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# OCTOBER 2023 PAPER SUMMARIES
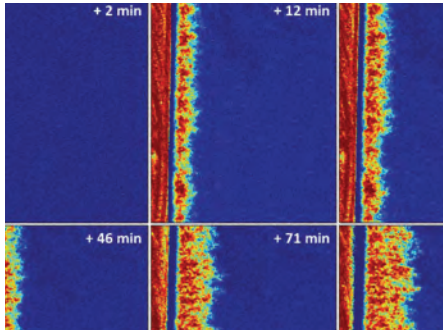


**Aerens et al.**        **PAGES 715–740**

This paper describes the use of X-ray microfocus radiography to examine the processes of mud-filtrate invasion and internal and external mudcake deposition in thin rectangular rock samples in real time. Water- and oil-based muds were injected into rock samples initially saturated with a range of different connate fluids, including viscous liquids, to study the impact of viscous and/or capillary forces on mud-filtrate flow behavior. The high-resolution experimental method (10 to 30 μm) is efficient and reliable and allows for a better understanding of the uncertainty of the effects of mud-filtrate invasion on borehole geophysical measurements acquired while or after drilling.



**Bennis and Torres-Verdín**        **PAGES 753–772**
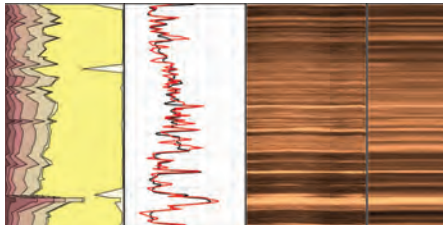
A new method is introduced to calibrate and verify the reliability of core data and well logs acquired in spatially heterogeneous rocks. The method was effectively implemented in two wells that penetrated a clastic formation in the North Sea. Numerical simulations of well logs based on core data enabled the detection of inconsistent, noisy, and inaccurate measurements, including cases of abnormal borehole environmental corrections causing biases in petrophysical interpretations.
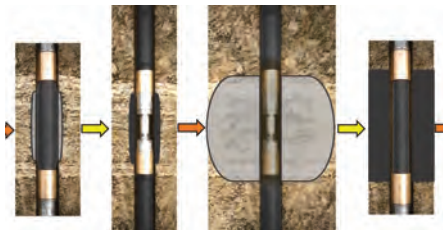


**Desroches et al.**        **PAGES 621–639**

This paper presents the learnings from a large integrated wireline-conveyed stress measurement campaign in eight deep boreholes in northeastern Switzerland. Over 150 tests were performed in the same lithological column, from the crystalline basement to late Jurassic massive limestones. Findings on the test depth selection process, the tool string hardware, the stress-testing protocol, and the use of imaging logs are presented.



**Hill et al.**        **PAGES 700–713**

A simple graphical display, using only natural gamma ray and neutron porosity wireline measurements, allows rapid identification of potentially commercial potash mineralization. It can be utilized with either a digital file or hand-picked data and is particularly useful for evaluating petroleum target wells drilled and cased without openhole logs through shallow evaporite beds.
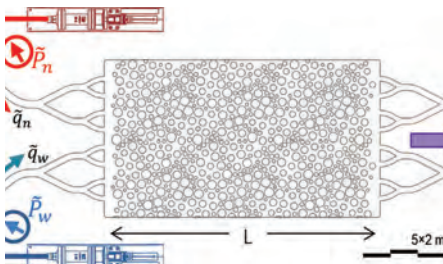


**Karadimitriou et al.**        **PAGES 656–679**

The authors investigate the feasibility of a universal scaling model for immiscible two-phase flow in porous media, considering its dependency on flow rate. They achieve this by conducting ex-core measurements to determine relative permeabilities during steady-state co-injections of two immiscible fluids in an artificial microfluidic pore network across various flow conditions. This research holds potential for enhancing SCAL protocols, particularly in the realms of flow characterization and dynamic rock typing.



**Laronga et al.**        **PAGES 680–699**

Pulsed-neutron logs are commonly run during the monitoring phase of CCS projects to verify well integrity and vertical distribution of stored $CO_2$. The true value of a set of carefully planned, time-lapse pulsed-neutron logs is in the ability to assess impactful subsurface phenomena unique to CCS projects, and in the resolution of residual uncertainties in the dynamic simulation, leading to improved project risk management.

