# Relaxometry in porous media

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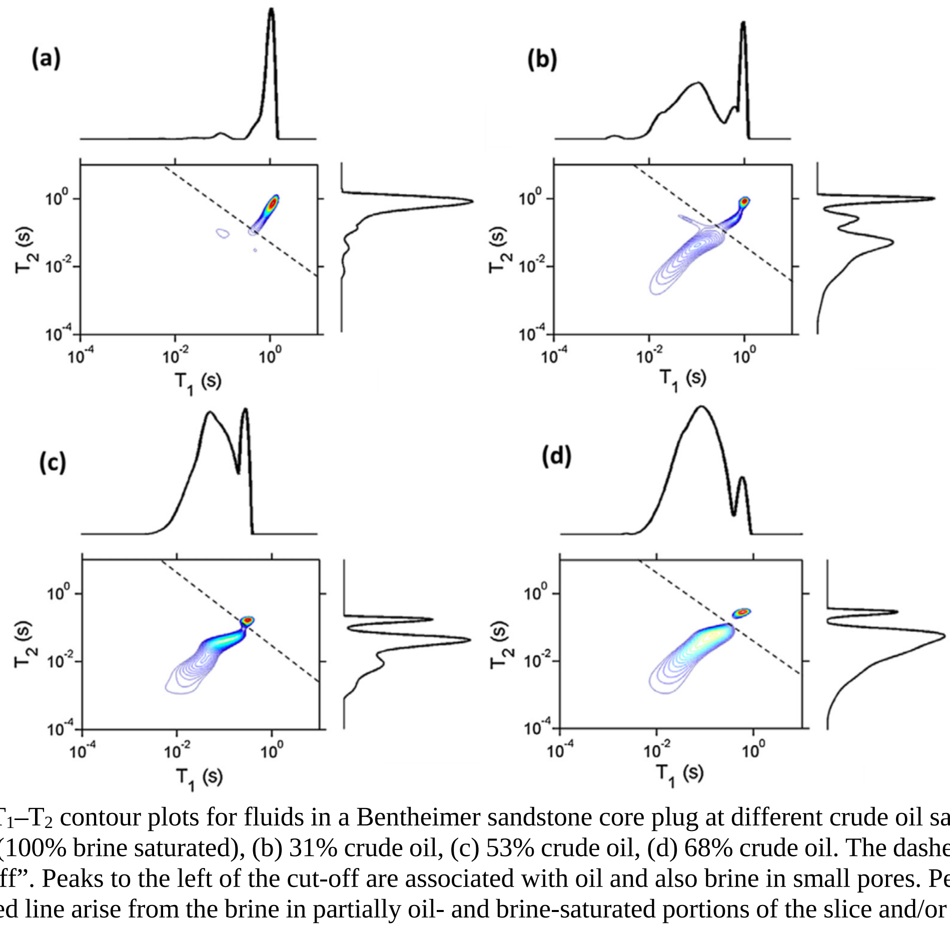
The magnetic resonance behaviour of nuclear spins turns out to be pleasingly sensitive to their confinement in porous media. Relaxation properties have therefore been measured under all manner of circumstances in rocks, cements, woods, foams, coral and bone, for example.

In this introductory survey, we will discuss the relative importance of various relaxation mechanisms in porous media [1] and their influence on spin-spin and spin-lattice relaxation time constants.

We will compare a range of magnetic resonance methods that may be used to measure relaxation time constants in porous media, including the measurements of correlations between two different relaxation time constants [2]. We will also discuss some approaches for achieving various degrees of spatial resolution of relaxation behaviours.

We will discuss the interpretation of measured relaxation time constants in terms of properties of the porous medium, in the light of the underlying relaxation mechanisms [3].




Slice-selective $T_1$–$T_2$ contour plots for fluids in a Bentheimer sandstone core plug at different crude oil saturation stages: (a) no crude oil (100% brine saturated), (b) 31% crude oil, (c) 53% crude oil, (d) 68% crude oil. The dashed line indicates the $T_1$-$T_2$ "cut-off". Peaks to the left of the cut-off are associated with oil and also brine in small pores. Peaks to the right side of the dashed line arise from the brine in partially oil- and brine-saturated portions of the slice and/or the signal from brine in the fully brine-saturated part of the slice. Reprinted from [2] J. Magn. Reson., 287, Vashaee *et al.*, "Local $T_1$-$T_2$ distribution measurements in porous media" pp. 113-122, Copyright 2018, with permission from Elsevier.

**References:** [1] Barrie, Ann. Rep. NMR Spect. **41** 265 (2000). [2] Vashaee et al. J. Magn. Reson. **287** 113 (2018). [3] Afrough et al. Phys. Rev. Appl. **11** 041002 (2019).