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基于模拟退火算法的地震资料谱反演技术

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Seismic spectral inversion based on simulated annealing

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摘要

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摘要 对于厚度小于地震调谐厚度的薄储层, 受地震分辨率极限的限制, 从地震资料上无法识别。为此, 文中基于模拟退火算法的谱反演技术, 采用薄层陷频理论, 首先对地震资料进行短时傅里叶变换以求取谱反演的输入数据, 再利用模拟退火算法进行反演。该方法依据温度的柯西分布状态产生函数, 在高温状态下可进行大范围的搜索, 在低温状态下只对当前模型附近进行搜索, 改进了退火过程及抽样过程, 并在改进过程中增加了记忆功能, 提高了模拟退火算法的效率与精度。该方法能够突破Widess模型分辨率的极限, 拓宽地震频带, 清晰刻画微小目标地质体及其内部特征。通过理论模型及实际地震资料的试算, 验证了本文方法的可行性。

关键词: 谱反演 薄层预测 模拟退火 地震分辨率

Abstract: Thin reservoirs with the thickness less than that of seismic tuning cannot be identified on seismic data due to the limit of the seismic bandwidth. A spectral inversion based on simulated annealing is put forward in this paper to widen seismic bandwidth for thin reservoir identification. According to the limit of thin layer frequent theory, we firstly process seismic data with short-time Fourier transform to gain input data of spectral inversion. And then we carry out a spectral inversion with simulated annealing. The method produces functions depend on the temperature Cauchy distribution, which can search in wide range at high temperature and search near the current model only at low temperature. Both the simulated annealing process and the sampling process are improved, and the memory function is increased. The efficiency and accuracy of the simulated annealing algorithm are also improved. Widening seismic bandwidth and Breaking through the resolution limit of Widness model, the proposed method depicts clearly tiny geological targets and their internal features. Tests on theoretical model and real seismic data verify the feasibility of the proposed method.

Keywords: spectral inversion thin layer prediction simulated annealing seismic resolution

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