

Abstract Submitted
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MRI measurements of heterogeneity in carbonate rock cores ANDREW POMERANTZ, ERIC SIGMUND, YI-QIAO SONG, Schlumberger-Doll Research, SCHLUMBERGER-DOLL RESEARCH TEAM — Magnetic resonance imaging (MRI) provides spatially resolved measurements of the spin-spin relaxation time (T_2) of brine that saturates the pores of carbonate rocks. Images with millimeter resolution reveal relaxation that can be well described by a double exponential in each voxel. From these images, it is possible to describe the length scales and extent of spatial heterogeneity both qualitatively and quantitatively. Qualitatively, the fitted values from each voxel can be combined into a histogram to make a T_2 distribution, and histograms produced at different resolutions can be compared to each other and to the Laplace inversion of CPMG data for the whole core. Quantitatively, experimental semi-variograms can be constructed and analyzed using geostatistical techniques. In general, heterogeneity both above and below the 1 mm imaging resolution is observed, although the extent of heterogeneity is found to vary greatly between rock cores. In many cases, the qualitative features of the T_2 distribution for the entire core are manifest in almost every individual voxel of microliter volume, indicating significant heterogeneity at short length scales.

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