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➤ POLITECNICO DI MILANO



Associazione Ingegneri Matematici Incontro proposte tesi

Ilario Mazzieri, Paola Antonietti
MOX-Dipartimento di Matematica
Politecnico di Milano



Spectral Elements in Elastodynamics with Discontinuous Galerkin

Open-source code for 3D seismic
wave propagation

Discontinuous Galerkin Spectral
Element Method (DGSEM)

OpenMP-MPI parallel programming
paradigm

Selected as emerging application
within PRACE-2IP WP 9.3 (2013).

<http://speed.mox.polimi.it>

People

P. Antonietti, A. Ferroni,
I. Mazzieri, A. Quarteroni
(MOX-PoliMi)

K. Hashemi, A. Guney Ozcebe,
F. Gatti, R. Paolucci
(DICA-PoliMi)

C. Smerzini (U. Thessaloniki)

M. Stupazzini (MunichRE)



SPEED: Some Applications

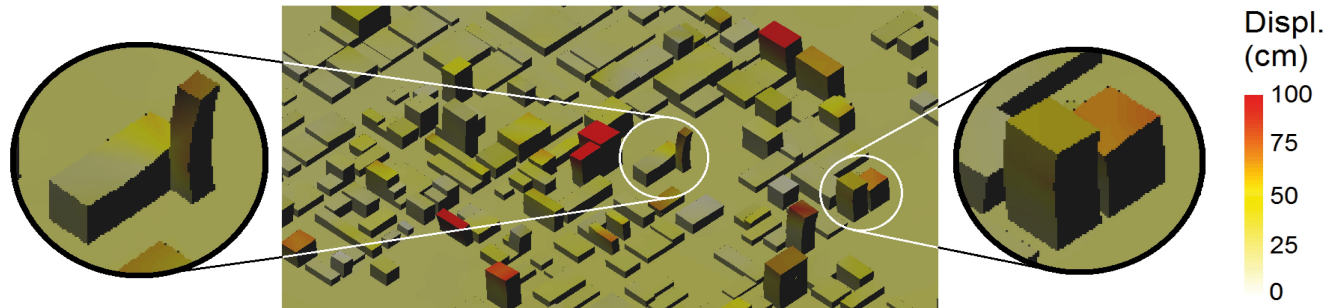


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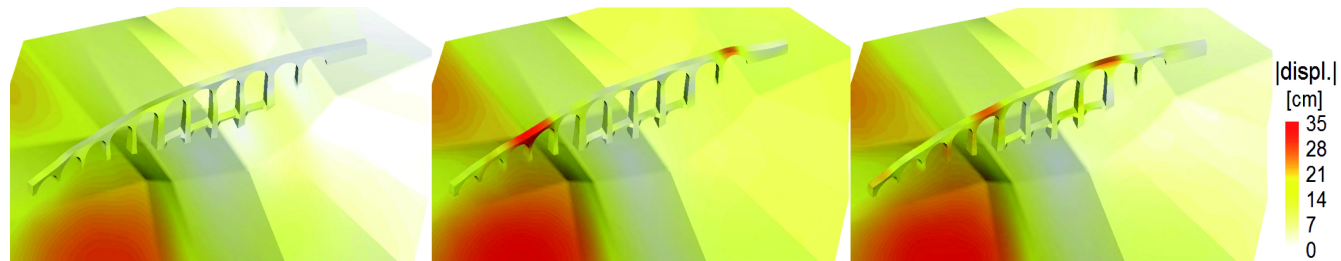


