



London Petrophysical Society



Borehole Imaging
Special Interest Group

Everything Borehole Imaging

Thursday 11th December 2025
Geological Society, Burlington House, London
09:00-17:00 GMT

London Petrophysical Society - "Everything Borehole Imaging" - Thursday 11th December 2025				
Start Time	End Time	Name	Company	Talk Title
09:00	09:20	Doors Open and Registration		
09:20	09:25	Martin Leonard	LPS	LPS Seminars - Introduction
09:25	10:00	Sarah Dominey	Islay Subsurface & Engineering	Fracture Wars: The Image Log Strikes Back
10:00	10:35	Andrew Barnett	Shell Research Limited	Diagnosing reservoir rock properties in the Guaratiba Formation, Brazil, through borehole image analysis
10:35	11:10	Angela Pascarella	TNO	Contribution of borehole image for the understanding of Heterogeneous geomechanical properties and cooling in a sandstone geothermal reservoir
11:10	11:30	Break		
11:30	12:05	Peter Barrett	Halliburton	How to QC an Image Log
12:05	12:40	Melissa Johansson	Geode-Energy Ltd	Application of Borehole Images in Deep Water Sediments – A Case Study from the Pliocene Kafr El Sheikh Formation, Egypt
12:40	13:40	Lunch		
13:40	14:15	Adrian Leech	GAIA Earth Group	Oil and Gas Well Borehole Image Logging - An Introduction to Imaging for Students and Recent Graduates
14:15	14:50	Ananda Shankar Roy	Aperion Management	Integrated Facies Analysis from Borehole Image Logs and Seismic Data for Turbidite Reservoir Characterization and Static Model Update: Case Study from Well 14/26b-5, CNS
14:50	15:25	Sebastien Soulas	Avalon Sciences Ltd)	3-C vector fidelity for Shear-wave polarizations characterisation in a hot dry rock geothermal reservoir: observed anisotropic effects of fractures
15:25	15:45	Break		
15:45	16:20	Bernd Ruehlicke	Eriksford Inc.	The Good, The Bad and The Ugly of Multi-frequency Pad Based Image Tools.
16:20	16:55	Sanchita Ganguly	EBN.B.V.	Integration of Borehole Image with Core and Well Test in Quantifying Permeability in Geothermal Reservoir
16:55	17:00	Philip Gibbons	LPS	LPS Seminars - Closing Remarks
17:00	President's Evening at The King's Head			

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Fracture Wars: The Image Log Strikes Back

Sarah Dominey; Islay Subsurface & Engineering

Borehole image logs are often the linchpin of any fractured-rock study. I avoid focussing on the term “reservoir” here because fractured rocks are everywhere and have an impact in many industries — oil & gas, geothermal, lithium, gas & carbon storage, hydrology, construction & engineering, and mining to name a few. Fractures and faults occur in source rocks, seals, concretes and cements, and in sedimentary, metamorphic and igneous rocks; their presence — or absence — can make or break a system.

What do we need to know about faults and fractures? How do we detect, measure and quantify them? And how can we bridge obvious scale gaps to predict structural character away from, or between, data sources?

Borehole image logs provide dependable well-scale orientation and character data for faults and fractures. The analysed data can be meaningfully up- or down-scaled and tied with other datasets to provide robust results, whether that is for subsurface reservoir modelling, seal analysis or ground investigations.

Despite the seemingly perfect fit of borehole image logs and fracture characterisation, there are uncertainties associated with the data itself and the current methodologies used for analysis. These uncertainties are often used as reasons to not use image data for fracture analysis but, can we really get a robust understanding of a fracture system without borehole images? How can we minimise these uncertainties? Obviously, we would all love a dataset with every possible log run, but this is very rarely possible. If I had just one log available, I would choose a borehole image log...

...“This is the way”

Sarah Dominey graduated from the University of Aberdeen in 2007 with an MSc in Integrated Petroleum Geoscience. She began her career as a borehole image log geoscientist in Aberdeen working on clastic, carbonate and basement fields from around the world. Upon moving to Merlin Energy, where she worked on a wide range of subsurface G&G projects, Sarah ultimately continued to focus on integrated borehole image analyses in tight sandstones, injectite fields, storage reservoirs and carbonate reservoirs. In 2017, Sarah joined Hurricane Energy and, as Lead Petrophysicist, built and managed a team that delivered the 2019 drilling campaign on the UKCS's first basement reservoir development. She established Apricity Geoscience in 2022 and joined Islay Subsurface and Engineering in 2023, expanding her consulting portfolio to include processing & analysis of Schlumberger's QuantaGeo data, and delivering petrophysical and borehole image log projects worldwide for clients from oil & gas, lithium extraction, geothermal, carbon & gas storage and helium & hydrogen exploration.

