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SURE算法在核磁共振信号去噪中的实现

谢庆明, 肖立志, 廖广志*

中国石油大学油气资源与探测国家重点实验室, 北京 102249

Application of SURE algorithm to echo train de-noising in low field NMR logging

XIE Qing-Ming, XIAO Li-Zhi, LIAO Guang-Zhi*

State Key Laboratory of Petroleum Resource and Prospecting, China University of Petroleum, Beijing 102249

摘要

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摘要 核磁共振产生的回波信号幅度比较低,容易受到噪声干扰.如何有效提高低场核磁共振回波信号的信噪比一直是核磁共振的关键课题之一.本文讨论了一种基于小波变换的Stein无偏风险估计(SURE)算法,从相关系数图版中确定尺度因子和分解层数在不同分解层次上的差异取不同的阈值对回波信号去噪.该算法与传统的模板大值法和空域相关法相比,能获得更高的信噪比.流体分析提供更准确的孔隙度信息.

关键词: 核磁共振 回波去噪 SURE SVD反演 小波变换

Abstract: NMR (nuclear magnetic resonance) echo train is easily contaminated by noise and the amplitude is very small. It is critical to improve the signal-noise-ratio of echo train. A novel de-noising algorithm—Stein Unbiased Risk Estimation, which is based on the wavelet transform was introduced in the paper. The scale decomposition level would be designed through calculating correlation, and the threshold in different decomposition level would be calculated according to noise coefficient. Compared to traditional algorithm method discussed in the paper would get the better SNR and can provide more precise porosity for the fluid analysis of formation.

Keywords: Nuclear magnetic resonance Echo de-noising SURE SVD inversion Wavelet transform

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Corresponding Authors: .E-mail: xiaolizhi@cup.edu.cn Email