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黏弹性介质VSP记录模拟及在估算Q值研究中的应用

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VSP record numerical modeling in viscoelastic media and its application in the study of Q-value estimation method

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摘要

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摘要 采用标准线性固体模型, 本文建立了黏弹性介质完全匹配层吸收边界的高阶速度-应力交错网格有限差分算法, 并对黏弹性介质中的地震波传播进行了数值模拟. 基于黏弹性波动方程正演模拟提供的零偏VSP全波场数据, 本文进行了质心频移法计算Q值的反演分析. 结果表明, 反射波、转换波及短程多次波对频谱的影响较大, 对Q值反演造成一定误差. 本文的结论为实际零偏VSP资料估算地层Q值提供了有益的指导.

关键词: 黏弹性介质 标准线性固体模型 数值模拟 零偏VSP Q值

Abstract: Using the standard linear solid model, a high-order velocity-stress staggered-grid finite-difference scheme with the perfectly matched layer method was proposed for simulating seismic wave propagation in viscoelastic media. With the full-wave field data of viscoelastic modeling of zero-offset VSP from several numerical experiments, the frequency shift method to calculate Q-value was analyzed. The numerical results showed that reflected waves, transformed waves and short-path multiples have relatively large influences on the frequency spectra of received data, and make further impacts on the Q-value inversion. The conclusions taken from the paper can provide helpful guidance for the estimation of subsurface interval Q-value with oilfield zero-offset VSP data.

Keywords: Viscoelastic medium Standard linear solid model Numerical modeling Zero-offset VSP Q-value

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