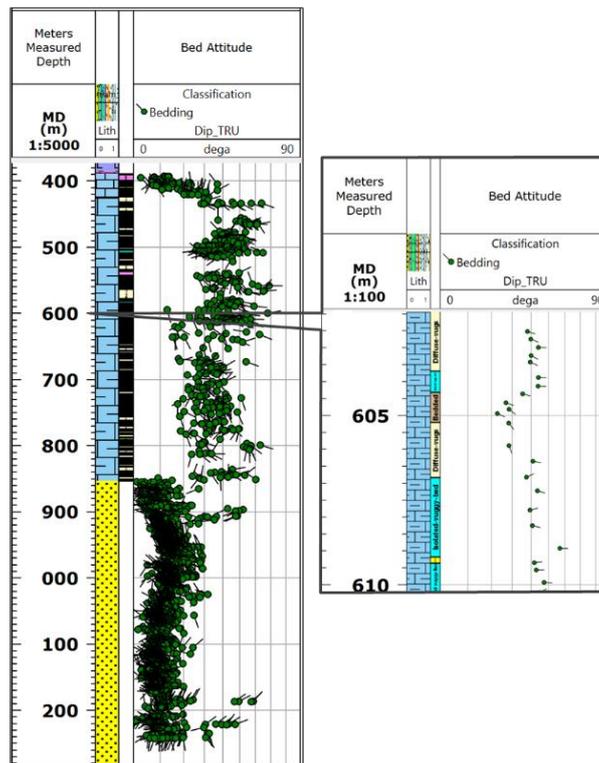
Diagnosing reservoir rock properties in the Guaratiba Formation, Brazil, through borehole image analysis

Edward Cavallerano; Shell International Exploration and Production Inc. & Andrew Barnett; Shell Research Limited

Lacustrine carbonates of the Guaratiba Formation in the Campos Basin pre-salt, Brazil, are comprised of calcimudstone, spherulite, shrub, grainstone, and rudstone facies. These are arranged into cyclothem that are controlled, in part, by structural influences, hydrology, climate, and catchment geology. Diagenetic textures, such as silicification or karst, may also be superimposed on the primary fabrics, complicating rock quality estimations and permeability forecasting.

Comprehensive reservoir characterization using manually-derived bed attitude data and detailed textural descriptions from acoustic and electrical borehole image log analysis have assisted in recognizing highly permeable mound facies outside of cored intervals. Differences in bed dip help define the vertical extent of mounded buildups, while primary strata types identified on the images provide crucial inputs for developing the wellbore-scale stratigraphic framework. These attributes can be upscaled to openhole logs and linked to secondary porosity descriptions that partition the reservoir interval into vug and fracture prone associations that are superimposed on the stratigraphy and impact permeability.

Information provided by borehole image log analysis and openhole logs has helped establish the geologic controls influencing non-matrix porosity in the example well. Moreover, the understanding built from the wellbore-scale architecture has been extended to seismic datasets to constrain seismic interpretations and help confirm the presence of mounded lacustrine deposits and their potential reservoir properties.



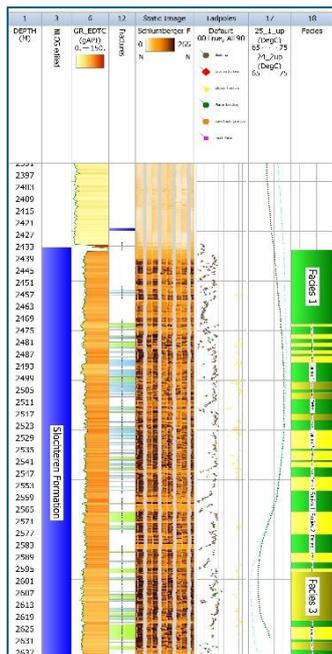
Andrew Barnett is a carbonate geologist at Shell Research Limited.

Edward Cavallerano is a borehole imaging geologist at Shell International Exploration and Production Inc.

