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The spectral element method as an effective tool for solving dynamic soil-structure interaction problems

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The spectral element method (SEM) is a powerful numerical technique naturally suited for wave propagation and dynamic soil-structure interaction (SSI) analyses and now in development for earthquake source dynamics. A class of SEM has been widely used in local and global seismological applications thanks to its capability of providing high accuracy and allowing for the implementation of optimized parallel algorithms. We illustrate in this contribution how the SEM can be effectively used also for the numerical analysis of dynamic SSI problems, with reference to the 2D seismic response of a railway viaduct in Italy. Seismic input motions are defined as equivalent excitation forces using the Domain Reduction Method. By adopting both a kinematic and dynamic description of the earthquake rupturing, we want to investigate the effect of an extended source over a close target as well as to test the reliability of kinematic models, when looking at specific parameters of the ground motion. Finally, some hints on the work in progress to effectively handle nonlinear problems with SEM are also given.