地球物理学报 2008 51 (2): 469～478 ISSN: 0001-5733 CN: 11-2074/P

基于二维三分量伪谱法模拟数据的EDA介质中横波分裂研究

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收稿日期 2006-11-9 修回日期 2007-11-1 网络版发布日期 2008-3-20 接受日期

摘要 为了检测定向裂隙介质中横波分裂的方位属性特征，分析地震属性随裂隙密度和方位变化，采用人工吸收边界和反周期扩展边界，用伪谱法获得不同裂隙密度和不同方位地质模型三分量地面记录；应用时频分析和剪切波偏振分析研究由于裂隙方位和密度引起的横波分裂.结果显示，裂隙密度和方位决定着横波分裂的时差和偏振.快慢横波的延迟时间随裂隙密度增大而增加，不同方位相同裂隙密度的横波分裂时差有微小的变化.在45°方位检测时间延迟时间最大.通过时频分析，可以看到不同方位的瞬时主频有显著的变化，在横波分裂处瞬时主频有明显变化.因此，瞬时主频和快横波的偏振以及延迟时间可以作为裂隙方位和密度的指示.

关键词 EDA介质, 横波分裂, 伪谱法, 偏振, 延迟时间, 瞬时主频, 瞬时频率

分类号 P315, P631

DOI:

Azimuth-dependence of shear-wave splitting in EDA media: Two-dimensional three-component pseudo spectral modeling

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Received 2006-11-9 Revised 2007-11-1 Online 2008-3-20 Accepted

Abstract In order to evaluate the detecting performance of azimuthal dependence of shear wave splitting on preferred oriented cracks/fractures，we made analyses of seismic attributes variations with respect to crack/fracture density and orientation. A set of three-component gathers are obtained from two-dimensional modeling with the popular pseudo-spectral wavefield simulation method. In our modeling，the absorbing boundary and antiperiodic extension method are applied to suppress surface-observed synthetic seismograms from the layered models with different orientation azimuth and density of cracks/fractures. Then，the time-frequency analysis and splitting shear wave's polarization check techniques are adopted to understand azimuthal dependence of shear wave splitting on preferred oriented cracks/fractures. The results demonstrate that the orientation and density of cracks/fractures determine the delay time and polarization of shear-wave splitting. With density of cracks/fractures increasing，the delay time of fast and slow shear wave increases. The delay time varies slightly with crack orientation，and re
aches maximum at 45°. On the other hand，by applying time-frequency analysis，we obtain that instantaneous dominant frequency is obviously different for different cracks/fractures orientation and it changes sharply with the shear wave splitting. Thus，the azimuthal variation of instantaneous amplitude and frequency as well as the delay time and fast splitting shear wave polarization can be used as seismic signatures of azimuth and density of orientated cracks/fractures.

Key words EDA media Shear splitting Pseudo-spectral modeling Polarization Delay time Instantaneous dominant frequency Instantaneous frequency

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