

Lab.MSSMat UMR CNRS 8579, CentraleSupélec

Data-enhanced high-fidelity earthquake simulator for improved seismic risk analysis

Filippo Gatti, Ph.D.

filippo.gatti@centralesupelec.fr

IHPCSS 2019

Kobe, July 7th-13th, 2019



CentraleSupélec

French seismic context

- Low-Moderate seismicity
- Strong GM catalogs relatively poor (compared to Japan, California etc)
- Uncertainty due to lack of observations

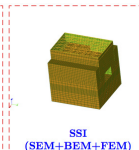
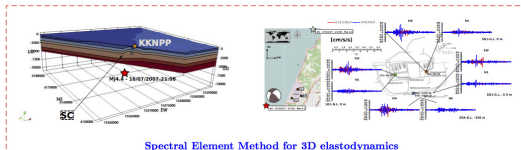
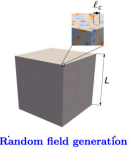
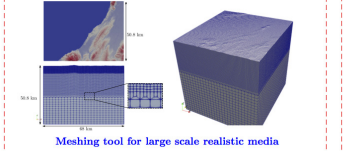
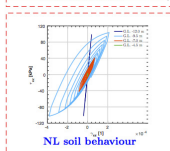
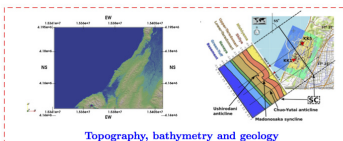
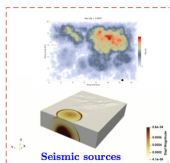
After Fukushima

- **SEISM Institute** (2012):
different expertises in seismic risk
- **NPP Seismic Risk & Vulnerability**
- **SINAPS@** (National FIA)



Fire at Onagawa Nuclear Power Plant, caused by Mw9.1 Tohoku earthquake

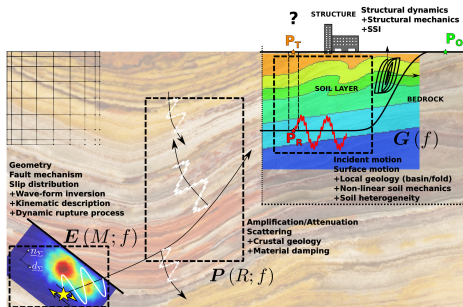
Improve methodology/tools for seismic risk assessment



3D simulation of source-to-site earthquake scenario - SINAPS® (ANR-11-RSNR-0022-04)

SEM3D: multiscale platform for predicting seismic response

SOURCE-TO-STRUCTURE ANALYSIS

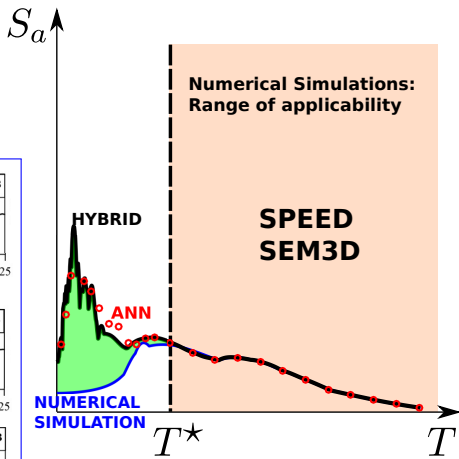
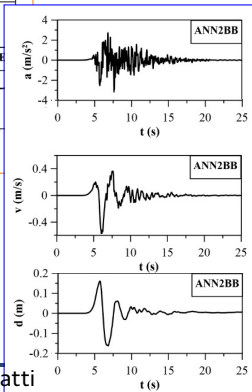
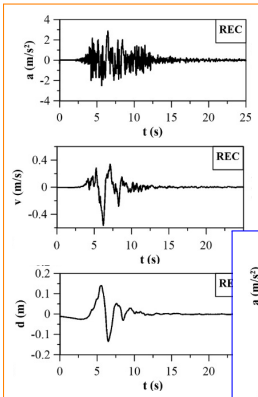


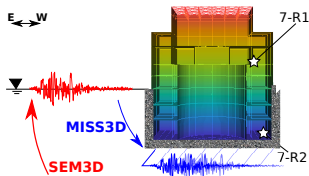
4.5·10⁸ dofs - 7 Hz earthquake simulation at Volvi (Greece)

20h wall-time - 216 MPI cores

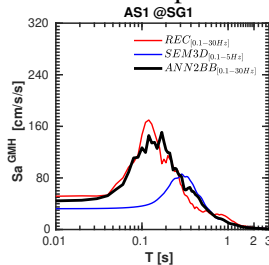
@ Fusion (Moulon Mésocentre)

Gatti et al., 2018

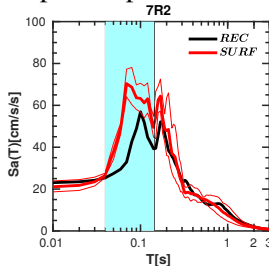




Broad-band input motion



Improved prediction of structural response



Make CivEng Great Again!

Filippo Gatti

filippo.gatti@centralesupelec.fr



<https://github.com/FilLTP89>

Science has limits: A few things that science does not do

No moral judgment

No aesthetic judgment

No rules in how to use it

No conclusions on supernatural phenomena

http://undsci.berkeley.edu/article/0_0_0/whatisscience_12

F. Gatti et al. (2018). “3-D source-to-site numerical investigation on the earthquake ground motion coherency in heterogeneous soil deposits”. In: *NUMGE2018*.