# OCTOBER 2023 PAPER SUMMARIES
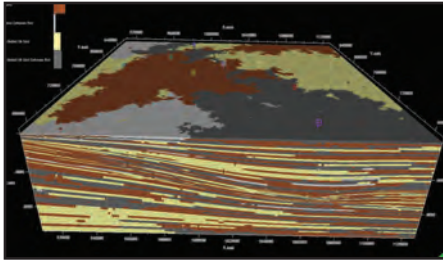


**Laronga et al.**                                    **PAGES 580–620**

In the evaluation of carbon capture and sequestration (CCS) projects aiming to store supercritical $CO_2$ in saline aquifers, we must quantify and de-risk future storage capacity, containment, and injectivity within the complex framework of the dynamic rock-brine-$CO_2$ system. We review each of these subtopics to highlight where the discipline of petrophysics can have an impact, and we present a typical workflow leveraging the most appropriate core-, log-, and formation-testing-based techniques to answer these questions.
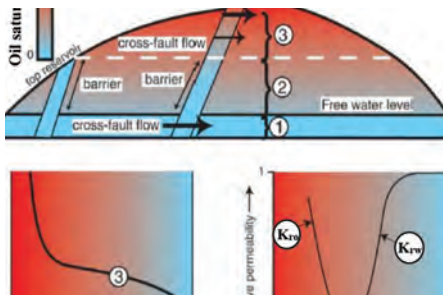


**Mohamed et al.**                                    **PAGES 773–795**

This paper presents a comprehensive and innovative approach to the complex issue of assessing hydraulic connectivity in heavily faulted reservoirs. This methodology represents a significant advancement over conventional approaches that often fall short in the face of the spatial complexity of such reservoirs. The novel interpretation workflow is employed to evaluate hydraulic connectivity of a heavily faulted reservoir in deepwater Gulf of Mexico, where a wide array of data acquired from 12 wells is integrated, including formation-testing measurements, well logs, pressure surveys, PVT properties, and geological data, among others.
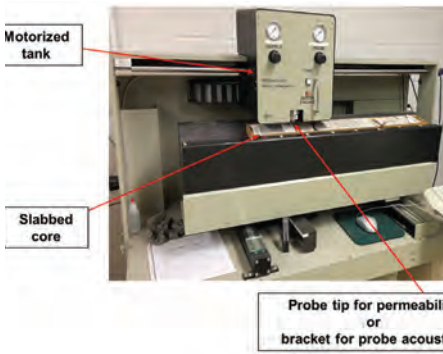


**Okwoli and Potter**                                 **PAGES 640–655**

This paper highlights the usefulness of probe core analysis techniques (probe luminance, probe magnetics, probe acoustics, and probe permeability) on slabbed core and powdered samples. For many reservoirs relevant to energy transition, such as geothermal prospects, carbon geosequestration, and hydrogen storage, it is crucial to have a high-resolution continuous record of petrophysical properties so that key features (e.g., thin naturally cemented or fractured zones) are not missed. Probe measurements are less destructive, without the need to cut core plugs, and provide: (1) high-resolution data at the lamina scale, so that key features, small-scale heterogeneities, and anisotropy can be identified, (2) improved depth matching to well-log data, and (3) rapid, cost-effective data.
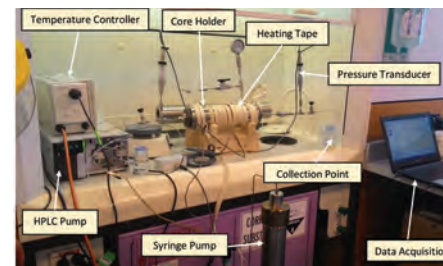


**Shafiq et al.**                                     **PAGES 796–817**

The authors look at the behavior of different chelating agents reacting with tight sandstone formations based on Integrated Mineral Analysis, including the application of pore topology, pore-size distribution, particle-size distribution, particle density, mineral analysis, and mineral locking in acidizing. This study will help to design effective acidizing treatments based on chelating agents and analysis from the TIMA (Tescan Integrated Mineral Analysis) technique. HEDTA proved to be the most effective chelating agent.
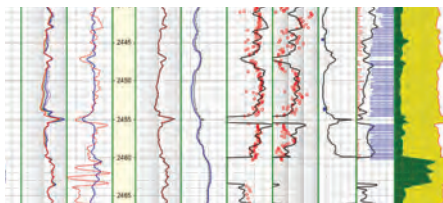


**Zhao et al.**                                       **PAGES 741–752**

This paper proposed an analytical equation of the anomaly amplitude of the spontaneous potential (SP) in shaly sandstone, and the influencing factors of the SP anomaly were analyzed. On this basis, a joint inversion of SP and resistivity was established to calculate oil saturation and $Q_v$ by particle swarm optimization method.