Adrok®

A REVOLUTION

IN SUBSURFACE EXPLORATION

Oil & Gas
6th August 2014

GO

Dr David Limmer and Liam Clark

Kansas Next Step KNS Connecting for Success

Finding and Obtaining Opportunities Lead to Success

Adrok®

A REVOLUTION

IN SUBSURFACE EXPLORATION

Content

Use the to browse this PDF

Who We Are

WE CHALLENGE THE OLD WAYS

WE BELIEVE WE ARE BETTER

WE KNOW WE ARE THE FUTURE

OUR AMBITION IS SIMPLE AND BOLD

We intend to expand further around the globe, eventually becoming the must-use scanner for all geophysical exploration projects.

THE ADROK SCANNER identifies and maps resources to record depths.

Our virtual boreholes are **DEEPER, CLEANER, FASTER, CHEAPER**

than other exploration methods. We have helped save up to 90% of project costs.

What We Do

ANYTIME.
ANYPLACE.
ANYWHERE.

WE CHALLENGE THE STATUS QUO

Our game-changing technology sends a narrow beam of energy into the ground using micro and radio waves. The beam reflected back has a fingerprint that positively identifies and maps Oil & Gas and minerals.

It is the ultimate in portability. Readings can be taken on planes or boats on mountains or in jungles

THERE ARE NO LIMITS

PLAY **Adrok Film**

How It All Began

TO FUNDAMENTALLY CHANGE THE WAY OUR INDUSTRY EXPLORES FOR ITS RESOURCES

- **ADROK** was setup in December 1997 to further Dr Stove's research and develop his technology.
- Dr Stove is a remote sensing specialist who has been a principal investigator with ESA, NASA, and NATO.
- The early use of SAR and LIDAR systems from aircraft and space shuttles revealed the ability of the signals to penetrate the ground surface.
- λ / 2 was the conventional theory.
- Dr Stove discovered something different in 1983 publishing his findings with the Royal Society of London.
- Adrok commenced first commercial survey in Spring 2007 in Morocco, North Africa, for Caithness Petroleum.
- Since then we have conducted over 100 projects.
- 5 sets of Scanner Systems

How It Works

- RADAR Transmission
- Scientific Reference Points
- Focused Beam of Invisible Light
- ESA's Mars Express Orbiter

RADAR Beam Transmission

- Radio Detection and Ranging.
- Microwave Amplification by Stimulated Emission of Radiation.
- Adrok's Scanner illuminates the ground by transmitting and receiving invisible lased EM Energy (radiowaves / microwaves).

The Beam is:

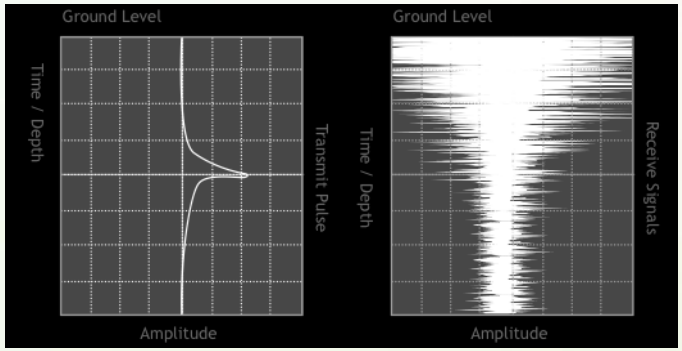
- Pulsed.
- Coherent (Narrow Band).
- Focused for minimal dispersion.
- Cylindrical Shaped.
- And contains resonant radiowave / microwave frequencies.

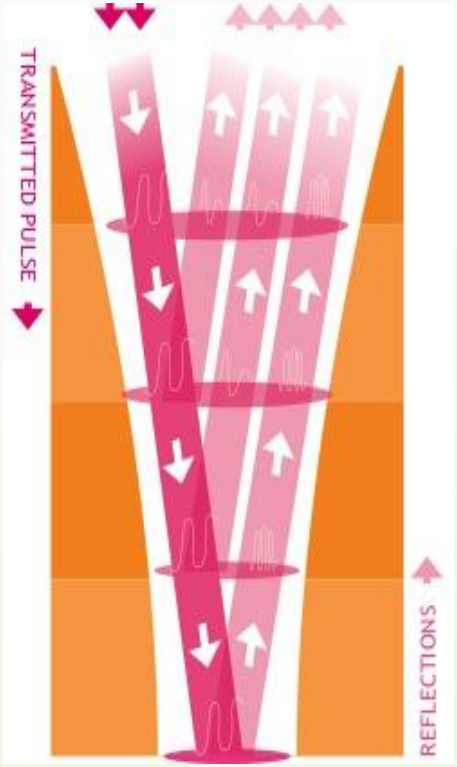
Outputs

- Dielectric Permittivity.
- Resonant Behaviours of Molecules.
- Spectroscopy.

ONCE IN A LIFETIME A TECHNOLOGY COMES ALONG THAT CHANGES EVERYTHING

ADR Transmit & Receive Beams



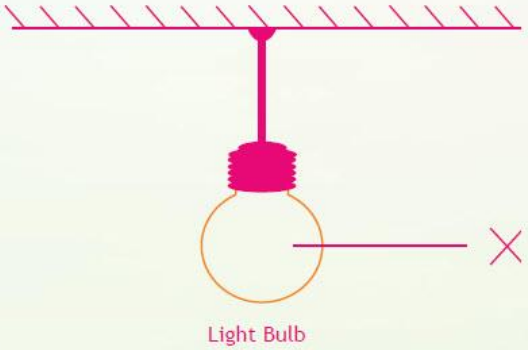


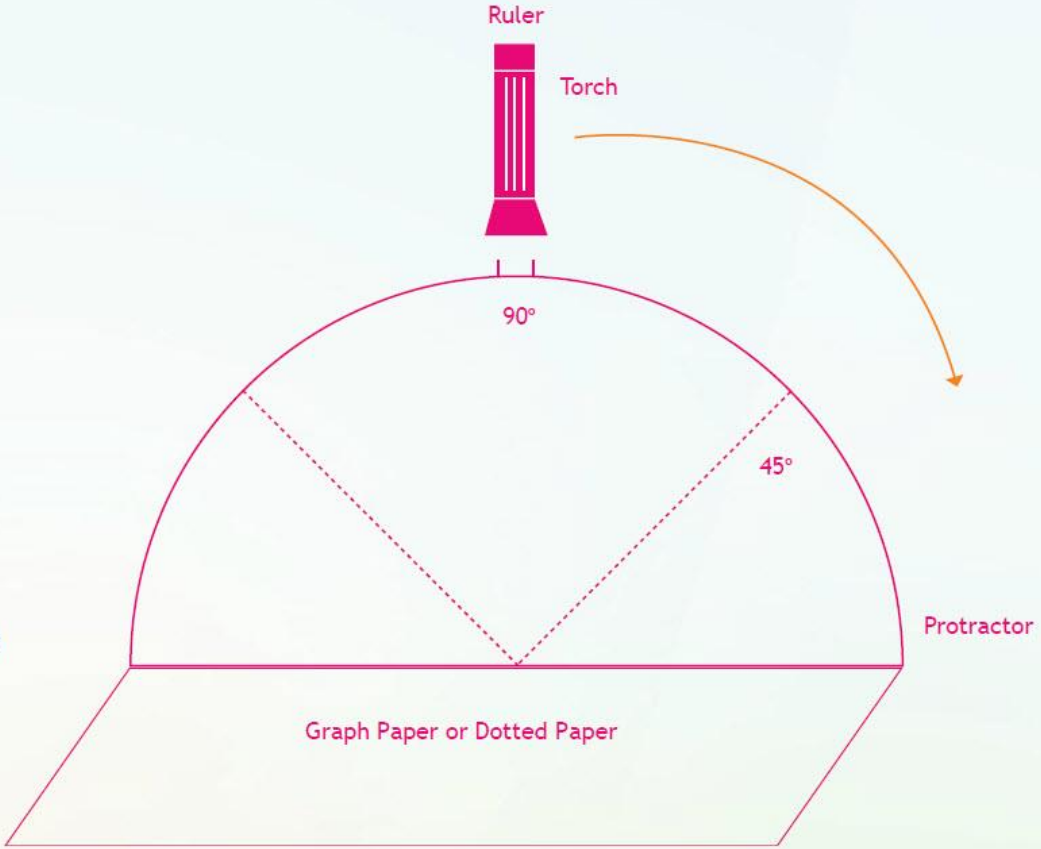
How It Works

- RADAR Beam Trasmission
- Scientific Reference Points
- Focused Beam of Invisible Light
- ESA's Mars Express Orbiter

Focused Beam of Invisible Light

The first three letters of our name A.D.R. stand for "Atomic Dielectric Resonance". And this phrase is the key to our success.
ADR generates a low-power transmission beam that is directional as opposed to wide-band, omni-directional dispersive beams. This means we can penetrate the earth's surface deeper compared to more conventional ground penetrating radar methods.



