

核磁共振双TW测井数据联合反演与流体识别

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摘要 针对核磁共振测井双TW观测数据分析和流体识别的需要, 研究了基于全局搜索的遗传算法和局部搜索的最小二乘法的联合反演算法, 实现了核磁共振双TW观测数据处理. 首先, 研究了饱和油气水岩石物理模型的核磁共振双TW观测模式的测井响应机理; 然后, 利用全局搜索性能优良的遗传算法, 对核磁共振回波差数据进行了反演, 计算出了流体的核磁弛豫性质及其体积; 最后, 以遗传算法的反演结果为初值, 利用阻尼最小二乘方法对双TW回波串进行更精细的反演, 计算出了双TW的 T_2 分布、孔隙度和流体饱和度. 理想模型的合成数据和实际测井资料应用表明, 遗传算法与最小二乘方法相结合是一种行之有效的联合反演方法, 能较好地实现核磁共振测井双TW观测数据的处理和流体评价.

关键词 [核磁共振双TW测井](#) [遗传算法](#) [最小二乘法](#) [联合反演](#) [流体识别](#)

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Joint inversion method for NMR dual-TW logging data and fluid typing

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Abstract For the analysis of dual-TW activation of NMR logging and fluid typing, a joint inversion method is proposed based on genetic algorithm (GA), a global searching method, and damping least square (LSQR) method, a local optimization method. Firstly, multi-exponential response mechanism of NMR spin echo trains of dual-TW activation in reservoir filled with oil, water and gas is deduced and discussed in detail. Then, GA method is applied to global optimization of differential echo trains of NMR dual-TW Logging and T_2 values of oil and gas, oil porosity, gas porosity are calculated. Finally, LSQR method is run for dual-TW echo trains based on the results of GA, and gives T_2 distributions of dual-TW activation data, component porosity, effective porosity and hydrocarbon saturation. From above calculating results, fluid types of reservoirs are interpreted and summarized successfully. The inversion results of synthesized echo trains from forward modeling of various ideal models indicate that the joint inversion method is correct and effective. Furthermore, the interpretation conclusion from the inversion results in oil field case agrees well with well testing. So, the joint inversion method based on GA and LSQR is effective and suits to dual-TW activation data processing of NMR logging and fluid typing.

Key words [NMR dual-TW logging](#); [Genetic algorithm \(GA\)](#); [Least square method\(LSQR\)](#); [Joint inversion](#); [Fluid typing](#)

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