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Inertial cavitation threshold in nonlinear viscoelastic media MATTHEW WARNEZ, ERIC JOHNSEN, University of Michigan — Thresholds for inertial cavitation in tissue are studied through spherical bubble models coupled to viscoelastic constitutive relationships. Therapeutic ultrasound treatments aim to exploit the large strains and shockwaves caused by large-amplitude bubble oscillations, but metrics for the onset of inertial cavitation in soft tissue do not readily carry over from water-based cavitation. Tissue is represented by a Zener-type model that incorporates viscosity, neo-Hookean elasticity, and upper-convected Maxwell relaxation. The partial differential equations for stress are solved via a spectral collocation method. The bubble dynamics are described by the Keller-Miksis equation with thermal effects. New metrics for viscoelastic cavitation thresholds are proposed and compared against past metrics. The influence of viscoelastic parameters and choice of constitutive relationship on bubble behavior is investigated in detail.

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