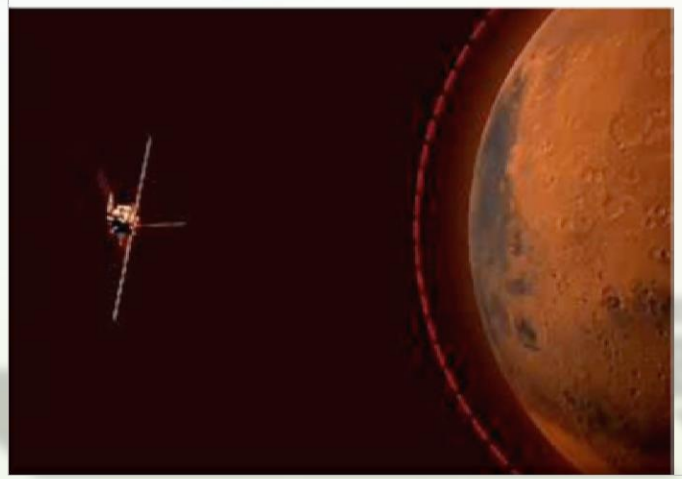


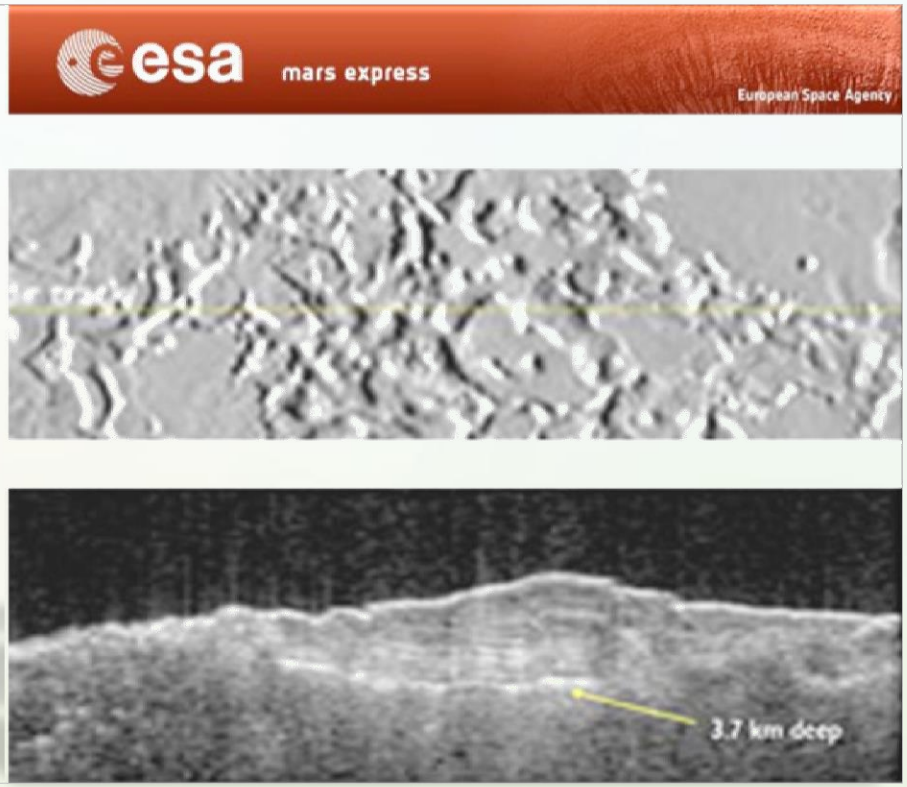
How It Works

- RADAR & MASER Beam Trasmission
- Scientific Reference Points
- Focused Beam of Invisible Light
- ESA's Mars Express Orbiter

ESA's Mars Express Orbiter

THE MARS EXPRESS RADAR experiment (MARSIS) in 2008 penetrated solid ground to 3.7km on a total power payload of 500 watts.





CREDITS MARSIS: ESA/NASA/ASI/JPL - Caltech/University of Rome: SHARAD: NASA/JPL - Caltech/ASI/University of Rome/Washington University in St. Louis

Source: http://www.esa.int/SPECIALS/Mars_Express/SEMIF74XQEF_1.html#subhead1

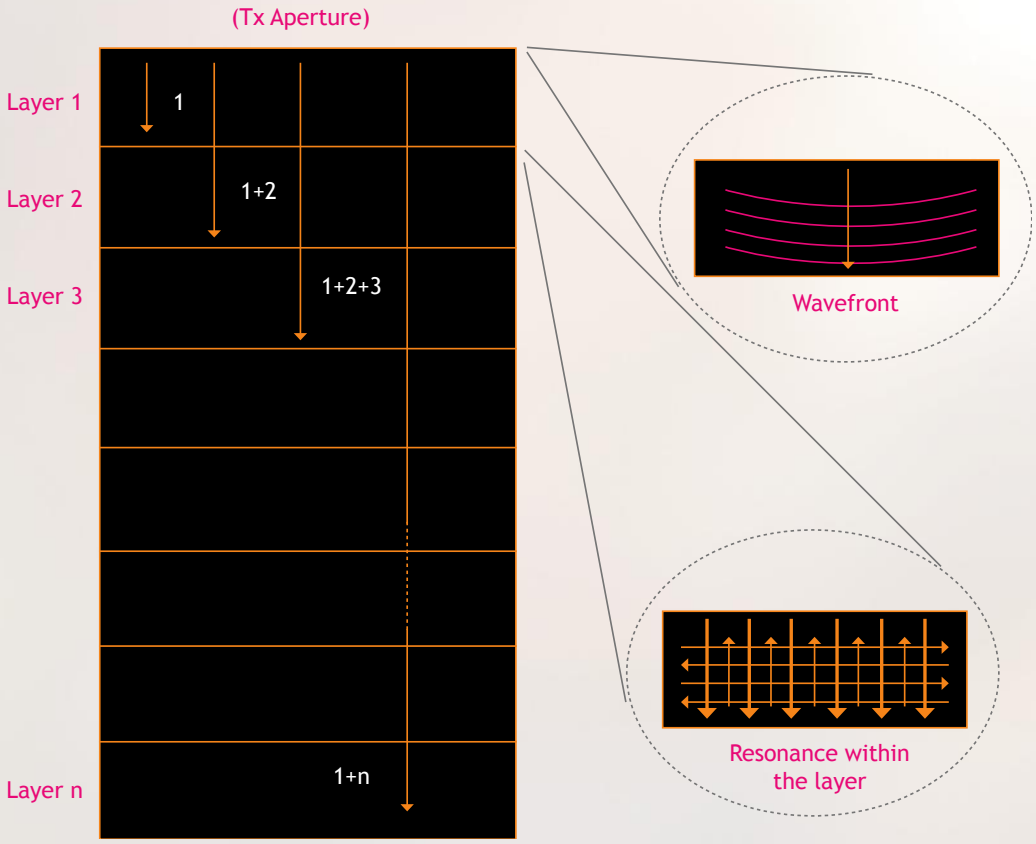
The Science

Deep Penetration with High Vertical Resolution

- Transmitted Beam
- Received Waves
- Material Classification through Spectroscopy
- Material Identification
- Dielectric Profile

