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# Nonlinear acoustic acceleration waves in porous media flow

Pedro Jordan
U.S. Naval Research Lab., Code 7181, Stennis Space Center, MS 39529-5004, USA

Acoustic acceleration waves are defined as jumps in the first derivatives of the velocity, pressure, or density across a propagating singular surface (or wavefront). In this talk, the temporal evolution of the amplitude and the propagation speed of such waves are investigated in the context of finite-amplitude acoustic propagation in Darcy-type porous media. It is shown that there exists a critical value, $\alpha^*(>0)$, of the initial jump amplitude such that the acceleration wave magnitude either goes to zero, as $t \longrightarrow \infty$, or blows up, in finite time, depending on whether the given initial jump amplitude is less than or greater than $\alpha^*$. In addition, a connection to traveling wave solutions is noted and the linearized case is examined. Finally, the numerical solution of a (1D) nonlinear IBVP involving sinusoidal signaling in a fluid-saturated porous slab is used to illustrate the finite-time transition from acceleration wave to shock wave, which occurs when the initial jump amplitude is greater than $\alpha^*$. [Supported by ONR/NRL funding (PE 061153N).]