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非二次幂Curvelet变换及其在地震噪声压制中的应用

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Non-dyadic Curvelet transform and its application in seismic noise elimination

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摘要

本文分析了Curvelet变换在地震数据处理中的优势及不足,提出了非二次幂Curvelet变换.主要有两点改进:(1)将经典Curvelet变换非自适应的二次幂多尺度多角度分解方式改进为基于地震数据特点的、自适应非二次幂可控多尺度多角度分解方式,可以更有效地反映地震信号的主要方向特征和频率特征;(2)在最粗尺度引入各向异性分析,实现了对低频信号的精细处理.本文通过处理合成记录和含有面波干扰的实际数据算例验证了非二次幂Curvelet变换在地震噪声压制中的有效性.

关键词 非二次幂Curvelet变换, 可控角度分解, 可控尺度分解

Abstract:

By analyzing the advantages and disadvantages of Curvelet transform in seismic processing, we propose a non-dyadic Curvelet transform for seismic noise elimination. There are two improvements:(1) The non-adaptive dyadic scale and angular decomposition has been updated to an adaptive non-dyadic controllable scale and angular decomposition, which provides a better representation of the primary characteristics of seismic data in terms of orientation and frequency. (2) The anisotropic analysis is introduced to the lowermost scale to improve the accuracy of low-frequency components processing. The synthetic and field data examples are used to validate the effectiveness of the proposed data analysis method.

Keywords Non-dyadic Curvelet transform, Controllable angular decomposition, Controllable scale decomposition

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