OUR ABILITY TO IDENTIFY AND MAP RESOURCES HAS BEEN THE TRUE BREAKTHROUGH

How it Works
Transmitted Beam



The Science

Deep Penetration with High Vertical Resolution

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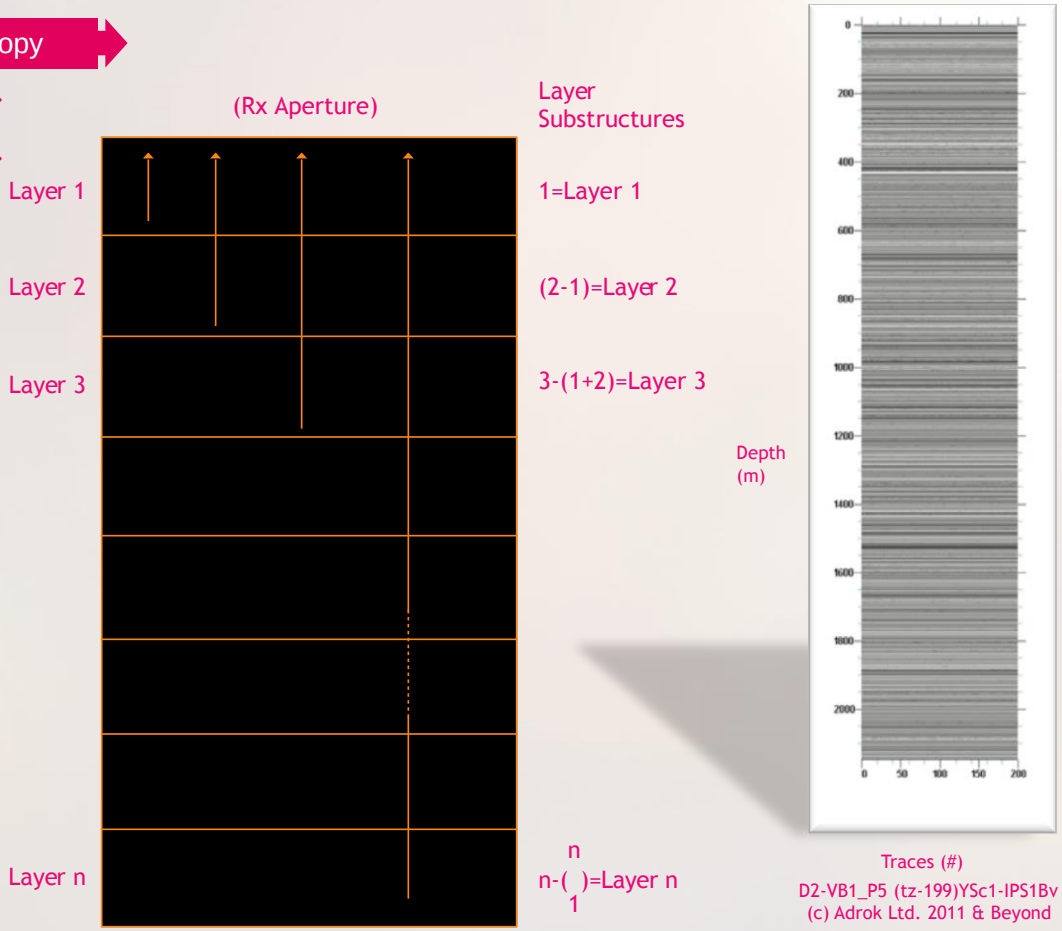
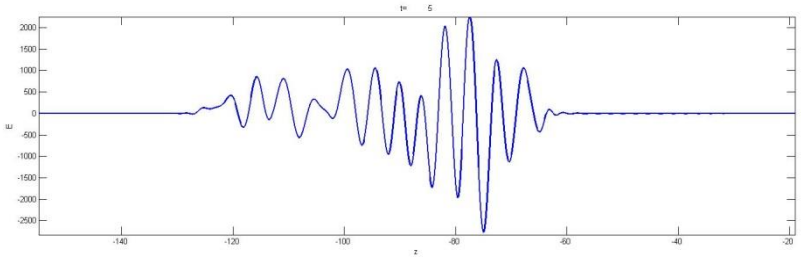
How it Works
Received Waves

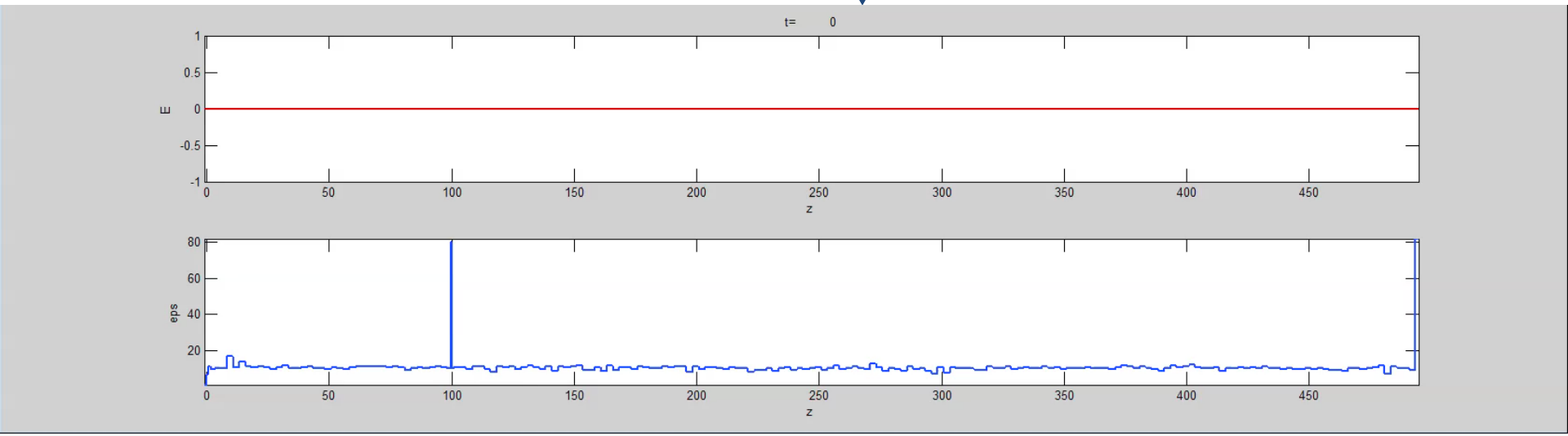


Verifying Theory: Model + field data

- Physical model verified by these tests



Tx pulse launched into ground at 0m



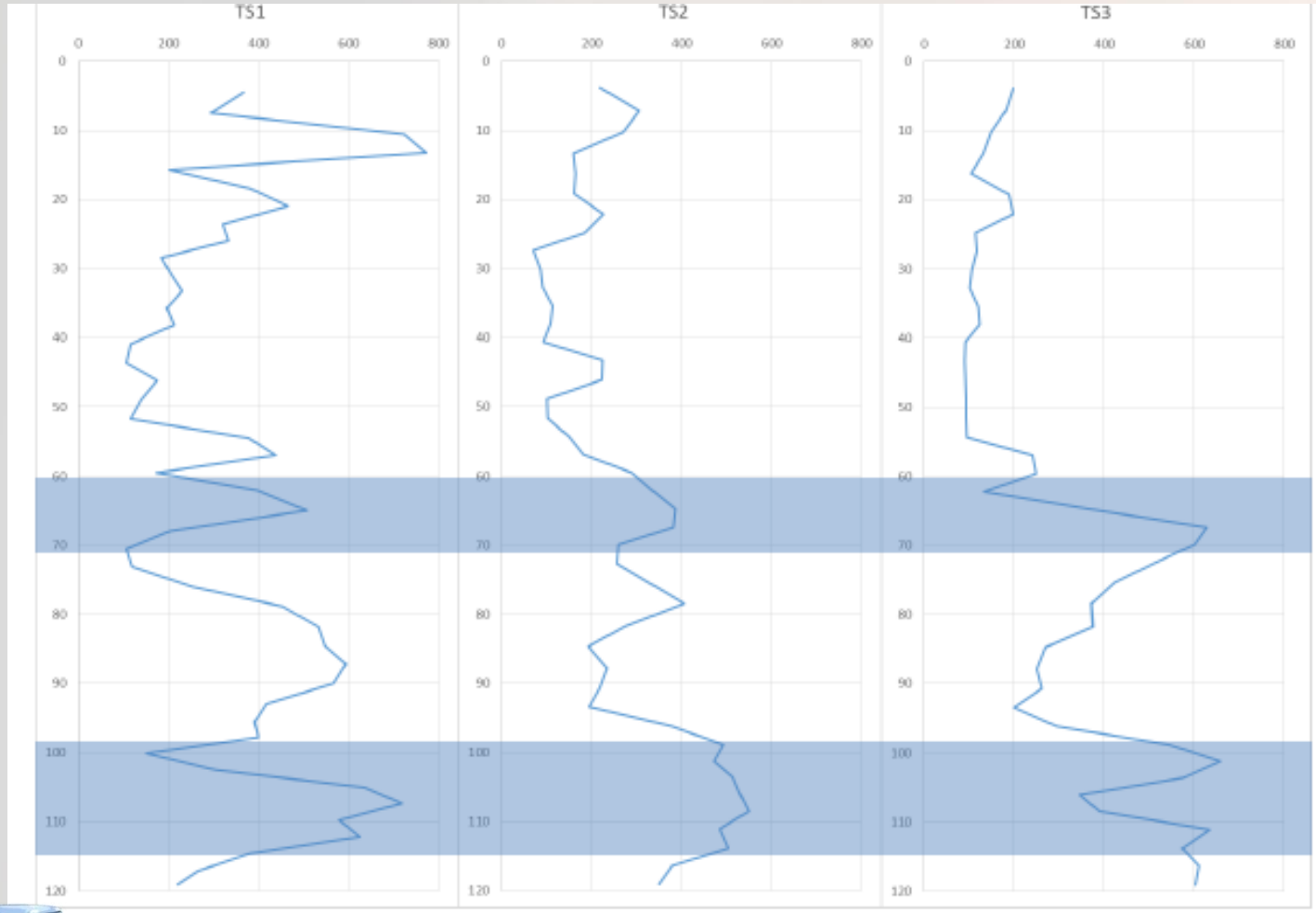
- Red: Transmission and reception of ADR
- Blue Measured dielectrics
- Detector 1m above ground (z=-1)