Contribution of borehole image for the understanding of Heterogeneous geomechanical properties and cooling in a sandstone geothermal reservoir

A. Pascarella¹, L. Buijze¹, H. van Oeveren², A. Vondrak²; TNO

Understanding the impact of long-term injection on geothermal reservoir properties is critical for sustainable energy production. Within the Dutch national innovation program *Geo4all*, we investigated geomechanical heterogeneities and thermal cooling in a siliciclastic geothermal reservoir located in the Middenmeer Geothermie license area, operated by Ennatuurlijk Aardwarmte. In 2025 a replacement production well (MDM-GT-11-S2) was drilled adjacent to an injector well that was active for a decade; several well log data, including a borehole image, were acquired in the replacement well with the intent of comparing predicted cooling models with measured temperature profiles and to assess reservoir properties before and after prolonged injection.



Measured temperatures were compared to modelled temperatures, conventional petrophysical logs were analyzed to derive porosity, permeability and elastic moduli, fractures (interpretation by SLB) and facies were interpreted on the image log (fig 1) and calibrated to cores from the same reservoirs in a different well.

The results of such analyses show that thermal cooling was concentrated within approximately one-third of the reservoir thickness. Well log analysis revealed significant variability in elastic moduli and reservoir properties and image log analysis revealed variability of sedimentological facies and fracture type and density along the borehole. The integration of these analyses has allowed to establish the existence of a link between cooling patterns, facies and fracture distributions, identifying facies more affected by cooling and facies where cooling inducing fractures seem more likely to develop.

Figure: image log interpretation and temperature data from MDM-GT-11-S2

Angela Pascarella, geologist, PhD in Earth Science and oil industry professional with more than 17 years of international experience in well logs acquisition and interpretation within high-profile corporations. Angela has started her career at wellsite acquiring wireline data and over time she has specialized in borehole image processing and interpretation and petrophysical interpretation. Currently she works at the geological survey of the Netherlands part of TNO (the Netherlands Organisation for Applied Scientific Research) as reservoir geologist/petrophysicist.

How to QC an Image Log

Peter Barrett; Halliburton

The value of an image log can be lost if the users do not have confidence in the data provided. The data should be QC'd and where necessary corrected by the service company. Some insist on receiving completely raw data for processing themselves. Some of the standard QC diagrams which are commonplace are insufficient for thorough quality control.

This presentation will show what can cause things to go wrong, how to perform the QC and then look at why when everything checks out the image can still be wrong. Some of the differences between the various service companies will be covered and the following point will be reinforced – “When you think you have seen everything which can go wrong, something else will get you.”

Image quality starts with the job planning too, we will touch on what you should do during job planning to help maximise the quality of your data.

***Peter Barrett** graduated with a Bachelor of Science in Mathematics, Modelling and Computing from Kingston University in London. He has over 30 years of experience working with image logs around the world, in Geoscience, Software Development and SME roles at both service companies and independent consultancies. Peter has seen changes, challenges overcome and advances in all aspects of the acquisition and use of image logs yet feels there is still a lot more still to come. Peter has co-authored numerous papers and has pushed hard on data quality and data integration initiatives and still enjoys coding to test ideas.*

Application of Borehole Images in Deep Water Sediments – A Case Study from the Pliocene Kafr El Sheikh Formation, Egypt

M. Johansson, Jurry van Doorn, Iwan Roberts, Sherif Farag, John Phillips; Geode-Energy Ltd

The Nile Delta, located at the southeastern part of the Eastern Mediterranean, is a rich hydrocarbon-producing province. The origins of the Nile delta date back to the Early Upper Miocene and the deposition of the deltaic deposits of the Qawasim Formation. These primarily clastic sediments have been greatly influenced by oscillating sea level, especially during the Messinian Salinity Crisis which significantly impacted the nature of sedimentation. The depositional setting of the Upper Miocene during the Messinian was therefore intense incision followed by canyon fill during the East Mediterranean desiccation which created a channelized topography. These deeply incised channels, commonly dendritic, strongly influenced the direction of sedimentation for both the Miocene sediments and the subsequent Pliocene sediments.

During the Pliocene, a major marine transgression occurred known as the Zanclean Flood, which inundated the Nile Delta, Egypt. This flood occurred when the Mediterranean reconnected with the Atlantic and resulted in the infilling of the Eonile canyons. The overlying Pliocene Kafr El Sheikh Sediments form a mega sequence of deep marine sediments deformed by mass transport deposits such as slurring, debris flows, liquefaction and slides. The coarse-grained sediments reached the embayment as lobes, with sands derived from the overspill from the margins of the remnant EoNile canyons (onshore Kafr El Sheikh Formation) and delta-fed sands forming channels and lobes (offshore Kafr El Sheikh Formation).

