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Hilbert-Huang 变换与大地电磁噪声压制

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摘要 大地电磁信号具有非线性、非平稳、非最小相位特征，不符合以Fourier变换为基础的传统功率谱估计的基本要求. Hilbert-Huang变换是近年发展起来的处理非线性、非平稳信号的完全局部时频分析方法. 本文在简要介绍Hilbert-Huang变换基本原理与算法基础上，以实际数据分析为例，探讨了它在大地电磁信号处理及噪声压制中的应用. 提出利用Hilbert时-频能量谱对大地电磁信号进行时段筛选，以提高信号品质，增强数据处理的质量和资料的可解释性. 利用经验模态分解方法及其多尺度滤波特征,可以有效地分析MT信号中的噪声分布特征，并进行干扰压制.

关键词 Hilbert-Huang变换,经验模态分解,固有模态函数,大地电磁,噪声压制

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Hilbert-Huang transformation and noise suppression of magnetotelluric sounding data

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Abstract Magnetotelluric signals are nonlinear, non-stationary, non-minimum phase, they do not meet the basic requirements of the Fourier transform based on the traditional power spectrum estimation. Hilbert-Huang Transformation is an entirely local time-frequency analysis method developed in recent years for dealing with nonlinear, non-stationary signals. This paper briefly introduced the Hilbert-Huang Transform basic principles and algorithms. Based on the analysis of actual data examples, we discussed its application in magnetotelluric signal processing and noise suppression. It has been founded that selecting magnetotelluric signal sessions using Hilbert time-frequency energy spectrum is helpful to improve signal quality and enhance the quality of data processing and information interpretability. Using empirical mode decomposition method and multi-scale filter characteristics can effectively analyze the noise distribution of MT signal and suppress interference.

Key words Hilbert-Huang transformation Empirical mode decomposition Magnetotelluric sounding Noise suppression

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