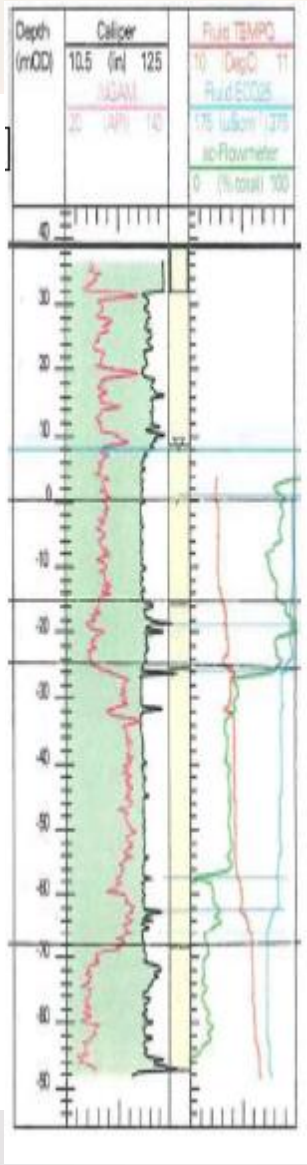
The Science

Deep Penetration with High Vertical Resolution

How it Works

Received Waves – from wet layers



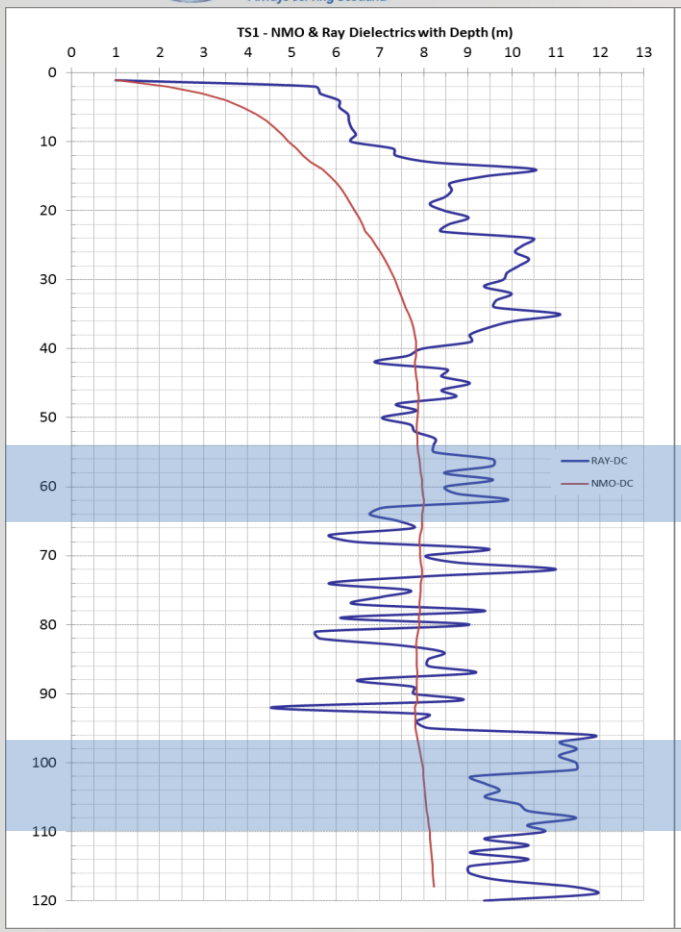


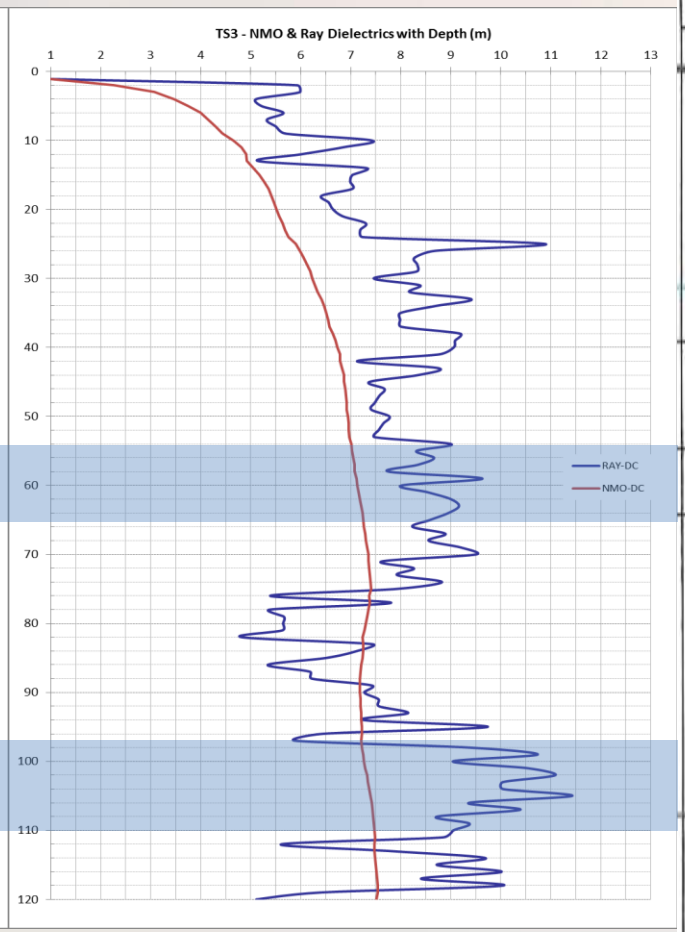
The Science

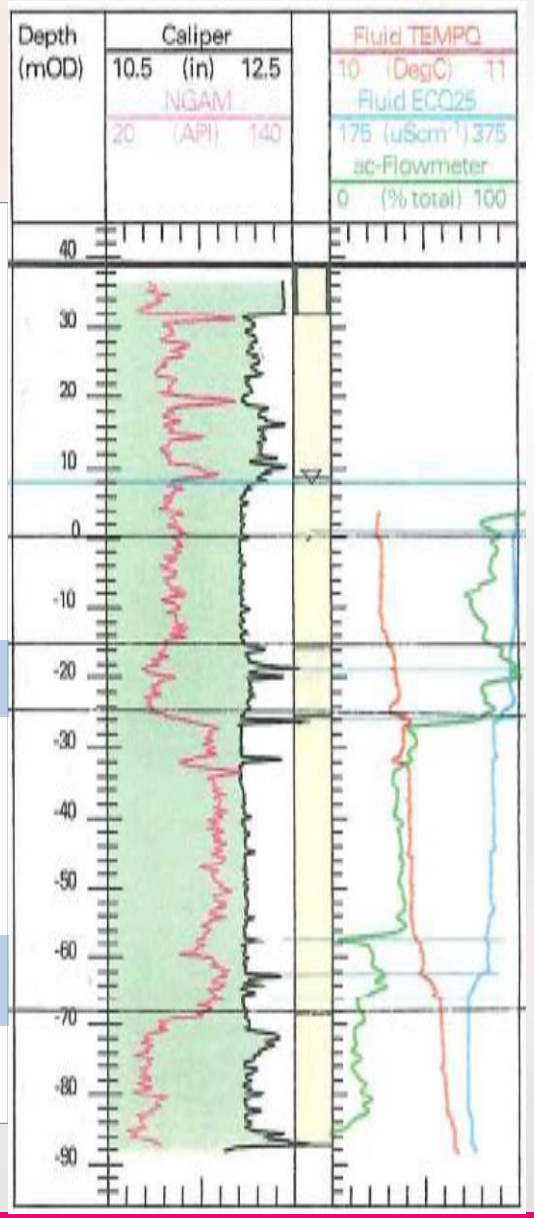
Deep Penetration with High Vertical Resolution

Scottish Water
