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evaluation of SPECFEM3D for local infrasound propagation over topography

Accurate infrasound propagation modeling is important for both understanding atmospheric processes and detailed infrasound source studies. Recent research has shown that over local distances (<15 km), topography is often the dominant influence on recorded infrasound signals. In addition to reflection or diffraction from interference with the topographic surface, infrasonic waves may also couple into the ground. For simplicity, seismo-acoustic coupling is typically ignored through a rigid boundary condition between the air and ground surface. Here we evaluate the 3D Spectral Finite Element Method (SPECFEM3D) for infrasound propagation over local distances. SPECFEM3D is widely used in seismology and is a promising tool for infrasound studies. At the fluid-solid interface, SPECFEM3D ensures continuity of traction and velocity normal to the interface between the two media, and solves the acoustic and elastic equations over split domains. We compare the effects of these two free surface conditions over a wide range of frequencies, starting with a well-studied 10 by 10 km region surrounding Sakurajima volcano, Japan. Comparisons with previously published Finite-Difference Time-Domain modeling results are also shown.

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