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JUNE 2024 PAPER SUMMARIES
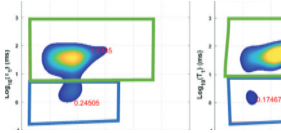
Althaus et al.   PAGES 388–396

Two-dimensional (2D) T_1-T_2 NMR data were used to quantitively measure the oil and water content in unconventional source rocks. The oil and water saturations measured on the preserved plugs using 2D T_1-T_2 NMR and CNG are consistent with those from the GRI method.

Badruzzaman   PAGES 274–301

Subsurface nuclear techniques can assess proposed carbon capture and storage (CCS) and nuclear waste burial sites, locate critical minerals for renewables, and probe for geologic hydrogen. These techniques can potentially monitor the movement of injected CO_2 and buried radioisotopes—the latter on a millennial timescale—but would require improved insight into underground biogeochemical processes and technological advances. Electronic radiation source logging tools would likely provide such insight safely and securely. A related imaging technique proposed in the literature could locate casing leak points in wells used to extract gas from hydrogen or methane storage. Muon-based deep look can potentially monitor buried nuclear waste on a seismic scale. Nuclear spectroscopy can allow targeted exploration for critical minerals required in renewables, thereby preventing indiscriminate drilling and likely mitigating reported mineral-extraction-related human rights abuses.
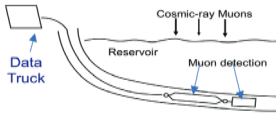
Duan et al.   PAGES 411–424


This paper introduces a novel approach, the R35 and fractal joint rock typing method, incorporating a new parameter, D_n (fractal dimension). This method is developed based on the analysis of mercury injection capillary pressure (MICP) data obtained from 20 carbonate samples in the Middle East, specifically Iraq.
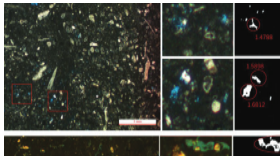
Jiang et al.   PAGES 397–410


This study utilized rock samples from a specific oil and gas reservoir and introduced pre-existing pore and fracture defects within them. Uniaxial compression tests were conducted on rock specimens with varying angles between the fractures and the bedding planes. The study involved measuring and analyzing the impact of pre-existing defect morphology on the shale's mechanical properties. Additionally, through the use of digital image correlation (DIC) technology, a comprehensive strain field map was obtained, depicting the initiation, propagation, and ultimate failure of surface cracks in shale under loading conditions.
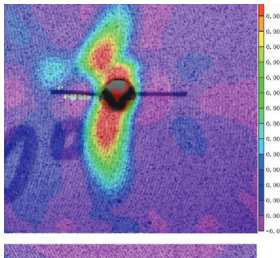
Molossi et al.   PAGES 365–387


Artificial intelligence stands as a crucial ally in several fields, aiding humans in task execution and decision-making processes. This paper showcases an end-to-end method rooted in deep learning, designed to assist petrophysicists in interpreting low-resolution borehole image logs. The approach introduces a semi-automated paradigm, skillfully blending human domain expertise with the broader generalizations of deep learning.
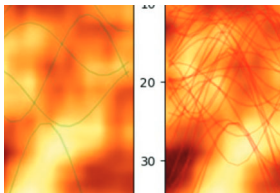
Morelli et al.   PAGES 342–363

Three different automatic facies analysis methods were applied to a complicated scientific drilling well in the crust-mantle transition zone for the first time. The newer FaciesSpect method result by using borehole image and geochemical spectroscopy logs (Fe and Ca) matched not only with core lithology changes but also with texture changes, such as massive, layered, severely altered, deformed, and fractured. The FaciesSpect method can save analysis time and costs, as well as has the potential to support different evaluation objectives such as natural hydrogen generation beyond petroleum.
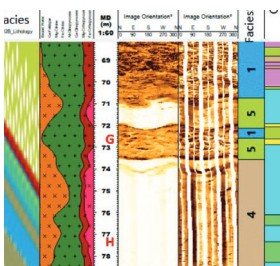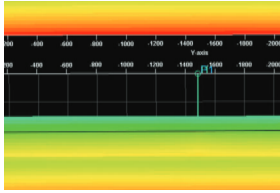
Okoroafor et al.   **PAGES 317–341**

The reservoir depth, formation dip, and flow capacity (permeability thickness) are key reservoir parameters impacting the productivity of hydrogen stored in porous media. Assuming the rocks are critically stressed, hydrogen storage in saline aquifers has a larger susceptibility to induced seismicity and uplift than depleted gas reservoirs. Advances in reservoir saturation monitoring tools can help close the gap in the measurements for tracking hydrogen plumes in the subsurface.
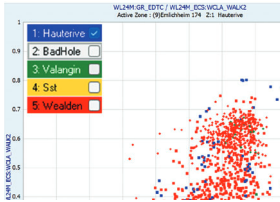
Strobel   **PAGES 302–316**

A petrophysical log interpretation can characterize and rank a claystone hosting a nuclear repository. Key log derivable criteria are a high homogeneity, a low diffusivity expressed through a low porosity, the absence of an advective transmissibility path, and an abundance of clay minerals above 45% by weight. Data points from core samples will add thermal and geomechanical parameters and estimates for the anion exclusion capacity.