Always serving Scotland

How it Works
Received Waves: Dielectrics from wet layers



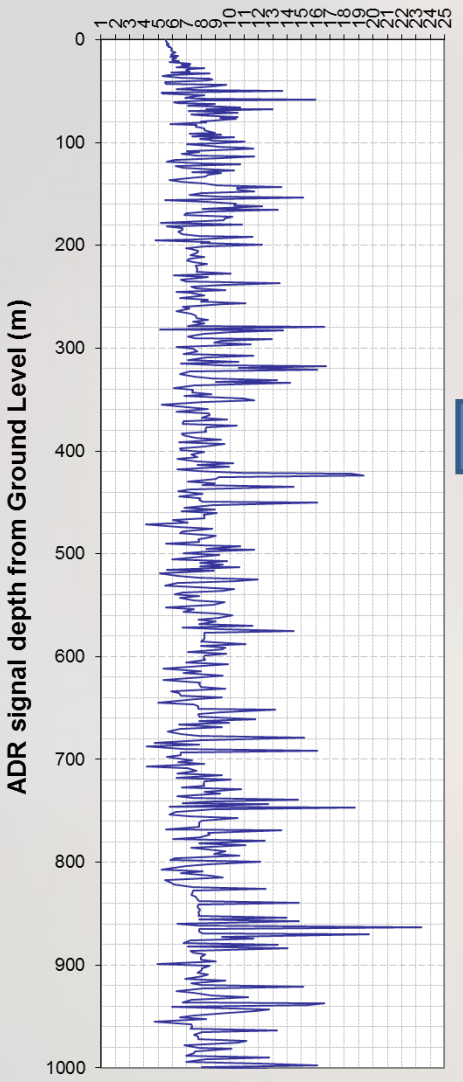


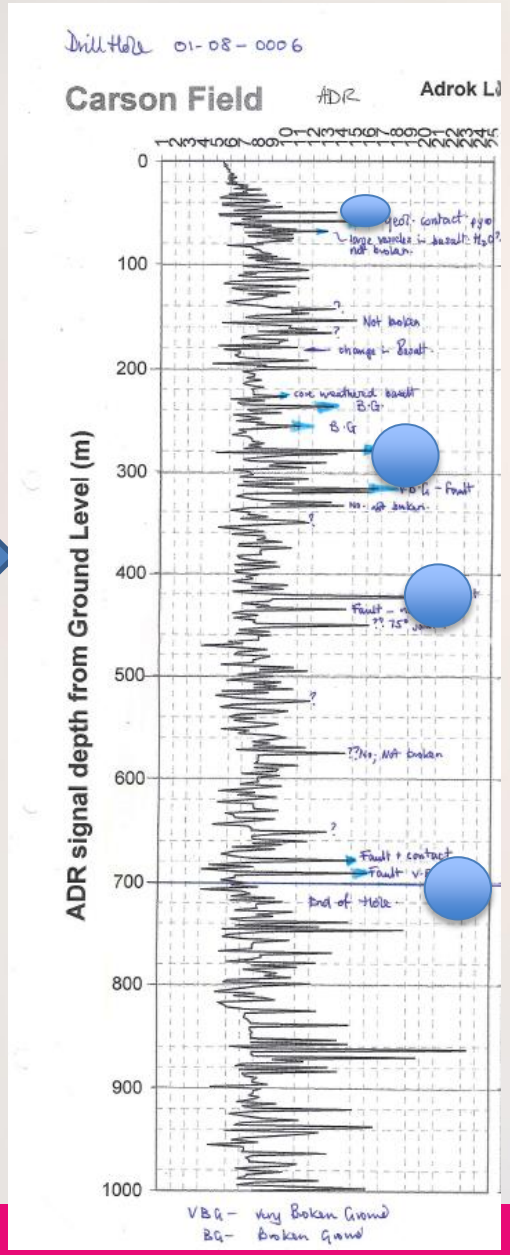


The Science

Deep Penetration with High Vertical Resolution

Carson Field





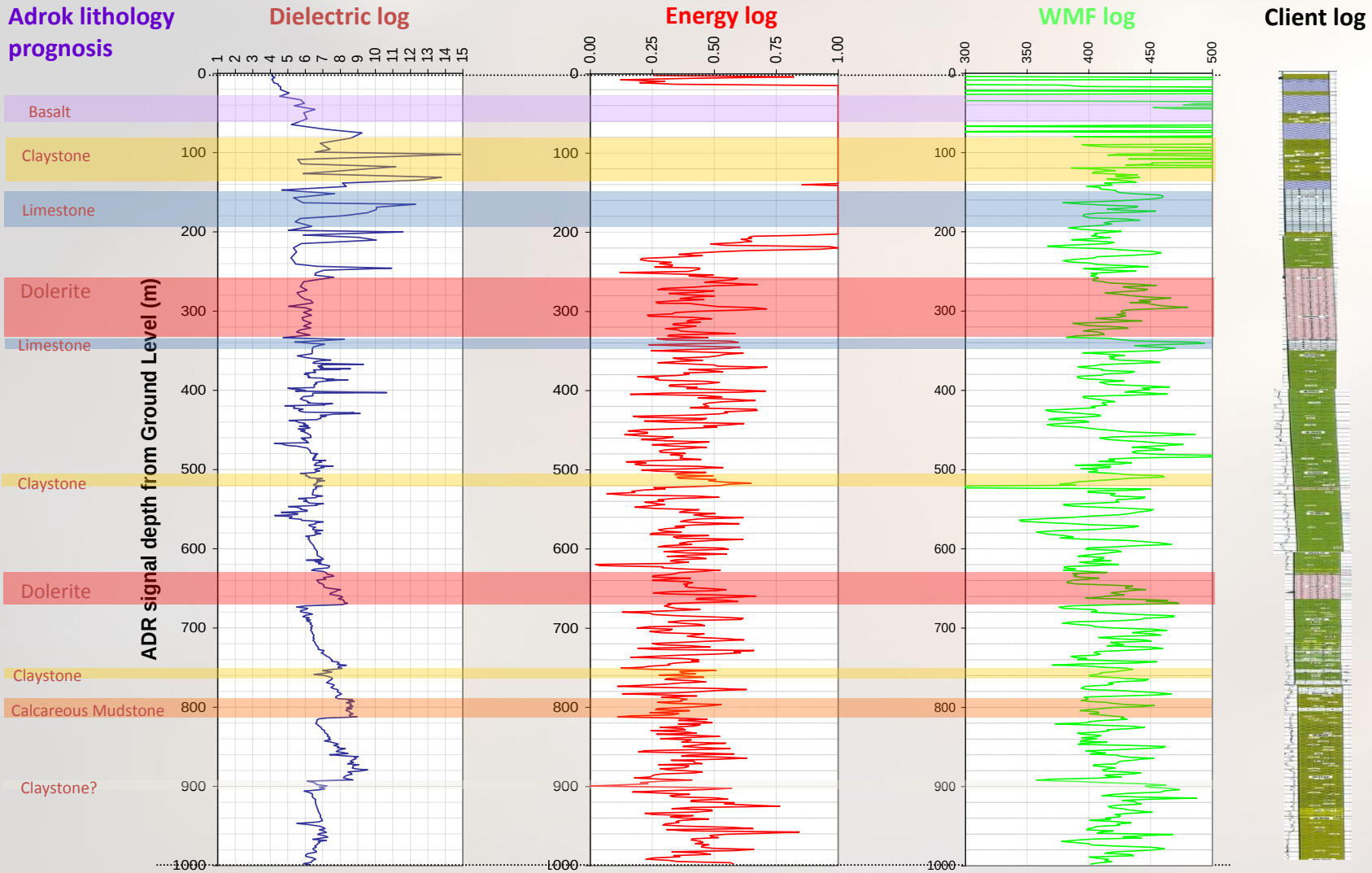
How it Works
Received Waves
– Hard Rocks
(Igneous/Metamorphic

