SM11L_10612

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Critical Time for Acoustic Waves in Weakly Nonlinear Poroelastic Materials

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The final time of existence (critical time) of acoustic waves is a characteristic feature of nonlinear hyperbolic models. We consider such a problem for poroelastic saturated materials whose material properties are described by Signorini-type constitutive relations for stresses in the skeleton and whose material parameters depend on the current porosity. In the one-dimensional case under considerations the governing set of equations describes changes of an extension of the skeleton, a mass density of the fluid, partial velocities of the skeleton and of the fluid, and a porosity. We rely on a second order approximation. Relations of the critical time to an initial porosity and to an initial amplitude are discussed.

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