Geoscience Canada

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Volume 18, numéro 4, december 1991

URI : https://id.erudit.org/iderudit/geocan18_4con04

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Éditeur(s)

The Geological Association of Canada

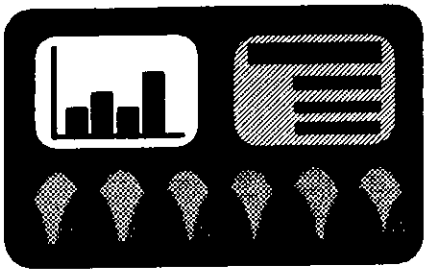
ISSN

0315-0941 (imprimé)
1911-4850 (numérique)

Découvrir la revue

Citer cet article

Bell, J. S. (1991). Geological Applications of Wireline Logs. *Geoscience Canada*, *18*(4), 178–178.



Geological Applications of Wireline Logs

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The second conference on Geological Applications of Wireline Logs (GAWL II) took place at Burlington House, headquarters of the Geological Society of London, on June 10-11, 1991. The conference was convened jointly by the Petroleum and Borehole Research Groups of the society. Thirty-three papers were presented. They focussed on fracture interpretation, physical properties, sedimentology, geochemistry, basin studies and new interpretational methods, and were presented by researchers from oil companies, service companies, geological surveys, consultants, university personnel, research institutes and the Ocean Drilling Project (ODP). The authors came from Europe, North America and Australia.

Mapping fractures is big business these days for waste disposal as well as for hydrocarbon recovery. Fracture detection by non-imaging tools depends on an accurate knowledge of the physical properties of the rocks involved. Bremer *et al.* discussed the characteristic responses of crystalline rocks and the problems in identifying fractured zones. Minerals such as graphite and pyrite can give log responses similar to those of open fractures. Hornby and Luthi described encouraging efforts to quantify fracture apertures with resistivity data from borehole microscanner images and reflected Stoneley waves. Jackson and Willis-Richards used conventional, but enhanced, resistivity tools to identify and characterize water-filled fractures in granites, whereas Goldberg *et al.* harnessed borehole televiewer images of fractures to temperature logs and quantified the fracture permeability of gabbros logged by ODP. Open fractures may deflect stress trajectories, and Bell *et al.* presented case histories where breakouts identified on dipmeter logs had been used to map possible fracture-generated anomalies.

Tests on stress-relieved core samples are unsuitable for relating log responses to *in situ* geotechnical properties, such as compressive strength and Young's Modulus. McCann and Entwhistle demonstrated the advantages of calibrating gamma/gamma and full wave-train sonic logs against in-situ measurements of physical properties, rather than using laboratory test results. In related papers, Ward *et al.* and Raaen presented methods for obtaining shear wave velocities from full waveform acoustic logs. McCann and Sothcott described measuring compressional and shear velocities and attenuation in sediments to pressures of 70MPa for use in log calibration.

Conventional well log signatures have provided sedimentological data for many years, but vertical resolution is still limited (Ruhovets *et al.*). Nor should we take obvious log correlations for granted, as Slatt and colleagues at ARCO demonstrated. They "logged" laterally discontinuous sandstone bodies exposed on quarry walls with gamma ray sondes. Correlations of "wells" metres apart (all by professionals) were unbelievably in error!

With the advent of the formation microscanner, downhole imagery has come of age. Geologists can now "see" depositional features (Bourke) and log-based analyses of successions such as resedimented volcaniclastics (Salimullah and Stow) are finally feasible. At the same time, it is becoming possible to recover reliable geochemical information from logs. Pelling *et al.* exhibited excellent geochemical profiles of oceanic crust and Myers and Jenkyns presented an improved method for deriving organic carbon content from density logs. However, Harvey and Lovell warned that inverting chemical data into mineralogy logs has its pitfalls. The most serious is when three or more mineral phases lie on the same compositional plane, so that a unique solution for log responses cannot be obtained. In a stimulating overview, Selley suggested that the impermeable calcite-rich zones commonly observed at the top and bottom of sandstone bodies might be scars of diagenetic fronts like those which are interpreted to have emplaced sedimentary uranium ores. If so, imaginative log correlation might identify non-stratiform diagenetic seals.

In recent years, the internal shape of a well has become almost as important as the properties of the rocks it penetrates, because of burgeoning interests in borehole stability and *in-situ* stress. Hillis and Williams used breakouts to map stress trajectories on part of the NW Australian continental shelf and combined these with tectonic data and stress magnitudes to propose fruitful orientations for horizontal production wells. Yassir *et al.* and Cowgill used breakouts to constrain models of the stress regimes in, respectively, southern Ontario and the Witch Ground Graben in the North Sea.

In addition to these offerings, there were papers on predicting thermal conductivity from logs (Griffiths), using dipmeters for structural interpretation (Adams *et al.*, Cameron), and water salinity determination (Gran *et al.*) and many encouraging testimonies about how log analysis is enhancing ODP research. Each series of papers was punctuated by stimulating discussions. All in all, it was an excellent meeting to attend and the Proceedings Volume promises to be of wide interest.

However, despite the international representation and enticing menu of talks, attendance was disappointing. Less than a hundred people were present in the auditorium. This was unfortunate, because the timing was reasonable and the field is of ongoing interest to a large number of earth scientists. Registration was approximately $200, which may have inhibited some, and the costs of visiting central London are not trivial. Nevertheless, few staff members of oil companies located minutes away were there. Regrettably, GAWL II suffered from poor publicity and, once underway, it was casually run. The Geological Society of London tends to be as restrained in pre-emptive bragging as they are in organizing such gatherings. Several international early birds were kept waiting outside Burlington House's oak doors until the advertised 9:30 a.m. opening time. When they finally got inside and found a coffee urn, it was labelled "Staff Only"! The hosts were catered for, but the (paying) guests had to wait until the session break at 11:25. A pity: better planning could have increased participation in this thoroughly worthwhile event.

Accepted, as revised, 16 October 1991.