

基于带状混合矩阵ICA实现地震盲反褶积

刘喜武,高伟,张宁,刘婉莹

中国海洋大学海洋地球科学学院, 青岛 266100

收稿日期 2007-4-15 修回日期 2007-7-19 网络版发布日期 2007-8-20 接受日期 2007-8-20

摘要 基于对地震反褶积本质上是一个盲过程的认识, 引入高阶统计学盲源分离技术——独立分量分析 (ICA) 实现地震盲反褶积. 在无噪声假设条件下, 利用地震记录时间延迟矩阵和地震子波带状褶积矩阵, 将地震褶积模型转化为一般线性混合ICA模型, 采用FastICA算法, 将带状性质作为先验信息, 实现所谓带状ICA算法 (B\|ICA), 得到个数与子波算子长度相等的多个估计反射系数序列和估计子波序列, 最后利用褶积模型提供的附加信息从中优选出最佳的反射系数序列及相应的地震子波. 模型数据和实际二维地震道数值算例表明: 对于统计性反褶积, 在不对反射系数作高斯白噪假设, 不对子波作最小相位假设的所谓“全盲”条件下, 基于ICA方法 (反射系数非高斯分布, 地震子波非最小相位) 可以较好解决地震盲反褶积问题, 是基于二阶统计特性的地震信号统计性反褶积方法的提升, 具有可行性和应用前景.

关键词 [地震盲反褶积独立变量分析 \(ICA\) 时间延迟矩阵带状褶积\(混合\)矩阵](#)

分类号

DOI:

ICA with banded mixing matrix based seismic blind deconvolution

LIU Xi wu, GAO Wei, ZHANG Ning, LIU Wan ying

Received 2007-4-15 Revised 2007-7-19 Online 2007-8-20 Accepted 2007-8-20

Abstract Considering seismic deconvolution is of blind processing, one kind of high order stasticstical methods, so called, independent components analysis(ICA), is introduced to implement seismic blind deconvolution in this paper. Neglecting noise, to facilitate this, time lagged version matrix of convolved signal and seismic wavelet banded convolving mixture matrix are used ,by multiplying the reflectivity vectors, to construct a basic ICA model. By applying FastICA algorithm, and combining the banded property as a prior information ,giving rised to a banded ICA algorithm(B\|ICA), more reflectivity series are produces as many as the dimension of the seismic wavelet filter, and finally one best independent component can be extracted from the candinate solutions by additional information from the seismic convolution model. The model and real seismic data numerical examples all shows the B\|ICA algorithm valid. The advantage of B\|ICA method is to inverse blindly the wavelet and the reflectivity at the same time effectively with no assumpsition of Guassality and whiten noise to relecticity non minimum phase to seismic wavelet.The B\|ICA algorithm refered here is a updated version of second order stasticstical methods for seismic signals blind deconvolution and worth doing more researchs.

Key words

通讯作者:

刘喜武 liuxiwu@ouc.edu.cn

作者个人主页: 刘喜武;高伟;张宁;刘婉莹

扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF](#) (1657KB)

▶ [\[HTML全文\]](#) (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“地震盲反褶积独立变量分析 \(ICA\) 时间延迟矩阵带状褶积\(混合\)矩阵”的 相关文章](#)

▶ 本文作者相关文章

- [刘喜武](#)
- [高伟](#)
- [张宁](#)
- [刘婉莹](#)