Analysis of borehole images and high-resolution seismic data has enabled the understanding of the facies characteristics, sand body orientation and depositional environment offshore and onshore Nile delta.

Dr. Melissa Johansson acquired her Ph.D. with Prof Dorrik. A.V. Stow from the University of Southampton on 'Deep Water Massive Sandstones. She went on to teach Sedimentology at UNIMAS Borneo for two years at the Faculty of Science before joining Schlumberger in Kuala-Lumpur in 1998.

Her career as Principal Sedimentologist spanning 24 years took her around the globe, working in countries such as Malaysia, Brunei, Philippines, Myanmar, Alaska, U.K., Norway, Egypt, Syria, Sudan, Qatar, Yemen and China. Much of her work involved sedimentological studies, interpreting core, borehole images and integrating petrophysical data in deltaic, shallow marine and deep-water sediments. She has designed unique workflows utilizing drilling data, LWD, Wireline and production data to build both facies and fracture models, utilizing IP, Techlog and Petrel. For the last 10 years she has worked as Principal Geoscientist for Geode-Energy Ltd. a company specializing in Borehole images and Reservoir Characterization for both oil/gas, CCS and Geothermal Fields.

For the last year (2024-2025) she worked for Stag Geological designing barrier location for P&A wells in the North Sea.

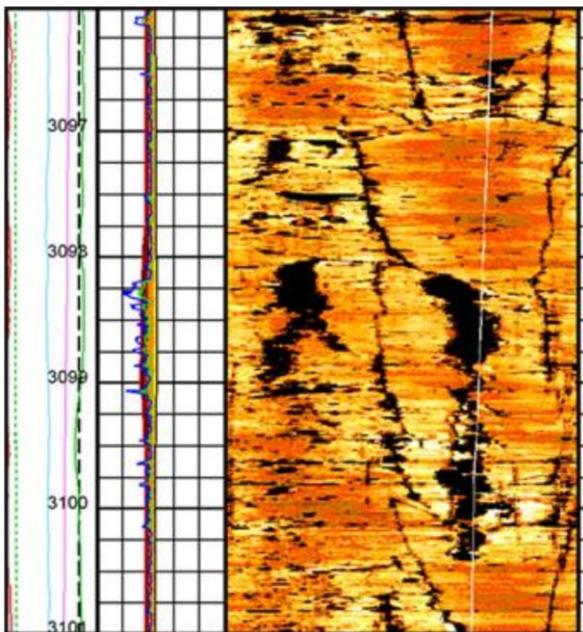
Oil and Gas Well Borehole Image Logging - An introduction to Imaging for Students and Recent Graduates

Adrian Leech; GAIA Earth Group

Many students and recent graduates will be attending this seminar with little or no knowledge as to what terms such as borehole imaging, wireline logging and a dozen other words or phrases refer to. Indeed, they may not know why and how imaging data is obtained. Borehole Imaging forms a standard part of the comprehensive wireline logging or Logging While Drilling (LWD) services offered by contractors.

Imaging can help:

- Firm up the Geological model (stratigraphy, bed dips, depositional environment, natural fractures, faults etc).
- Fine tune the petrophysical analysis via the geological model.
- Help diagnose drilling dynamics (borehole breakout, drilling induced fractures etc) for future reference.
- It can give an indication as to the production potential of wells (natural fracture networks, fracture propagation potential etc).



This talk hopes to provide those new to borehole image logging with a basic introduction to logging, tool theory and image interpretation forming a background to the topics that will be covered during the course of the day.

Adrian Leech has been in the Oil and Gas Industry for over 45 years starting out as a Schlumberger wireline logging engineer in South America. He became a Wireline QAQC Consultant in 1998 and since 2003 has helped build The Gaia Earth Group into a leading Wireline and LWD QAQC and Wireline Conveyance Consultancy worldwide.

