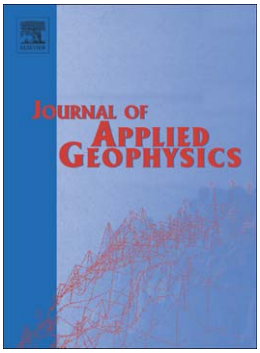

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Viscoacoustic anisotropic full waveform inversion

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ABSTRACT: A viscoacoustic vertical transverse isotropic (VTI) quasi-differential wave equation, which takes account for both the viscosity and anisotropy of media, is proposed for wavefield simulation in this study. The finite difference method is used to solve the equations, for which the attenuation terms are solved in the wavenumber domain, and all remaining terms in the time-space domain. To stabilize the adjoint wavefield, robust regularization operators are applied to the wave equation to eliminate the high-frequency component of the numerical noise produced during the backward propagation of the viscoacoustic wavefield. Based on these strategies, we derive the corresponding gradient formula and implement a viscoacoustic VTI full waveform inversion (FWI). Numerical tests verify that our proposed viscoacoustic VTI FWI can produce accurate and stable inversion results for viscoacoustic VTI data sets. In addition, we test our method's sensitivity to velocity, Q, and anisotropic parameters. Our results show that the sensitivity to velocity is much higher than that to Q and anisotropic parameters. As such, our proposed method can produce acceptable inversion results as long as the Q and anisotropic parameters are within predefined thresholds.

Keywords: viscoacoustic VTI quasi-differential wave equation; robust regularization operators; viscoacoustic VTI FWI; modified Marmousi model; sensitivity test