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从2007年度EAGE年会看地球物理技术的发展

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摘要 采用多方位或宽方位的三维采集技术，能够改善地震资料的照明、去除多次波和提高横向分辨率，因此，相对窄方位采集的资料，在成像方面有明显的改进。在地震速度建模方法中建立短波长的速度模型，可以提高速度场的分辨率。复杂地质体建模加入地层倾角变化和各向异性的影响，使得速度模型更加适应地下复杂构造。在构造倾角大于90°和射线多路径成像问题中，可以采用逆时偏移方法实现高陡构造的成像。纵波各向异性叠前深度偏移应用表明，在偏移处理中即使采用最简单的各向异性参数，也比使用各向同性参数处理的效果好，各向异性参数应尽早引入处理流程。对比转换波资料的各向异性叠前时间偏移和各向异性叠前深度偏移，各向异性叠前深度偏移能够改善成像道集和剖面的质量。S波分裂中的慢S波在含水地层的振幅响应为弱振幅，且S波分裂现象明显，而含油地层的S波分裂不明显。这些观测表明了用S波分裂进行油水识别的可行性。多分量地震资料中PS波的振幅信息能够提升PP波在河道砂岩识别中的精度，速度比和各向异性参数的应用能精细刻画地层裂缝发育。在四维地震资料处理中，叠前时间偏移和叠前深度偏移获得的不同差值剖面可能会改变对剩余油分布的判断，显示出叠前深度偏移处理的重要性。用时移地震资料监测断层的移动，可以规避钻井穿越活动断层时的风险。贝叶斯方法能够有效地计算出AVAZ反演产生的不确定性，可视化显示后可为AVAZ反演效果提供评估依据。叠前地震资料反演的属性参数能用于储层预测。

关键词 宽方位采集；地震速度建模；逆时偏移；各向异性叠前深度偏移；四维地震

Developing trends of geophysical technologies: Highlights of 2007 EAGE conference

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Abstract Comparing to narrow azimuth data, wide azimuth data results in noticeably better seismic imaging due to improvement in illumination, transverse resolution, and attenuation of multiples. High-resolution velocity model is built by solving short-wavelength velocity variations with hybrid grid tomography. Incorporating formation dips and anisotropy into a structural model make it suitable for complex subsurface structure. Reverse time migration has become commercially available for complex environments, where both steep dip and multipathing is an issue. It is concluded from the applications of anisotropy in PSDM (prestack depth migration) that even a simplest anisotropic model is worthwhile compared to isotropic data processing. For PS-wave processing, imaging is obviously more definite on anisotropic depth migrated section than on anisotropic prestack time migrated section as shown from the comparison between anisotropic prestack time migration and anisotropic prestack depth migration. Slow S-wave component shows amplitude dimming in water-flooded areas, whereas oil-bearing formation shows only weak S-wave splitting. These observations reveal the potential of using S-wave splitting for oil-water discrimination. PS-wave seismic amplitudes complement PP-wave channel interpretation to highlight prospective drilling targets. PS-wave and PP-wave seismic data can be coupled to highlight fault and fracture trends and guide well placement. Difference sections from time-lapse PSTM and PSDM give additional confidence in revealing remaining oil column. Monitoring fault movements with time-lapse seismic data is important to avoid the hazards associated with wells crossing reactivated faults. Uncertainty can be calculated following a Bayesian methodology for AVAZ inversion and viewed with visualization technique. Lambda-rho attribute derived from prestack seismic data is useful in detecting and delineating hydrocarbon reservoirs. The results show that hydrocarbon sands are associated with low values of lambda-rho.

Key words wide azimuth data acquisitions; velocity model construction; reverse time migration; anisotropic PSDM; time-lapse seismic
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