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# 球面波的反射P波AVO分析

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# Spherical-wave AVO analysis of reflected P-wave

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摘要 本文对球面波反射P波反射系数计算公式进行了推导,根据推导公式计算出第I类AVO和第III类AVO介质中反射系数及相位随入射角的变化,并与基于平面波的Zoeppritz方程计算的结果进行对比.结果显示,对于第I类AVO介质,球面波反射系数在临界角附近较基于平面波的Zoeppritz方程计算结果更精确;同时受界面深度的影响较大,随深度的增加,球面波AVO趋势接近平面波AVO.最后,通过数值模拟技术,对模型数据和实际数据进行模拟,对平面波AVO道集和球面波AVO道集进行了验证分析.浅层的第I类AVO现象,在近临界角和超临界角处折射引起反射系数与相位的变化较大,对于第III类AVO现象,由于不存在临界角问题,球面波模拟结果与基于平面波的Zoeppritz计算结果差别较小.上述计算分析,可为实际资料的大偏移距道集的AVO分析提供理论基础.

关键词 球面波, Zoeppritz, AVO, 弹性介质, 反射波

Abstract: In this paper, the reflection coefficient formula of spherical reflected P wave was derived. According to the derived formula, the variations of reflection coefficient and phase of class I and class III AVO media versus angle were calculated, and compared with the result of plane wave Zoeppritz formula. The results show that for the class I AVO medium, spherical wave reflection coefficient near the critical angle is more accurate than the Zoeppritz's computed result, and is highly influenced by the interface depth, i.e. with depth increasing, the trend of spherical wave AVO is close to plane wave AVO. Finally, numerical simulation technology was applied to verify and analyze the spherical wave AVO gather. The results show that a larger variation occurred for the refraction caused by the near-critical or super-critical angle through the class I AVO medium. But for the class III AVO phenomenon, because there is no critical angle problem, the spherical wave simulation results had little difference with Zoeppritz's. These calculation and analysis results would provide a theoretical basis for the AVO analysis of large offset gather data in practice.

Keywords Spherical wave, Zoeppritz, AVO, Elastic medium, Reflected wave

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