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基于地震数据瞬时相位谱的地层厚度估算

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Thickness Estimates from Instantaneous Phase Spectrum of Poststack Seismic Data

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摘要/Abstract

摘要：

针对低于调谐厚度的地层厚度估算难题，探索了一种应用叠后地震数据瞬时相位谱的地层厚度估算方法。该方法在有效地震频带内应用瞬时相位谱构建地层厚度估算的目标函数，不需要考虑反射系数大小和极性、地震子波的主频率。合成记录数据测试显示该方法在地震数据无噪声的情况下，对于厚度小于和大于调谐厚度的情况均能得到精确的厚度估算，厚度估算不受地震数据带宽、反射系数大小和极性的影响，但是厚度估算严重受噪声污染的影响。野外实际数据的应用表明,当在有效频带内地震数据具有高信噪比的前提下，应用该方法获得的地层厚度估算与测井解释数据比较，误差均小于10%，能够为油气藏勘探和开发的钻井部署提供依据。

关键词: 调谐厚度, 厚度估算, 瞬时相位谱, 旅行时, 谱分解

Abstract:

Thickness estimates using instantaneous phase spectrum of post-stack seismic data was explored to estimate bed thickness that is less than tuning thickness.Objective function for thickness estimates,in this method,was constructed on the basis of the instantaneous phase spectrum in the available seismic frequency band,in which magnitude and polarity of seismic reflectivity and the dominant frequency of seismic wavelet were not need to be considered.Synthetic data test showed that on the premise of seismic data without noise,bed thickness of less than and greater than tuning thickness is estimated accurately,and bed thickness estimates using the proposed method is not affected by the frequency bandwidth of seismic data and magnitude and polarity of seismic reflectivity,but thickness estimates is contaminated seriously by noise.Real seismic data examples was evaluated to demonstrate that when SNR of seismic data within the effective frequency band is very high,estimation error employing this method,compared with well logging and interpretation data,is less than 10%,providing the basis for drilling deployment of petroleum reservoir exploration and development.

Key words: Tuning thickness, Thickness estimates, Instantaneous phase spectrum, Travel time, Spectral decomposition

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