



# Variability estimation in ground motion around Istanbul based on the probabilistic dynamic rupture scenarios along the North Anatolian fault

Hideo Aochi, Thomas Ulrich, David Michéa, Fabrice Dupros

## ► To cite this version:

Hideo Aochi, Thomas Ulrich, David Michéa, Fabrice Dupros. Variability estimation in ground motion around Istanbul based on the probabilistic dynamic rupture scenarios along the North Anatolian fault. 26th IUGG general assembly, IUGG, Jun 2015, Prague, Czech Republic. hal-01137757

HAL Id: hal-01137757

<https://hal-brgm.archives-ouvertes.fr/hal-01137757>

Submitted on 31 Mar 2015

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Abstract overview

Category **IASPEI (Seismology, Geophysics)**  
Symposium **S06b Strong Ground Motion: Earthquake Scenarios**  
Abstract title **Variability estimation in ground motion around Istanbul based on the probabilistic dynamic rupture scenarios along the North Anatolian fault**

H. Aochi<sup>1</sup>, T. Ulrich<sup>1</sup>, D. Michea<sup>2</sup>, F. Dupros<sup>2</sup>.

<sup>1</sup>BRGM, Direction Risques et Prévention, Orleans, France.

<sup>2</sup>BRGM, Direction des Systèmes d'Information, Orleans, France.

Variability of ground motion estimation according to various earthquake scenarios is studied in the region of the Sea of Marmara around Istanbul, Turkey, through numerical simulations using a 3D finite-difference method with CPU-GPU implementation. The earthquake scenarios dynamically simulated based on mechanical models are given with probability according to the geological, geophysical and seismological hypotheses. We adopt a 3D geological model of the Sea of Marmara taken into account of the basin structure (down to about 10 km depth) and the existence of the Sea layer (1.5 km depth at max.). Although beneath the land part around the Sea of Marmara is briefly a 1D structure, the influence of the 3D structure of the basin on the ground motion caused by the earthquakes along the North Anatolian fault is significant. Various earthquake scenarios of a magnitude of about 7 lead to a very heterogeneous ground motion pattern. For the selected points, we carry out statistical analysis on its characterization. In Istanbul area, a very strong ground motion (peak ground velocity larger than 1 m/s) may not be the most probable scenario, but has a probability of a few percents in the case where the stress drop is extremely high enough to lead to a super-shear rupture propagation.

Keywords **Strong ground motion  
North Anatolian Fault  
Istanbul  
Finite Difference Method**