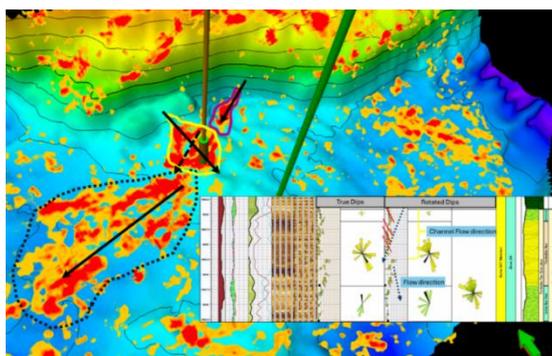
Integrated Facies Analysis from Borehole Image Logs and Seismic Data for Turbidite Reservoir Characterization and Static Model Update: Case Study from Well 14/26b-5, CNS

Ananda Shankar Roy, Sumon Bhattacharyya; Aperion Management

This study demonstrates that borehole image log–based facies analysis, when integrated with seismically resolvable geomorphology, provides an effective means of characterizing turbidite fan complexes and constraining depositional architectural elements and geometry for reservoir modelling. The results significantly improve the understanding of reservoir connectivity and address the uncertainty in the static model definition for the Thunderball Field, offering refined inputs for future dynamic simulation and field development planning.

An integrated structural and facies interpretation was carried out on Well 14/26b-5 in the Thunderball Field, Central North Sea (UKCS), using Formation MicroImager (FMI) logs, open-hole petrophysical data, and integrate 3D seismic attributes to constraint the depositional architecture used in the static reservoir model of the Burns Sandstone Member part of the Kimmeridge Clay Formation. Detailed manual interpretation of bedding and structural features from FMI data enabled the identification of the prograding turbidite fan complex sourced from the Halibut Horst, deposited within a middle- to lower-slope environment comprising of confined to weakly confined channel–lobe systems.

Facies characterization was done, integrating borehole image log textures, core sedimentology, and petrophysical response. Palaeotransport analysis from rotated dip data indicates dominant flow directions consistent with depositional trends and accommodation space inferred from palaeotopographic analysis. Seismic RMS amplitude and sweetness attributes successfully captured the overall geometry within the seismic tuning thickness and lateral continuity of possible individual turbiditic lobes and channels, providing quantitative geometrical constraints used in the object modelling acting as a possible analogue (widths, aspect ratios, and channel dimensions). The strong correlation between seismic attributes and image log–derived facies validate the integrated workflow in terms of geological control in distribution of the turbidite facies beyond the well bore.



Ananda Shankar Roy is an independent geoscientist with over 24 years of experience in reservoir characterization, borehole image interpretation, seismic–well integration and PSM. He has worked extensively on North Sea, West African, South Asia and Indian offshore basins, focusing on deepwater turbidite systems and complex clastic reservoirs. Ananda has held technical roles with companies including Cairn India, Schlumberger and Halliburton, contributing to exploration and development projects through integrated structural, stratigraphic, and facies analysis. His current work emphasizes applying borehole image logs and seismic attributes to refine depositional models and update static frameworks for improved field development planning.

3-C vector fidelity for Shear-wave polarizations characterisation in a hot dry rock geothermal reservoir: observed anisotropic effects of fractures

Sebastien Soulas, Will Wills, Steve Bridger, Tom Tubridy, Ben Kaack, Charles Naville (Former IFPEN); Avalon Sciences Ltd

The paper focuses on a VSP 3-C analysis for shear-wave polarisations characterisation in a hot dry rock geothermal reservoir, Cornwall UK. We analysed the clear high amplitude direct S wave arrival recorded by our high fidelity 3-C geophone tool string which showed excellent data quality on horizontal components. One of the objectives was to evaluate the coherency of the shear-waves polarisations in respect to the maximum stress direction and strike-slip faults that were detected during hydraulic stimulations experimental work at Rosemanowes quarry a Carnmenellis granite environment drilled in the 80s. On this site, hydro-fracturing were proved to be almost irrelevant, and the granite rock was dominated by natural fracture system. Additionally, we qualitatively showed that stress fields in crystalline rock are invariably anisotropic using shear wave splitting analysis. The analysis showed a clear shear-wave anisotropy of about 7 percent in the granite formation below 2000m (figure 1). The ability to record discrete electromechanical 3-C sensors with excellent vector fidelity and high SNR are critical for vector wavefield processing of downhole seismic measurements.

