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Applications of acoustic-gravity waves numerical modelling to tsunami signals observed by gravimetry satellites in very low orbit.

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Acoustic and gravity waves propagating in planetary atmospheres have been studied intensively as markers of specific phenomena (tectonic events, explosions) or as contributors to atmosphere dynamics.

To get a better understanding of the physics behind these dynamic processes, both acoustic and gravity waves propagation should be modeled in an attenuating and windy 3D atmosphere from the ground all the way to the upper thermosphere. Thus, in order to provide an efficient numerical tool at the regional or global scale we introduce a high-order finite- difference time domain (FDTD) approach that relies on the linearized compressible Navier-Stokes equations with non constant physical parameters (density, viscosities and speed of sound) and background velocities (wind).

We present applications of these simulations to the propagation of gravity waves generated by tsunamis for realistic cases for which atmospheric models are extracted from empirical models including 3D variations of atmospheric parameters, and tsunami forcing at the ocean surface is extracted from finite-fault dislocation simulations. We describe the specific difficulties induced by the size of the simulation, the boundary conditions and the spherical geometry and compare the simulation outputs to data gathered by gravimetric satellites crossing gravity waves generated by tsunamis.