

Applying Low-Field NMR in Petrophysics: A journey from ill-posed inversion of Hydrogen spin system recovery to rock and fluid characterization

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Abstract

Nuclear Magnetic Resonance relaxation is a spin system recovery process where rotational (T₂, spin-spin) and translational (T₁, spin-lattice) diffusion influences the energy (Hamiltonian) of the Hydrogen nuclei. The spectra of relaxation times, T₁ and T₂, obtained from Laplace inversion of magnetization build-up and decay measurements contribute enormously to the studies of petrophysical characterization of rock-fluid systems.

LF-NMR has become, in many cases, a unique and decisive technology for determining petrophysical properties like porosity, porosity partitions, permeability, pore-size distributions, fluid types, fluid saturations, and oil viscosity. LF-NMR can also shed light on the understanding of rock-fluid interactions.

The present talk is a journey through examples of LF-NMR well logging and core measurements that aims to explain fundamental scientific research and business drivers that make the LF-NMR such an attractive and challenging technology, not only in Oil & Gas but also in Geothermal Energy applications.