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Analytical Model for Tsunami Propagation including Source Kinematics

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There are only a few analytical 2+1 D models for tsunami propagation, in which most of them treat the tsunami generation as an isolated part from a static deformation field, usually obtained from seismic models. This work examines the behavior of the tsunami propagation in a simple set-up including a time source function which accounts for a time description of the rupture process on the seismic source. An analytical solution is derived in the wavenumber domain, which is quickly inverted to space with the Fast Fourier Transform. The solution is obtained in closed form in the 1+1D case. The inclusion of temporal parameters of the source such as rise time and rupture velocity reveals a specific domain of slow earthquakes that enhance the tsunami amplitudes and produce non-negligible shifts on the arrival times. The obtained results confirm that amplification occurs when the rupture velocity matches the long-wave tsunami speed and the static approximation corresponds to a limit case for (relatively) fast ruptures.