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HPC modeling of the wave propagation of extreme magnitude earthquakes

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The realistic 3D wave propagation modeling of extreme magnitude earthquakes through hundreds or thousands of kilometers of the earth's crust is both a numerical and a computational challenge, which involves spatial and temporal scales of different orders. Herewith, the mathematical and computational aspects of an ongoing interdisciplinary and international PRACE research project, on the 3D Finite Difference modeling of the wave propagation of earthquakes, implemented recently on an optimized seismic wave propagation parallel finite difference code (3DWPFD) will be presented. The opportunities and the challenges experienced and foreseen by our group in its development, implementation, and application on different High Performance Computing (HPC) platforms will be discussed. Finally, the results obtained with the 3DWPFD code to generate low frequency 3D synthetic seismograms for the 2011 Tohoku, Japan, Mw 9 earthquake will be discussed.