The successful integration of orientation device (HSI) and usage of measured relative bearing in deviated well for 3-C orientation procedure turned out to be a very robust solution as conventional method could not work due to low direct P-wave energy on horizontal components. Clear direct S-wave train allowed to determine the azimuth and velocities of fast and slow principal Shear waves and confront them with the known local stress directions, The ability to measure S-wave polarisation variations is important to monitor subsurface pressured fluid movement and stress changes in either storage or recovery operations, and to illuminate 3-Dimension structures around the wellbore.

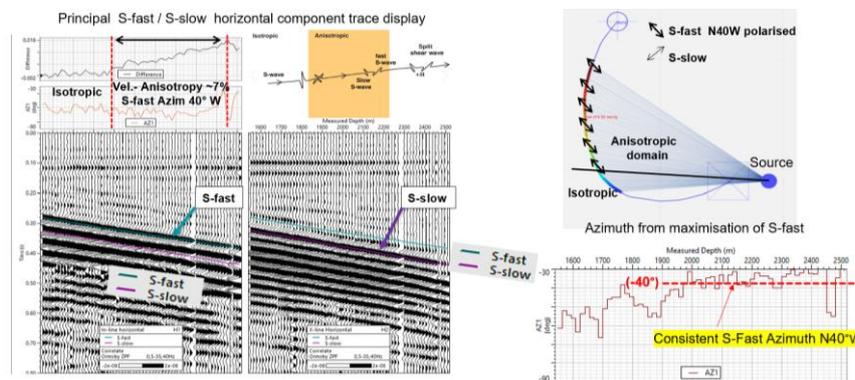


Figure 1 Flattened data at 100ms on direct P-wave arrival time for S-fast and S-slow (right) components after split S-wave polarisation separation. Direct fast shear pick arrival is the green pick on the (left side display). Direct slow shear pick arrival is the purple pick on the right-side display. Top black curve is the relative travel time difference between fast and slow shear arrival, and the bottom orange curve is the polarisation azimuth of the S-fast wave from receiver back to source. Bottom right graph is showing the azimuth (N40W) of S-fast (S1) consistent with the N50W from literature.

Sebastien Soulas is a borehole seismic geophysicist with 30 years' experience and currently acting as Global Operations Manager for Avalon Sciences in Somerton UK and is overseeing field operations, field testing and advise on internal/external technical matters. He also supports the R&D team for 3-C fibre optic sensors and DAS technology continuous development. He has presented numerous technical papers on borehole Geophysics including DAS seismic at EAGE/SEG conferences and workshops promoting data value, technology adoption and integration with surface seismic

The Good, The Bad and The Ugly of multi-frequency pad based image tools

Bernd Ruehlicke; Eriksfiord, Inc

Back in ~2001/2002 Baker Atlas wrote a paper for the 43rd SPWLA Annual Symposium in Japan introducing the EARTH Imager, a new micro-resistivity imaging device for use in oil-based mud. The idea (simply put) was to model the mud and rock as a capacitor and resistor in an AC circuit allowing to derive rock resistivity from the complex sensor signal. It was a major technological step up from the OBMI/OMRI/COI image log tools on the market at that time.

A 2nd generation tool was released around 2008/2009 leveraging multiple frequencies to address not just highresistive rocks but also low-resistive rocks. SLB's 8 arm NGI (Quanta Geo) was released around 2014 and Halliburton released its STX (StrataXaminer) around 2021 both with 6 and 8 arm setups – all recording complex impedance at multiple frequencies.

The presentation will address what delivery one should expect, and tries to, at least partly, help in demystifying how to leverage the full breadth of acquired data (real, imaginary, magnitude, phase angle) to support interpretation of detected features and to put them into geological context. Image examples will be given to represent some of the good, bad and ugly of this technology to foster a discussion and might therefore be thought provoking on purpose. A few mathematical equations may be un-avoidable, but nothing more complicated than Pythagoras, basic trigonometry and vector calculus.

Key words: EMeX (Enhanced iMager eXplorer™), NGI (Quanta Geo™) , STX (StrataXaminer™). Multifrequency image log, impedance, complex readings, stand-off, vector, real, imaginary, phase angles, roll-over.



Bernd Ruehlicke is the president of Eriksfiord, Inc. He leads the numerical group in Eriksfiord as senior image and sonic log specialist with 30 years of experience in the processing and application of image and sonic logs to geology and geomechanics. Bernd's first exposure to Image Logs was in 1993 when joining Z&S Geologi in Stavanger to develop geological applications for RECALL(Halliburton). Bernd was president of the SPWLA Houston chapter (2022-2024) and was a SPWLA distinguished speaker 2021-22. He holds a MSc in theoretical Mathematics, a BSc in Computer Science from Aarhus University, Denmark and an MBA from the University of Houston-Victoria.

