SPATIAL VARIABILITY OF NEAR-SOURCE SEISMIC GROUND MOTION WITH RESPECT TO DIFFERENT DISTANCE METRICS, WITH SPECIAL EMPHASIS ON MAY 29 2012 PO PLAIN EARTHQUAKE, ITALY

Kiana HASHEMI
PhD Researcher, Department of Civil and Environmental Engineering, Politecnico di Milano, Milan, Italy
seyedehkiana.hashemydahaj@polimi.it

Ilario MAZZIERI
Post-doctoral Researcher, Department of Mathematics, Politecnico di Milano, Milan, Italy
ilario.mazzieri@polimi.it

Roberto PAOLUCCI
Professor, Department of Civil and Environmental Engineering, Politecnico di Milano, Milan, Italy
roberto.paolucci@polimi.it

Chiara SMERZINI
Post-doctoral Researcher, Aristotle University of Thessaloniki, Greece
chiara.smerzini@gmail.com

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In near-source conditions, earthquake ground motion may illustrate specific features such as long-period velocity pulses and directivity. One of the main issues corresponding to characterization of near-fault earthquake ground motion is spatial variability of seismic ground response. This denotes the differences in the amplitude and phase of seismic motions over extended area with respect to the distance from the source. In order to be able to predict reliably the earthquake ground motion and to simulate the combined effects of the near-source conditions and the site effects induced by complex geological structures, there is a certain need of using large size 3D numerical simulations. Therefore, this paper aims at illustrating the spatial variability of seismic motion predicted by a deterministic physics-based numerical study with emphasis on the sites affected by the Po Plain earthquake of 29 May 2012. Such a study is intended to illustratethe variability of peak ground motion with respect to different distance metrics available in the literature as well as proposing a new metric which can decrease the variability of resultsand the corresponding inter-event residuals significantly. Finally the results will be compared with the strong ground motions recordings obtained during M_w6.0, 29 May 2012 earthquake.

This study has made use a high-performance computer code, SPEED - *Spectral Elements in Elastodynamics with Discontinuous Galerkin*: http://mox.polimi.it/it/progetti/speed/SPEED/Home.html which is developed at Politecnico di Milano. The code, based on the Discontinuous Galerkin Spectral Elements Method (Mazzieri et al., 2013; Paolucci et al., 2014), allows to deal with non-conforming meshes and, thus, turns out to be particularly useful in tackling multi-scale seismic wave propagation problems in highly heterogeneous media.

In this analysis, the spatial variability of the peak ground motion from the earthquake occurred on 29 May 2012 in Emilia-Romagna region with moment magnitude of M_w6.0 simulated numerically by SPEED has been investigated. The computed values of **P**eak **G**round **V**elocity and **D**isplacement (**PGV** and **PGD)** have been plotted with respect to different distance metrics such as R_{hyp}, R_{jb}, R_{rup} as well as a new distance metric which is defined as the distance of each sites to a line of intersection of the fault plane with ground surface. The mid-point of this line is the projection of the hypocenter along the direction of fault plane on the ground surface and the length of the line is defined with the correlation proposed by Wells & Coopersmith (1994). The comparison of peak ground motion with respect to different distance metrics has been presented in Figure 1 for the fault normal component of motion. It can be observed that the variability of results decreased significantly in the case of using the proposed line distance metric. Further studies are in progress to check the performance of this novel distance metric against results of other numerical case studies on different fault mechanisms.

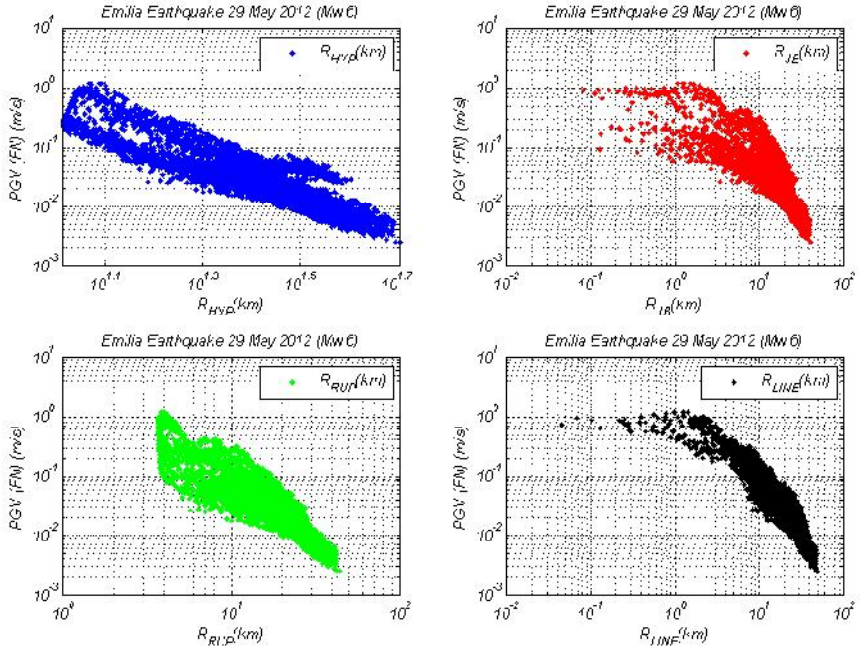

Figure 1. Comparison of peak ground velocity values of Po Plain earthquake of 29 May 2012 for different distance metrics

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