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Lithosphere-Atmosphere coupling: Spectral element modeling of the evolution of acoustic waves in the atmosphere from an underground source.

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Infrasound is one of the four Comprehensive Nuclear-Test Ban Treaty technologies for monitoring nuclear explosions. This technology measures the acoustic waves generated by the explosions followed by their propagation through the atmosphere. There are also natural phenomena that can act as an infrasound sources like sprites, volcanic eruptions and earthquakes. The infrasound waves generated from theses phenomena can also be detected by the infrasound arrays. In order to study the behavior of these waves, i.e. the physics of wave propagation in the atmosphere, their evolution and their trajectories, numerical methods are required. This presentation will deal with the evolution of acoustic waves generated by underground sources (earthquakes and underground explosions).
A 2D Spectral elements formulation for lithosphere-atmosphere coupling will be presented. The formulation includes the elastic wave equation for the seismic waves and the momentum, mass and state equations for the acoustic waves in a moving stratified atmosphere. The coupling of the two media is made by boundary conditions that ensures the continuity of traction and velocity (displacement) in the normal component to the interface.
This work has several objectives. The first is to study the evolution of acoustic waves in the atmosphere from an underground source. The second is to derive transmission coefficients for the energy flux with respect to the seismic magnitude and earth density. The third will be the generation of seismic waves from acoustic waves in the atmosphere. Is it possible?