

利用VSP资料直达波的包络峰值处瞬时频率提取介质品质因子

高静怀¹, 杨森林¹, 王大兴^{1,2}

1 西安交通大学电子与信息工程学院波动与信息研究所, 西安 710049; 2 中国石油长庆油田分公司勘探开发研究院, 西安 710021

收稿日期 2007-8-22 修回日期 2008-2-28 网络版发布日期 2008-5-17 接受日期

摘要 本文采用一个具有4个待定参数的函数去逼近震源子波, 利用黏弹介质中单程波传播理论推导出了地震子波包络峰值处瞬时频率(EPIF)和品质因子之间的解析关系; 同时, 为提高瞬时频率的估计精度和抗噪性能, 在小波域中发展了一种计算瞬时频率的方法, 并在此基础上提出了估算VSP资料 Q 值的方法, 简称小波域包络峰值处瞬时频率法(WEPIF). 合成的VSP数据衰减估计结果表明, 与对数谱比法和中心频率偏移法相比较, WEPIF法受到界面反射波影响相对较小、计算结果稳定、精度相对较高. 将WEPIF法用于某气田的单炮零偏6级VSP资料 Q 值估计, 结果表明, 吸收强弱与储层含气性高低有良好的对应关系.

关键词 [衰减](#) [品质因子](#) [瞬时频率](#) [小波变换](#) [包络峰值处瞬时频率](#)

分类号 [P631](#)

DOI:

Quality factor extraction using instantaneous frequency at envelope peak of direct waves of VSP data

GAO Jing-Huai¹, YANG Sen-Lin¹, WANG Da-Xing^{1,2}

1 Wave and Information Institute, School of Electronic and Information Engineering, Xi'an Jiaotong University, Xi'an 710049, China; 2 Research Institute of E & D, Changqing Oil-Field Company of CNPC, Xi'an 710021, China

Received 2007-8-22 Revised 2008-2-28 Online 2008-5-17 Accepted

Abstract In the work, employing a function with four undetermined parameters to model the source wavelet, an analytical relation between Q -factor and envelope peak instantaneous frequency (EPIF) is derived from the theory of one-way waves propagating in an anelastic medium; at the same time, a method for extracting instantaneous frequency (IF) in wavelet domain is developed for improving the precision and anti-noise performance of IF estimation, and based on these, a method called EPIF in wavelet domain (WEPIF) is proposed for estimating Q -factor of VSP data. Test of synthetic zero-offset VSP data indicates that, comparing with logarithm spectral ratio method and centroid frequency shift method, WEPIF method is more stable and precise, and less sensitive to interface reflection waves. The Q -factors of single-shot zero-offset VSP data of 6-series from a certain gas field is estimated by WEPIF method, and the result shows that the extent of absorption corresponds well to the gas saturation of reservoirs.

Key words [Attenuation](#) [Quality-factor](#) [Instantaneous frequency \(IF\)](#) [Wavelet transform](#) [Envelope peak instantaneous frequency \(EPIF\)](#)

通讯作者:

高静怀 jhgao@mail.xjtu.edu.cn

作者个人主页: 高静怀¹; 杨森林¹; 王大兴^{1;2}

扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF](#) (2173KB)

▶ [\[HTML全文\]](#) (0KB)

▶ [参考文献](#)

服务与反馈

▶ [把本文推荐给朋友](#)

▶ [加入我的书架](#)

▶ [加入引用管理器](#)

▶ [引用本文](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

相关信息

▶ [本刊中 包含“衰减”的 相关文章](#)

▶ 本文作者相关文章

• [高静怀](#)

• [杨森林](#)

• [王大兴](#)

• [—](#)