INTEGRATION OF BHI, CORE, AND WELL TEST IN QUANTIFYING PERMEABILITY - A CASE STUDY FROM GEOTHERMAL WELL IN THE NETHERLANDS

Ganguly, S., Janzen, A., Broek, J.v.d., ter Borg, M., Groot, L.d.; EBN.B.V.

Permeability, one of the most important subsurface parameters in Geothermal Energy, is often the most uncertain reservoir properties due to lack of direct measurements at various scales to capture reservoir heterogeneity. To have better control over the permeability variation and its uncertainties, it is essential to integrate and calibrate with available well data and verify with dynamic reservoir data.

SCAN (Seismische Campagne Aardwarmte Nederland) project in the Netherlands includes drilling and acquiring extensive well data in potential geothermal reservoirs, e.g., Buntsandstein and Rotliegend. The workflow of this study comprises integration and calibration of logs, image log data, derive permeability from core probe and plug data at reservoir conditions, upscale the log perm to match well test pressure transient analysis as well as PLT log interpretations.

The upscaled log permeability and well test results were compared at: 1) reservoir scale, and 2) at flow zones, to recognize the impact of heterogeneity at various levels. The match at reservoir scale was within same decade of variability, whereas the deviations at the flow zones scale were explained with the features observed from the high-resolution data (image logs and core). This workflow can help with future geothermal reservoir characterization, planning, and performance optimization.

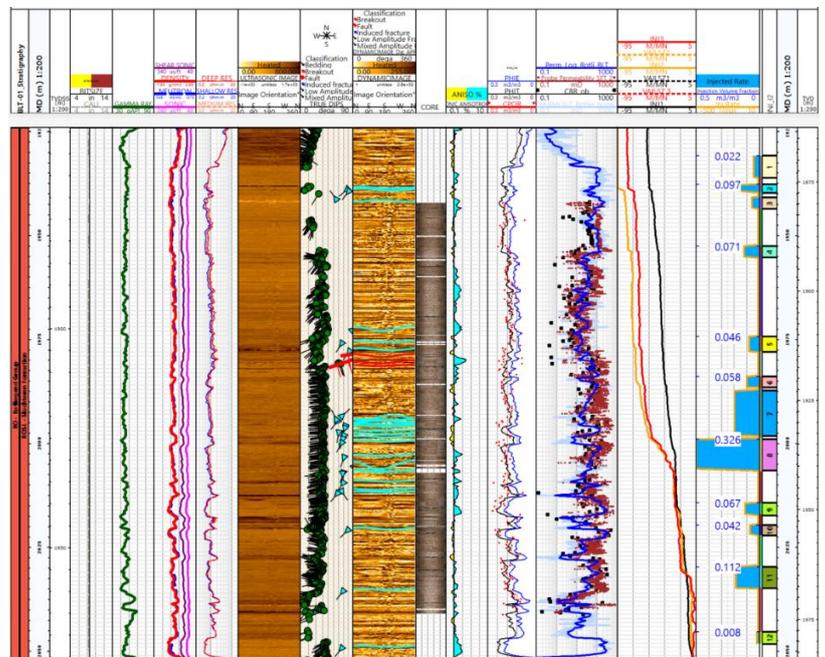


Figure 1: Integration of Core, Log and Well test data to characterize and quantify Permeability along the heterogeneous geothermal reservoir.

Sanchita Ganguly did a Masters in Applied Geology from IIT Kharagpur, India and has 21 years of experience in the Energy sector. She worked first in Schlumberger, India, as Borehole Geologist and Image log specialist, and then joined Wintershall Noordzee in the Netherlands, as Senior Petrophysicist and later continued in Wintershall Dea, Germany. She has worked in many petroliferous basins in India, in the Dutch, Danish, UK, and German North Sea, a couple of Norwegian fields as well as in GOM, Mexico, spanning from oil and gas exploration, appraisal, development, abandonment as well as CCUS exploration projects. In her current position at EBN B.V., she is responsible for petrophysical evaluation of Dutch SCAN project for Geothermal Energy as well as CCUS workover project 'Porthos', apart from monitoring various Dutch offshore oil and gas project developments.