- Dielectric survey from Northern Ireland
- High dielectrics verified by client from core inspection to be broken ground, very broken ground or faulting

The Science

Deep Penetration with High Vertical Resolution

How it Works
Received Waves – Hard Rocks (Igneous/Metamorphic)



The Science

Deep Penetration with High Vertical Resolution

- Transmitted Beam
- Received Waves
- Material Classification through Spectroscopy
- Material Identification
- Dielectric Profile

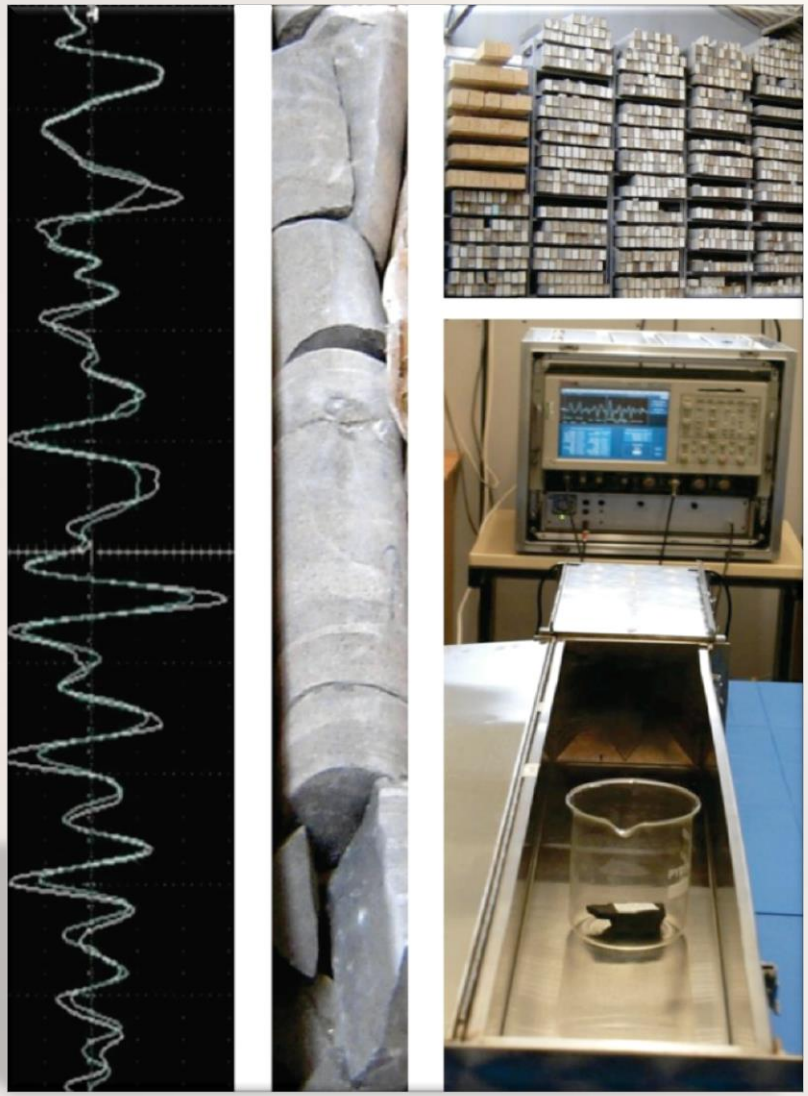
What it Does
Material Classification

The ADROK SCANNER measures the dielectric permittivity of rocks.

From the dielectric measurements we produce velocities, dielectric constants, and depth measurements from the surface and between subsurface layers.

We Measure:

- Zinc & Lead
- Moisture content of rocks
- Hydrocarbon concentrations in rocks
- Mineral grades in rock (Uranium, Nickel, Copper)



The Science

Deep Penetration with High Vertical Resolution

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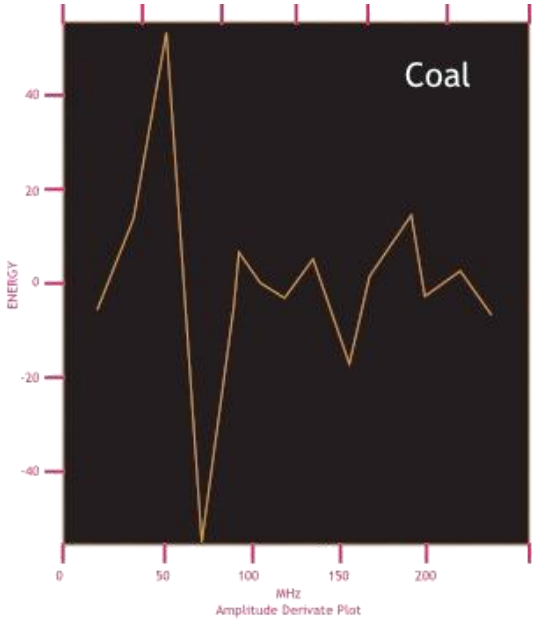
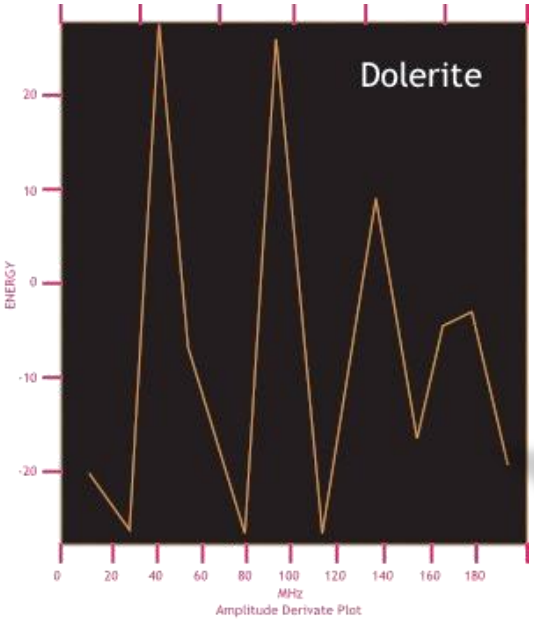
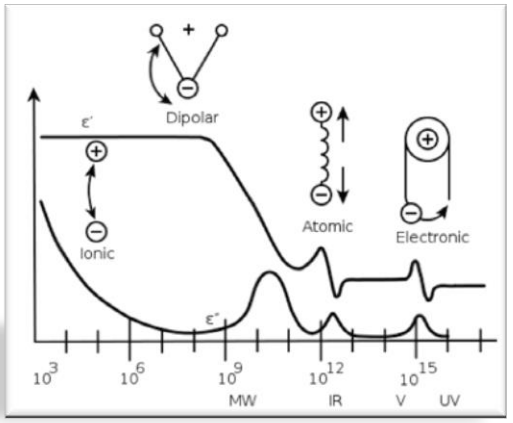
What it Does
Material identification

The ADROK SCANNER is an imaging spectrometer. Reference databases of Adrok signatures developed by Spectral Analysis (energy, frequency).

Expert Systems developed to help classify material signatures by different statistical methods.





