

基于高阶累积量ARMA模型线性非线性结合的地震子波提取方法研究

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摘要 在地震子波非因果、混合相位的假设下, 本文应用自回归滑动平均(ARMA)模型对地震子波进行参数化建模, 并提出利用线性(矩阵方程法)和非线性(ARMA拟合方法)相结合的参数估计方式对该模型进行参数估计. 在利用矩阵方程确定模型参数范围的基础上, 利用累积量拟合法精确估计参数. 理论分析和仿真结果表明, 该方式有较好的适应性: 一方面提高了子波估计精度, 避免单独使用矩阵方程法在短数据地震记录情况下可能带来的估计误差; 另一方面提高了子波提取运算效率, 降低了ARMA模型拟合方法参数范围确定的复杂性, 避免了单纯使用滑动平均(MA)模型拟合法估计过多参数所导致的运算规模过大问题. 初步应用结果表明该方法是有效可行的.

关键词 [高阶累积量](#) [子波提取](#) [自回归滑动平均](#) [线性非线性结合](#)

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Seismic wavelet extraction via cumulant-based ARMA model approach with linear and nonlinear combination

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Abstract ARMA model was used to describe the seismic wavelet on the assumption that the seismic wavelet is non-causal and mixed phase. A cumulant-based parametric estimation approach was proposed to estimate the wavelet parameters which synthesized both the linear (matrix equation) and nonlinear (cumulant matching) methods. In this approach, the cumulant matching approach is used for accurate parameter estimation, on the basis of the initial guess generated from matrix equations. Theoretic analysis and numerical simulation demonstrate the feasibility of the approach. Compared with the potential computational error of the linear methods, this approach can improve parameter estimation precision. Moreover, it extracts wavelet with high computational efficiency by avoiding the use of cumulant matching method under MA model description, and reduces the complexity of initial guess via ARMA model matching approach. The preliminary application results show that this approach is effective and feasible.

Key words [High-order cumulant](#); [Wavelet extraction](#); [ARMA \(autoregressive moving average\)](#); [Linear and nonlinear combination](#)

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