Dynamic Soil-Structure Interaction

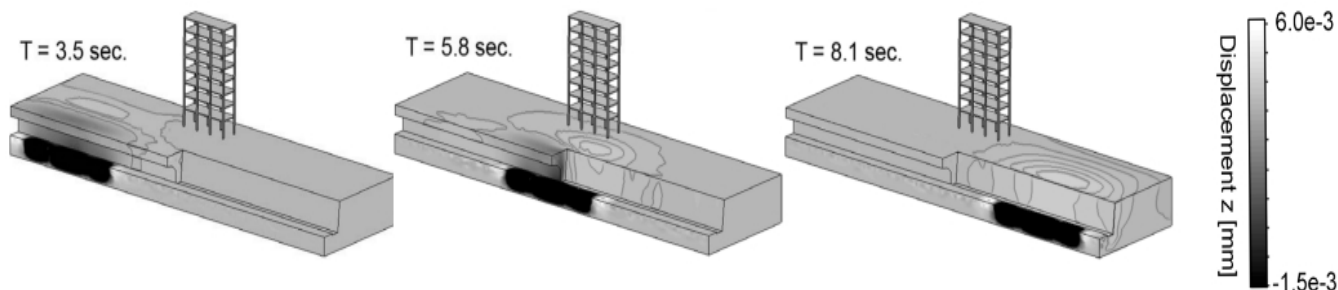
Christchurch Business District



Aquasanta Railway Bridge



Train Induced Vibrations





SPEED: Some Applications

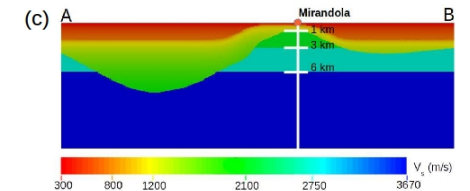
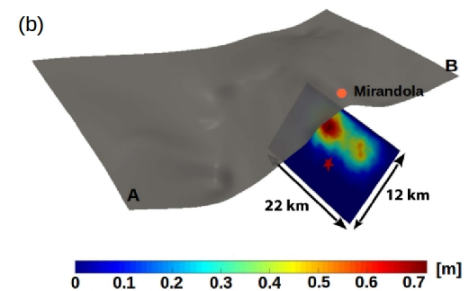
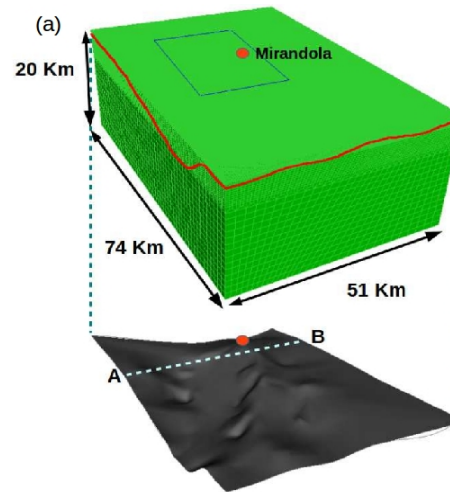


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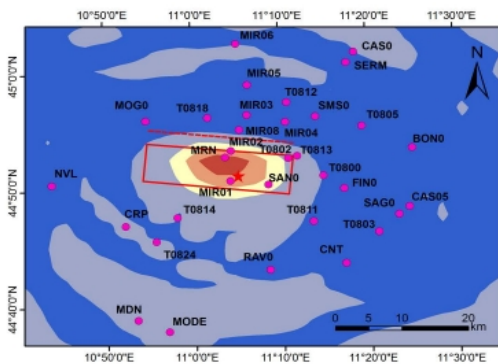


Earthquake Ground Motion

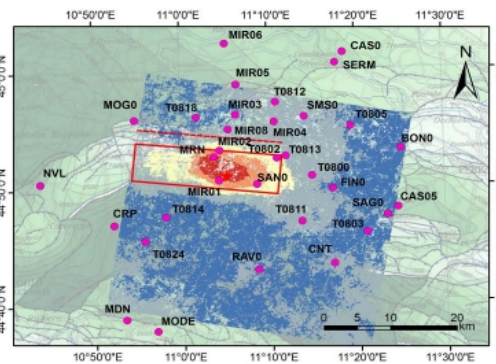
Mw 6.0 2012, May 29 Po
Plain Earthquake



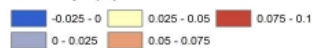
SPEED-3D



COSMO-SkyMed



Vert. Displ. (m)



Comparison with COSMO
Skymed Data



Ongoing Projects



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- **PolyPDEs: Non-conforming polyhedral finite element methods for the approximation of partial differential equations**



MINISTERO DELL'ISTRUZIONE DELL'UNIVERSITA' E DELLA RICERCA

- **PolyNuM: Polyhedral numerical methods for PDEs**



fondazione
c a r i p l o



Regione
Lombardia

- **MRPM II: Probabilistic seismic hazard analysis (enhanced)**

Munich RE





Thesis proposals



METHODS

- ◆ Efficient solvers for time integration
- ◆ Variational time integration schemes
- ◆ New discretization methodologies on polytopic grids (PolyDG, VEM)
- ◆ Non-linear constitutive models
- ◆ Exact absorbing boundaries

ALGORITHMS

- ◆ DGSEM/BEM coupling
- ◆ Acoustic-elastic coupling
- ◆ Space-time adaptive techniques

CODING

- ◆ SPEED for exascale computing
- ◆ SPEED2d parallelization (MPI/OpenMP)