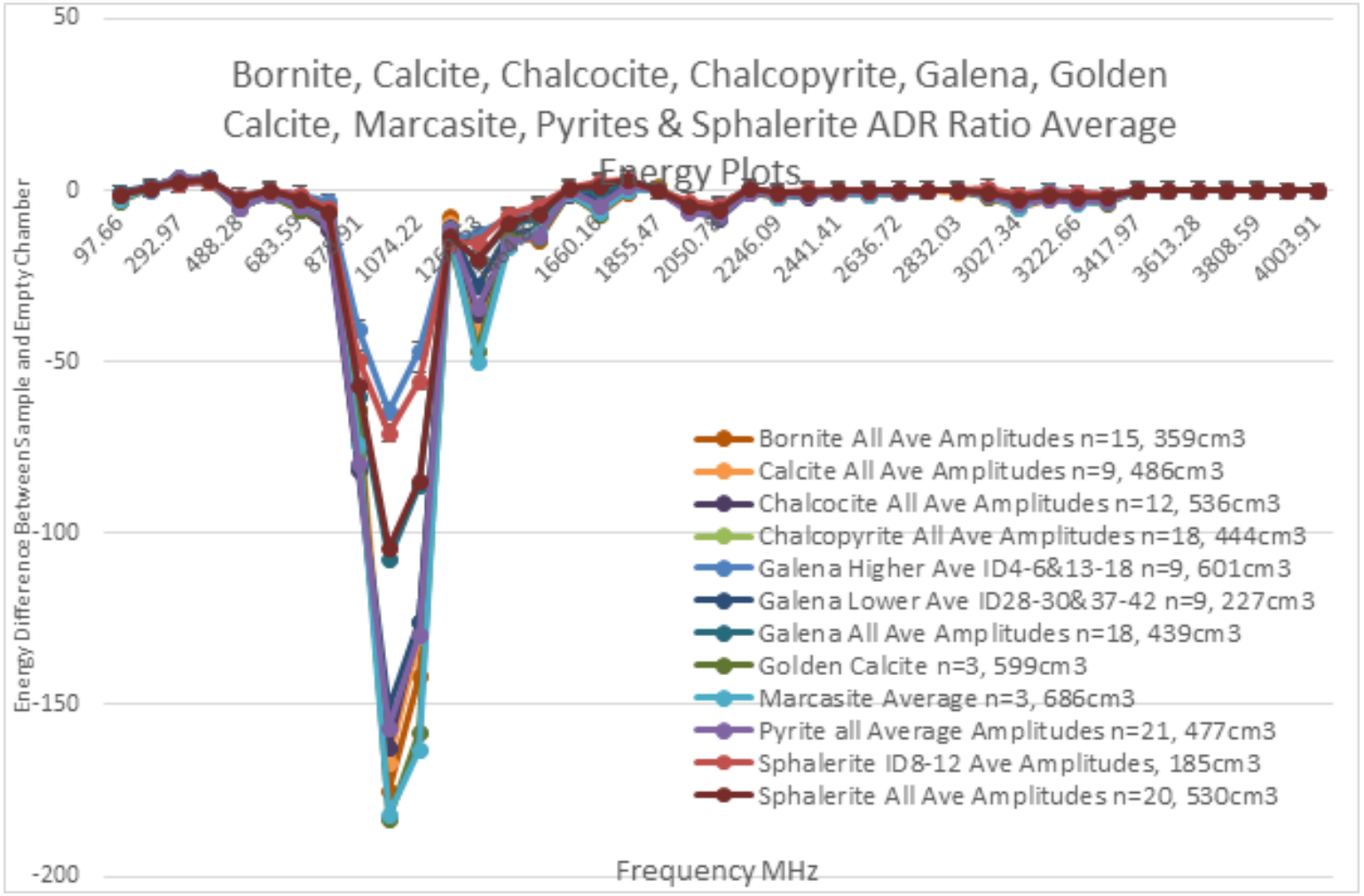


The Science

Deep Penetration with High Vertical Resolution

Material Classification through Spectroscopy

What it Does
Material identification

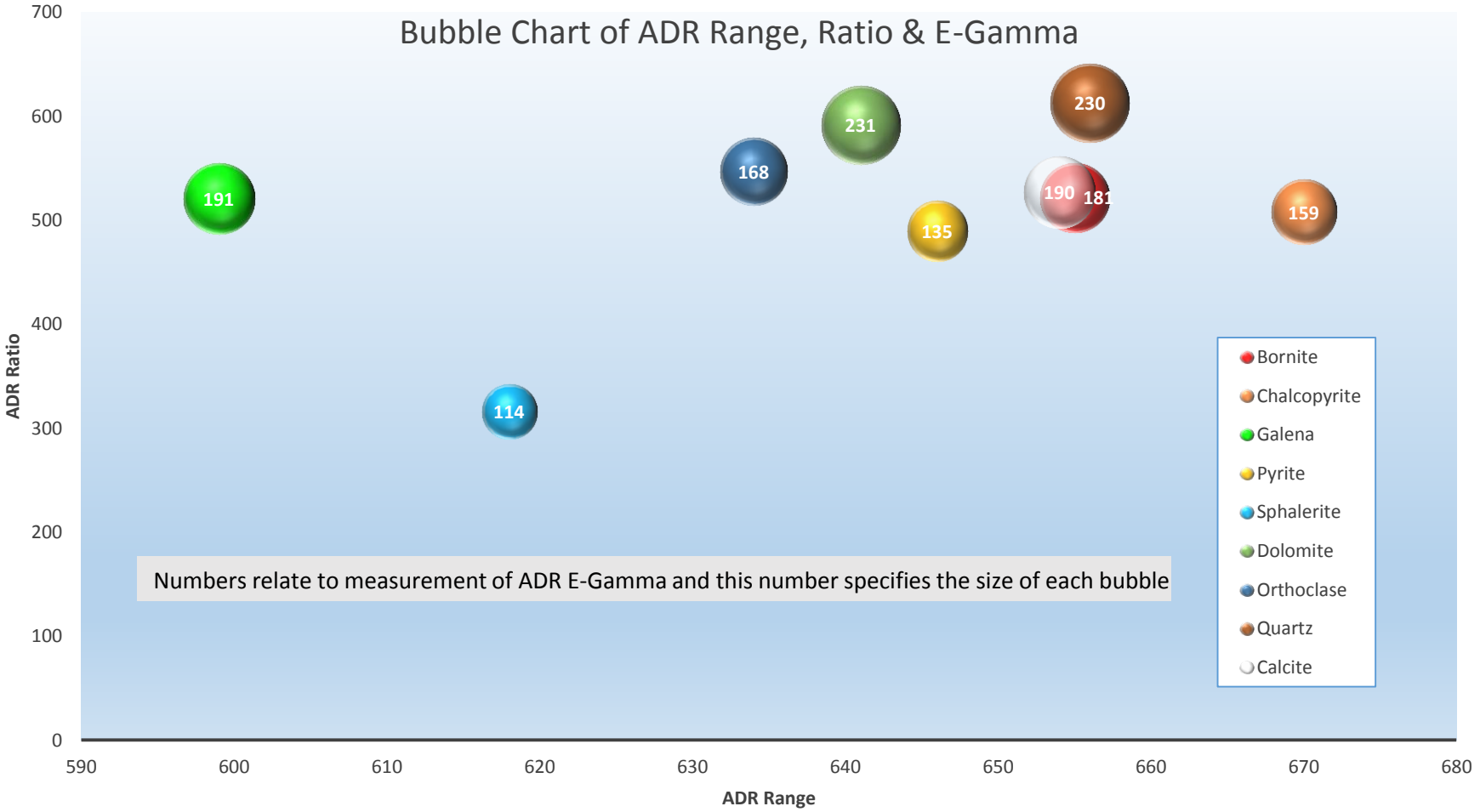


The Science

Deep Penetration with High Vertical Resolution

Material Classification through Spectroscopy

What it Does
Material identification



The Science

Deep Penetration with High Vertical Resolution

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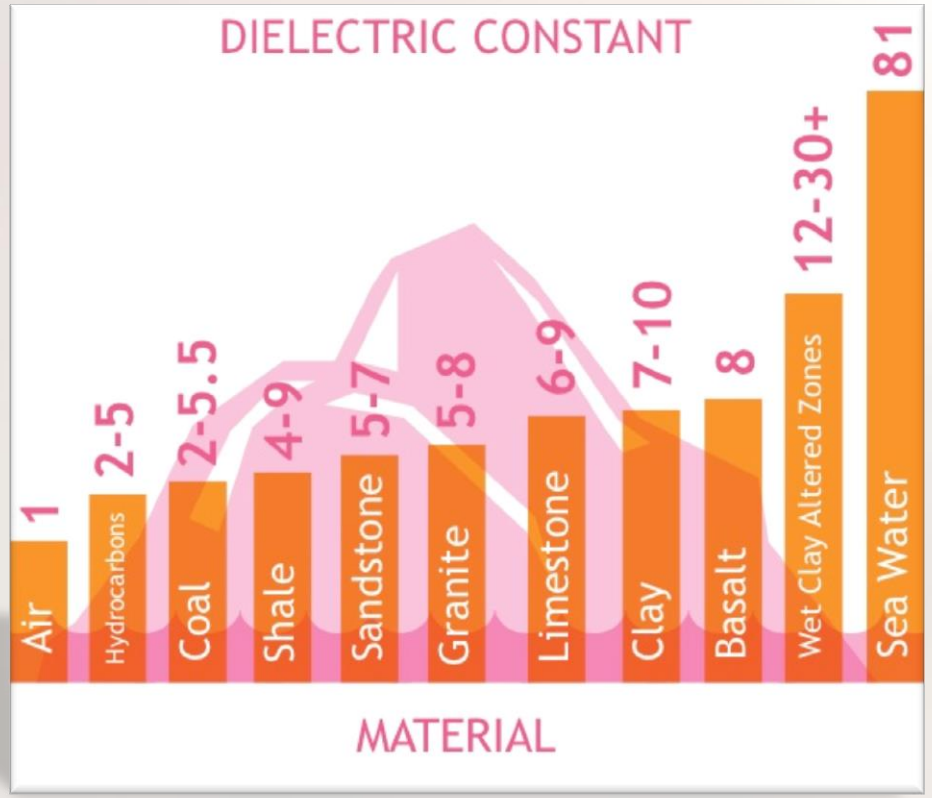
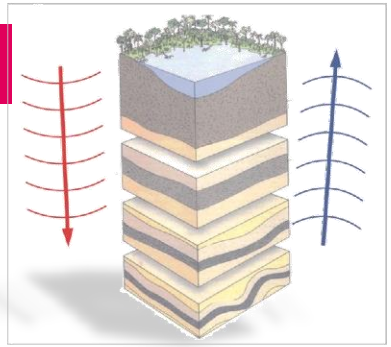
What it Does
Dielectric Profile



Survey Process



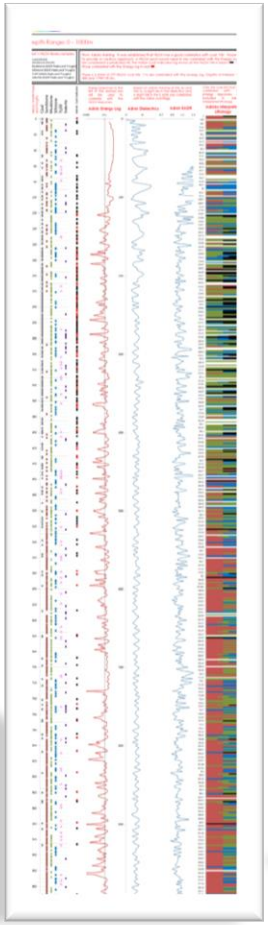
1 **Pre-survey field modelling**

2 **On-site Survey Data Acquisition**

Training for geological signatures

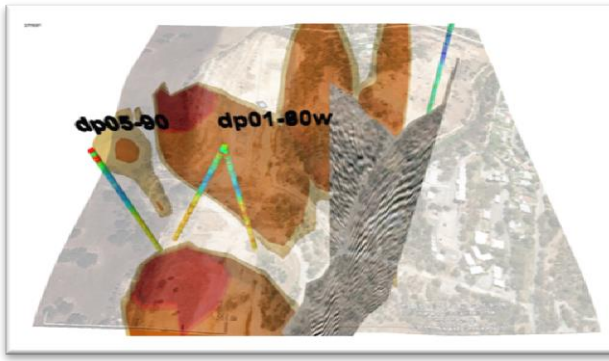
3

4 **Data Processing & Interpretation**



5 **Analysis & results Delivery**

6 **Integration to other data sets**



