GIT Systems Version 11

Advanced NMR Rock Core Analysis Software

GeoSpec

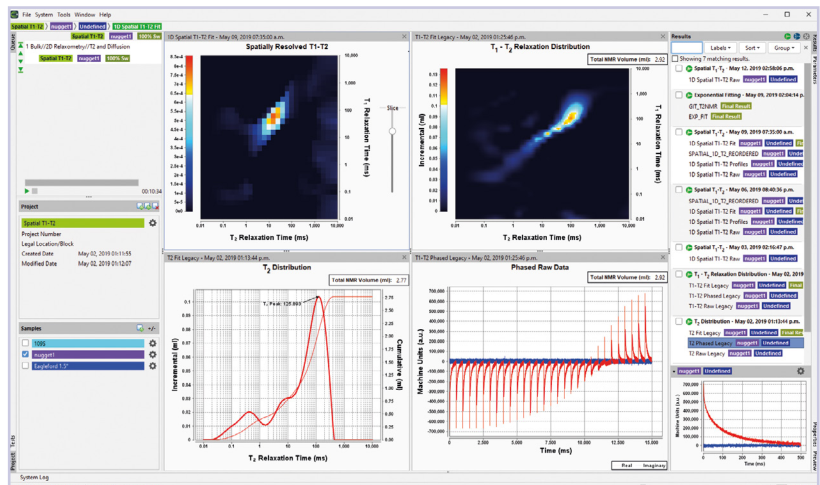
GIT Systems Version 11 introduces a major update to the user interface, presenting users with an intuitive and configurable experience. Version 11 also provides improved performance and responsiveness, particularly when working with large datasets or computationally intense measurements.

New Measurements

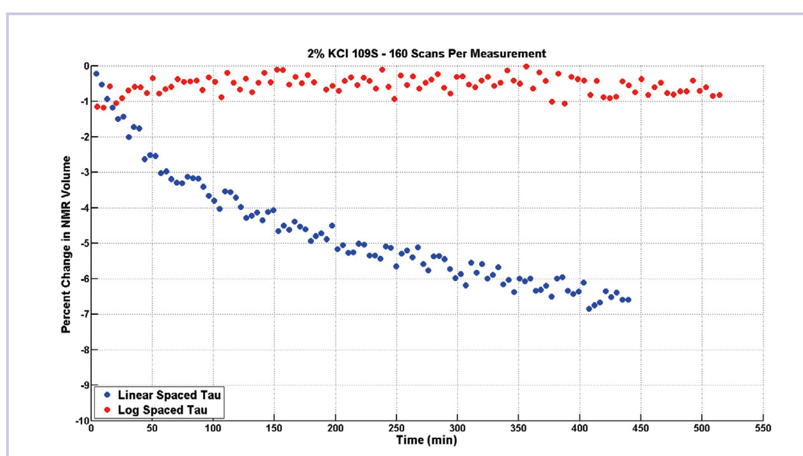
This latest version of the **GIT Systems** software suite adds several new measurements. The highlights of these additions will be discussed below.

Variable Tau CPMG

This innovative CPMG pulse sequence addresses the problems of sample heating sometimes seen during intensive T_2 encoded sequences, such as T_1- T_2 correlation maps, diffusion- T_2 correlation maps, spatial T_2 and others. In higher field instruments (12 MHz +) RF heating during signal intensive measurements can heat a sample by 10˚ to 100˚ C. The variable tau CPMG sequence reduces the amount of Radio Frequency (RF) power going into the sample by limiting the number of refocusing RF pulses to a constant 512, and then varying the timing of the pulse train so that the same range of T_2 values can be integrated. Reducing RF heating is important because localized heating in samples during measurements such as a T_2-diffusion map creates thermal currents which can dramatically affect the results, as shown in the figure to the right .



The GIT Systems user interface has been updated to allow users to efficiently create and view their data with scalable, user defined window layout and clear, intuitive colour schemes and layouts.



