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Source effects on the simulation of the strong groud motion of the 2011 Lorca earthquake

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On May 11, 2011 a moderate seismic event (Mw=5.2) struck the city of Lorca (South-East Spain) causing nine casualties, a large number of injured people and damages at the civil buildings. The largest PGA value (360 cm/s2) ever recorded so far in Spain, was observed at the accelerometric station located in Lorca (LOR), and it was explained as due to the source directivity, rather than to local site effects. During the last years different source models, retrieved from the inversions of geodetic or seismological data, or a combination of the two, have been published. To investigate the variability that equivalent source models of an average earthquake can introduce in the computation of strong motion, we calculated seismograms (up to 1 Hz), using an approach based on the wavenumber integration and, as input, four different source models taken from the literature. The source models differ mainly for the slip distribution on the fault. Our results show that, as effect of the different sources, the ground motion variability, in terms of pseudo-spectral velocity (1s), can reach one order of magnitude for near source receivers or for sites influenced by the forward-directivity effect.
Finally, we compute the strong motion at frequencies higher than 1 Hz using the Empirical Green Functions and the source model parameters that better reproduce the recorded shaking up to 1 Hz: the computed seismograms fit satisfactorily the signals recorded at LOR station as well as at the other stations close to the source.