan)
- Mark Petersen (US Geological Survey, USA)
- Philippe Renault (swissnuclear, Switzerland)
- Makoto Takao (Tokyo Electric Power Company, Japan)
- Maria José Crespo (Principa, Spain)

In addition to the invited speakers, we welcome other contributions on the topics mentioned above. Therefore, any participant willing to present his/her work orally or in the form of a poster should submit an abstract (max 300 words). After acceptance of the abstract and the type of presentation (oral or poster) we will encourage the participant to submit a full paper.

## C. Participation and Registration

The workshop is targeted at experts from regulatory bodies, utilities, technical support organizations, vendors and research and development organizations, who are working in the areas covered by the workshop. For registration please fill in the attached Participation Form (Form A).

Participants should complete the Participation Form as soon as possible and send it to the competent official authority (Ministry of Foreign Affairs or National Atomic Energy Authority) for transmission to the IAEA Secretariat (see Section D), to arrive no later than **10 September 2015**. The nomination of a participant will be accepted only if forwarded by the Government of an IAEA Member State.

### **Abstract and paper submission:**

Participants willing to present their work orally or in the form of a poster must submit an abstract (max. 300 words). After acceptance of the abstract and the type of presentation (oral or poster) we will encourage the participant to submit a full paper. The minimum length of the paper is 6 pages, and it is recommended to be no longer than 15 pages. This is a guideline and not an absolute limit. Please include this information when filling in Form A.

**Important dates:**

- Abstract submission deadline: **30 June 2015**
- Full paper submission deadline: **31 August 2015**
- Registration deadline: **10 September 2015**
- Workshop: **18–20 November 2015**

## **D. Organization**

**IAEA Scientific Secretary:**

**Mr Yoshimitsu Fukushima**

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## **E. Visas**

Participants who require a visa to enter Austria should submit the necessary application to the nearest diplomatic or consular representative of Austria at least four weeks before they travel to Austria. Since Austria is a Schengen State, persons requiring a visa will have to apply for a Schengen visa. In States where Austria has no diplomatic mission, visas can be obtained from the consular authority of a Schengen Partner State representing Austria in the country in question.

## **F. Expenditure**

No registration fee is charged to participants.

The IAEA is generally not in a position to bear the travel and other costs of participants in the workshop.

## **G. Working Language**

The working language of the workshop will be English.

## **H. Workshop Web Page**

Participants should visit the IAEA Meetings web page regularly for new information at:  
<http://www-pub.iaea.org/iaeameetings/50896/Workshop-on-Best-Practices-in-Physics-Based-Fault-Rupture-Models-for-Seismic-Hazard-Assessment-of-Nuclear-Installations>

Participants will also find information on services at the Vienna International Centre (VIC) and general information at: <http://www-pub.iaea.org/mtcd/meetings/vicservices.asp>