In the figure above, the NMR volume of a brine saturated sandstone is calculated from a CPMG experiment repeated many times. The volume drops by 7% using the conventional CPMG train (blue). The red line is using the variable tau CPMG sequence.

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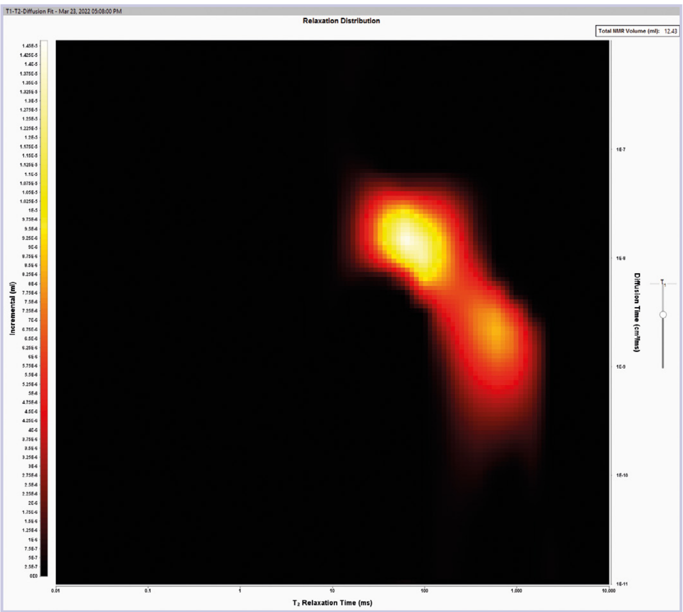
3D T_1-T_2-Diffusion Map

Taking the popular 2D correlation maps to the next level, this 3D map adds a third value to the correlation. A user can select T_1- T_2 correlation maps of specific diffusion values. For example, this would allow users to produce a T_1- T_2 correlation map of just the oil signal. A processing tool is available to allow users to select the diffusion values on a collapsed T_2-Diffusion map, then plot the T_1- T_2 map from the selected values.



The figure above shows an example of the T_1-T_2-Diffusion 3D map interface.

New Wettability Models

These new models give users the ability to perform wettability modelling from either T_2 or T_1- T_2 measurements. The T_2 method is based on Looyestijn's method, while the T_1 - T_2 method is based on the Valori method. Unlike wettability models from other technologies, NMR wettability tracking is non-destructive, allowing for wettability monitoring during a single flood (or Enhanced Oil Recovery (EOR) process).

2D Slice Selection

Users looking to select slices of data along a 2D measurement can now do so for images acquired using FSE, SPRITE or SE-SPI pulse sequences. The resolution of the 2D images has been increased by reducing the averaging over the third dimension.

Saturation Recovery T_1-T_2 Maps

To reduce the acquisition times for T_1 - T_2 correlation maps, the option is now available to use a saturation recovery method instead of the inversion recovery. For example, a 30-step inversion recovery T_1 - T_2 correlation map with 16 averages and a maximum T_1 and T_2 of 500ms takes 43 minutes. The same measurement with the same parameters but using saturation recovery takes just 24 minutes.

Inversion Recovery Spin Echo T_1

For samples with high ferrite content (thus short T_2^*), traditional free induction decays are too short to acquire adequate T_1 data following inversion recovery. Users can now use a spin echo inversion recovery to acquire adequate signal for a T_1 measurement.

Subtraction of 2D and 3D images

During EOR studies, users often wish to examine the effects of surfactant floods and other rock matrix alterations. This examination is made easier with the ability to subtract before and after images to note the changes between the two.

Reprocessing of Spatially Resolved T_1 or T_2

Examination of spatially resolved relaxation data often requires changing inversion parameters to look at the effects of different parameters. The ability to reprocess relaxation data with varying parameters makes this examination easier.

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