

Petrophysics Vol. 64 No. 6, December 2023

TABLE OF CONTENTS PAGE

ARTICLES – BEST OF THE 2023 ANNUAL SYMPOSIUM

A Universal Data Format for Wellbore Logs

Tom Bradley, Simon Austin, David Holbrough, Warren Fernandes, Xuandong Wang, Gleb Dyatlov, and Arnt Veenstra

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 823–836; 16 FIGURES, 1 TABLE.
DOI:10.30632/PJV64N6-2023a1

Changing the Game: Well Integrity Measurements Acquired on Drillpipe

Andy Hawthorn, Tonje Winther, Laurent Delabroy, Roger Steinsiek, Ian Leslie, Lynda Memiche, and Abe Vereide

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 837–847; 7 FIGURES.
DOI:10.30632/PJV64N6-2023a2

Applications of Two-Dimensional Laboratory Higher-Frequency NMR in Unconventional Shale Characterization

Z. Harry Xie and Omar Reffell

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 848–863; 17 FIGURES.
DOI:10.30632/PJV64N6-2023a3

Learnings From Impact and Implications of Signal-To-Noise in NMR T_1 - T_2 Logging of Unconventional Reservoirs

Olabode Ijasan

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 864–878; 10 FIGURES, 3 TABLES.
DOI:10.30632/PJV64N6-2023a4

A New Workflow for Assessment of Fluid Components and Pore Volumes From 2D NMR Measurements in Formations With Complex Mineralogy and Pore Structure

Artur Posenato Garcia, Robert Mallan, and Boqin Sun

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 879–889; 9 FIGURES.
DOI:10.30632/PJV64N6-2023a5

Application of GAN to Resolution Enhancement of LWD Real-Time Image Logs to Support Decision Making

Willian Andrighetto Trevizan² and Candida Menezes de Jesus

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 890–899; 8 FIGURES, 1 TABLE.
DOI:10.30632/PJV64N6-2023a6

Development and Baseline Comparison of a New Pulsed-Neutron Spectroscopy Tool for Carbon-Oxygen Analysis and Three-Phase Saturation Monitoring

Ian McGlynn, Toyli Anniyev, Feyzi Inanc, David Chace, Alexandr Kotov, Emmanuel Soans, and Ardi Batubara

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 900–918; 13 FIGURES, 3 TABLES.
DOI:10.30632/PJV64N6-2023a7

Holistic Evaluation of Reservoir Oil Viscosity in Breidablikk Field – Including Mud Gas Logging Approach

Alexandra Cely, Ingvar Skaar, and Tao Yang

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 919–930; 13 FIGURES, 2 TABLES.

DOI:10.30632/PJV64N6-2023a8

Assessment of Depth of Mud-Filtrate Invasion and Water Saturation Using Formation-Tester Measurements: Application to Deeply Invaded Tight-Gas Sandstones

Mohamed Bennis, Tarek S. Mohamed, Carlos Torres-Verdín, German Merletti, and Camilo Gelvez

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 931–953; 23 FIGURES, 3 TABLES.

DOI:10.30632/PJV64N6-2023a9

Time-Scaling Creep in Salt Rocks for Underground Storage

Talha H. Khan, Michael T. Myers, Lori Hathon, and Gabriel C. Unomah

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 954–969; 14 FIGURES, 1 TABLE.

DOI:10.30632/PJV64N6-2023a10

Effect of Predisolved Natural Gas on CO₂ Solubility in Water With Various Salinities at Reservoir Conditions

Jie Wang and Christine Ehlig-Economides

PETROPHYSICS, VOL. 64, NO. 6 (DECEMBER 2023); PAGES 970–977; 6 FIGURES, 2 TABLES.

DOI:10.30632/PJV64N6-2023a11

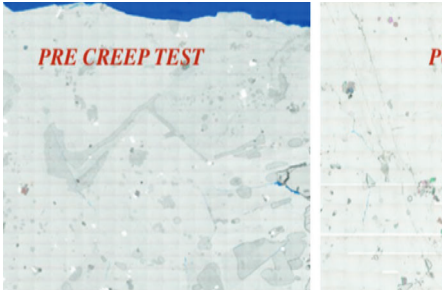
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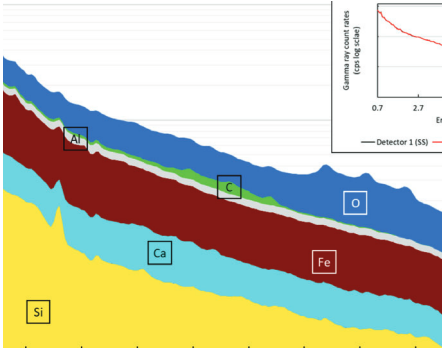
DECEMBER 2023 PAPER SUMMARIES



Khan et al.

PAGES 954-969

Solution-mined caverns have been proven to be among the most efficient techniques for storing energy resources, primarily hydrogen. The sequestration of CO₂ using underground salt caverns could be an additional resource in reducing anthropogenic greenhouse gas emissions along with depleted reservoirs or saline aquifers storage. This study provides a framework for understanding nonlinear creep damage and predicting time-independent geomechanical behavior in salts during critical operational stages of fluid storage and depletion to mitigate creep-induced cavern closure.



McGlynn et al.

PAGES 900-918

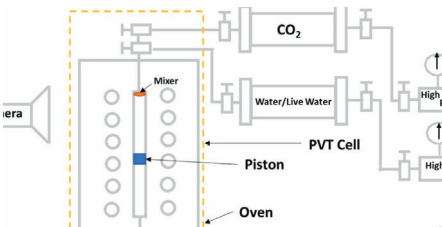
This paper details the development of a new pulsed-neutron spectroscopy instrument that provides simultaneous carbon/oxygen (C/O), pulsed-neutron capture sigma, and ratio-based gas measurements for two- and three-phase saturation analysis. The new instrument incorporates high-resolution LaBr₃ detectors, a higher-output neutron source, and a new digital electronics platform that allows faster logging or improved precision at legacy logging speeds. The instrument provides legacy windows-based C/O measurements and new spectral yields C/O measurements for saturation determination. A field example is presented to demonstrate the improved performance and compatibility with a legacy pulsed-neutron instrument, which is crucial for time-lapse monitoring applications.



Trevizan and Menezes de Jesus

PAGES 890-899

This work shows the development and application of generative adversarial neural networks (GANs) to increase the resolution and quality of real-time image logs. The main application is the detection in real time (while drilling) of geological structures that may impact completion designs.



Wang and Ehlig-Economides

PAGES 970-977

The solubility of CO₂ in saline water, crucial for trapping CO₂, is affected by pressure, temperature, salinity, and often neglected, pre-dissolved gases. Experiments reveal quantitatively that “live” saline water containing dissolved gases has a lower capacity to dissolve CO₂ than “dead” saline water, especially as salinity increases. Accurately assessing CO₂ solubility in such “live” conditions is vital for effective carbon capture and storage strategies.

Xie and Reffell

PAGES 848-863

This article reviews the importance and advantages of the use of the laboratory higher-frequency (HF), e.g., 23 MHz, NMR systems and 2D mapping techniques for identifying and quantifying different forms of water and hydrocarbons in unconventional shale core samples. Examples of applications are given to demonstrate the measurements of saturations, activation energy of hydrocarbons, mobility of oil, and kerogen maturity in shales.