

引用本文(Citation):

袁艳华, 王一博, 刘伊克, 常旭. 基于非二次幂Curvelet变换的最小二乘匹配算法及其应用. 地球物理学报, 2013, 56(4): 1340-1349, doi: 10.6038/cjg20130428

YUAN Yan-Hua, WANG Yi-Bo, LIU Yi-Ke, CHANG Xu. A non-dyadic Curvelet transform based least-squares matching algorithm and its application. Chinese Journal Geophysics, 2013, 56(4): 1340-1349, doi: 10.6038/cjg20130428

基于非二次幂Curvelet变换的最小二乘匹配算法及其应用

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A non-dyadic Curvelet transform based least-squares matching algorithm and its application

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摘要

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摘要

本文提出了基于非二次幂Curvelet变换的最小二乘匹配算法. 首先, 根据输入地震信号的频谱和方向等特征进行非二次幂Curvelet变换, 根据其特征不同, 最大程度地将有效信号和噪声分开; 然后, 在噪声能量集中的非二次幂Curvelet子记录上对输入数据和预测的噪声模型进行最小二乘匹配滤波处理. 本方法提高了常规最小二乘匹配算法在时间空间域内进行信噪分离的稳定性和准确性. 对含有面波的实际地震数据进行测试, 其结果表明本方法可以有效地压制面波干扰, 特别是当面波和有效信号有交叉或重叠等现象出现时, 能较好地保护反射同相轴信息. 本方法还可用于对含自由表面多次波和层间多次波等地震数据进行自适应信噪分离.

关键词 非二次幂Curvelet变换, 最小二乘匹配算法, 信噪分离, 面波

Abstract:

We propose a non-dyadic Curvelet transform based least-squares matching method. Firstly, in order to separate the signal and noise better, the input data is decomposed using non-dyadic Curvelet transform according to their spectral and directional characteristics. Secondly, the least-squares matching method is applied on non-dyadic Curvelet coefficients which contain noises most. Our approach improves the stability and accuracy of conventional time-spatial domain least-squares matching method. Results of field records show that the proposed approach performs well not only in suppressing energies of surface waves, but also in protecting effective reflection events, especially in case of overlapping events. The proposed approach can also be used to adaptively subtract predictable interferences such as free surface-related multiples and internal multiples.

Keywords Non-dyadic Curvelet transform, Least-squares matching method, Signal-noise separation, Surface wave

Received 2012-11-19;

Fund:

国家自然科学基金(40904030, 40930421)和国家重点基础研究发展计划(973计划)项目(2009CB219404)资助.

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