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黏弹性介质纵波反射系数近似

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P wave reflection coefficient approximation of viscoelastic medium

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摘要 图/表 参考文献 相关文章 (15)

摘要 本文从黏弹性介质精确Zoeppritz方程出发,以黏弹性介质为背景,根据介质的分解理论,利用弱黏弹性近似和相似介质近似推导了黏弹性介质反射系数近似公式,该式分为实部和虚部,在实部中既存在弹性项,也存在黏弹性项,更精确地反映了实际地层介质中波的传播规律。特别地,当品质因子为无穷大、衰减角为零时,该式与以完全弹性介质为背景得到的反射系数近似公式(Aki-Richards近似公式)完全吻合,证明了公式的合理性。最后利用四类AVO模型,采用不同的黏弹性参数对黏弹性介质反射系数近似公式的有效性进行验证,结果表明,与Aki-Richards近似公式相比,以黏弹性介质为背景推导出的纵波反射系数近似公式的精度更高。

关键词 : 黏弹性介质, 弹性参数, Zoeppritz方程, 品质因子, 衰减角, 反射系数

Abstract : We propose in this article a method for P wave reflection coefficient approximation. Based on the accurate Zoeppritz equation of viscoelastic medium and the viscoelastic medium, we use the approximation of weak viscoelastic medium and similar medium to derive reflection coefficient approximate formula of viscoelastic medium according to the theory of decomposition of medium. The approximate formula is divided into real part and imaginary part. The elastic and viscoelastic terms are all in the real part, which more accurately reflects the wave propagation in the actual formation. In particular, when the quality factor is infinite and the attenuation angel is zero, the reflection coefficient approximate formula is completely consistent with the reflection coefficient approximate formula in the elastic medium(Aki-Richards approximate formula), which proves the rationality of the formula. Finally, the validity of the reflection coefficient approximate formula of viscoelastic medium is verified with the four kinds of AVO models and different viscoelastic parameters. The results show that the P-wave reflection coefficient approximate formula with the background of viscoelastic medium has higher precision than Aki-Richards approximate formula.

Key words : viscoelastic medium elastic parameter Zoeppritz equation quality factor attenuation angel reflection coefficient

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