WE COMBINE EFFICIENT TECHNOLOGY WITH CUSTOMER SERVICE

THE BRITISH ASSESSMENT BUREAU ISO9001 UKAS MANAGEMENT SYSTEMS 4307
Certification No.188208

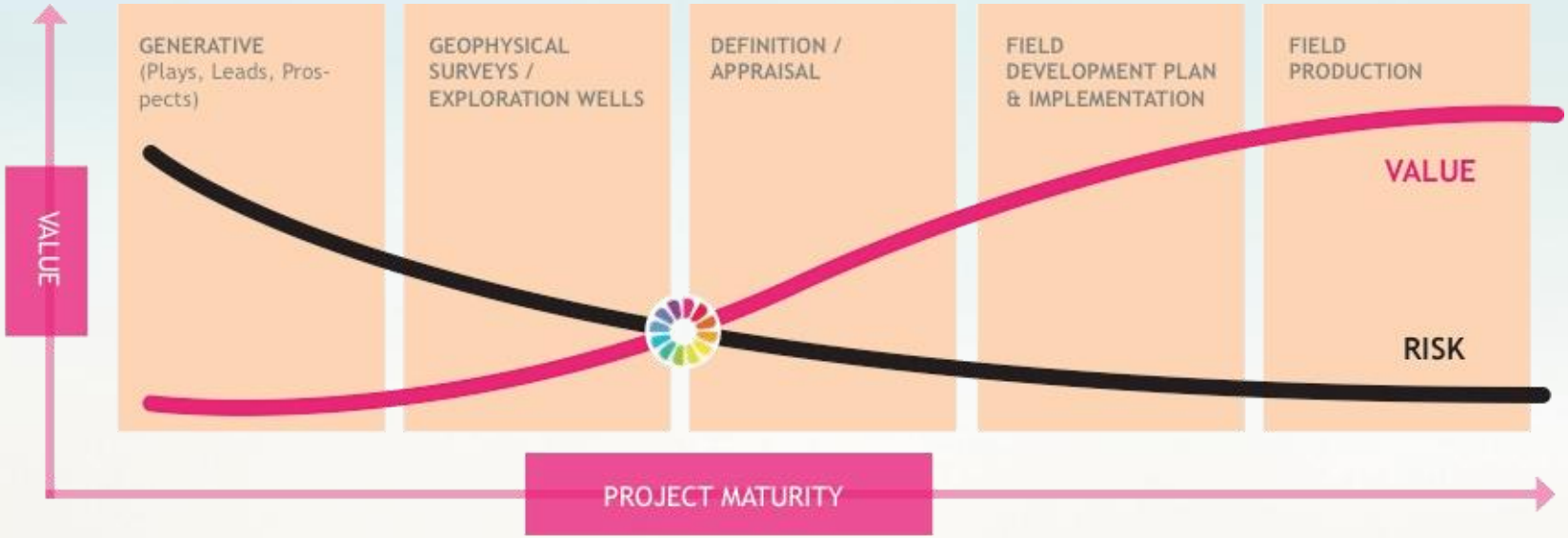
Adrok aims to provide useful subsurface measurements to help de-risk drilling programmes...
Thus enhancing recovery of hydrocarbons, minerals & water!

Advantages Of Using Adrok

- Cost
- Time
- Environment

DEEPER FASTER GREENER **CHEAPER BETTER**

Adrok provides geophysical survey services, usually for a pre-agreed fixed-price during our client's Exploration and/or Appraisal activities as a complementary survey to Seismic or as a cost-effective alternative. We typically aim to save our clients up to 90% of the cost of physically drilling the ground using a borehole.



Advantages Of Using Adrok

- Cost
- Time
- Environment

DEEPER **FASTER** GREENER CHEAPER **BETTER**

Advantages Of Using Adrok

- Cost
- Time
- Environment

DEEPER FASTER **GREENER** CHEAPER **BETTER**

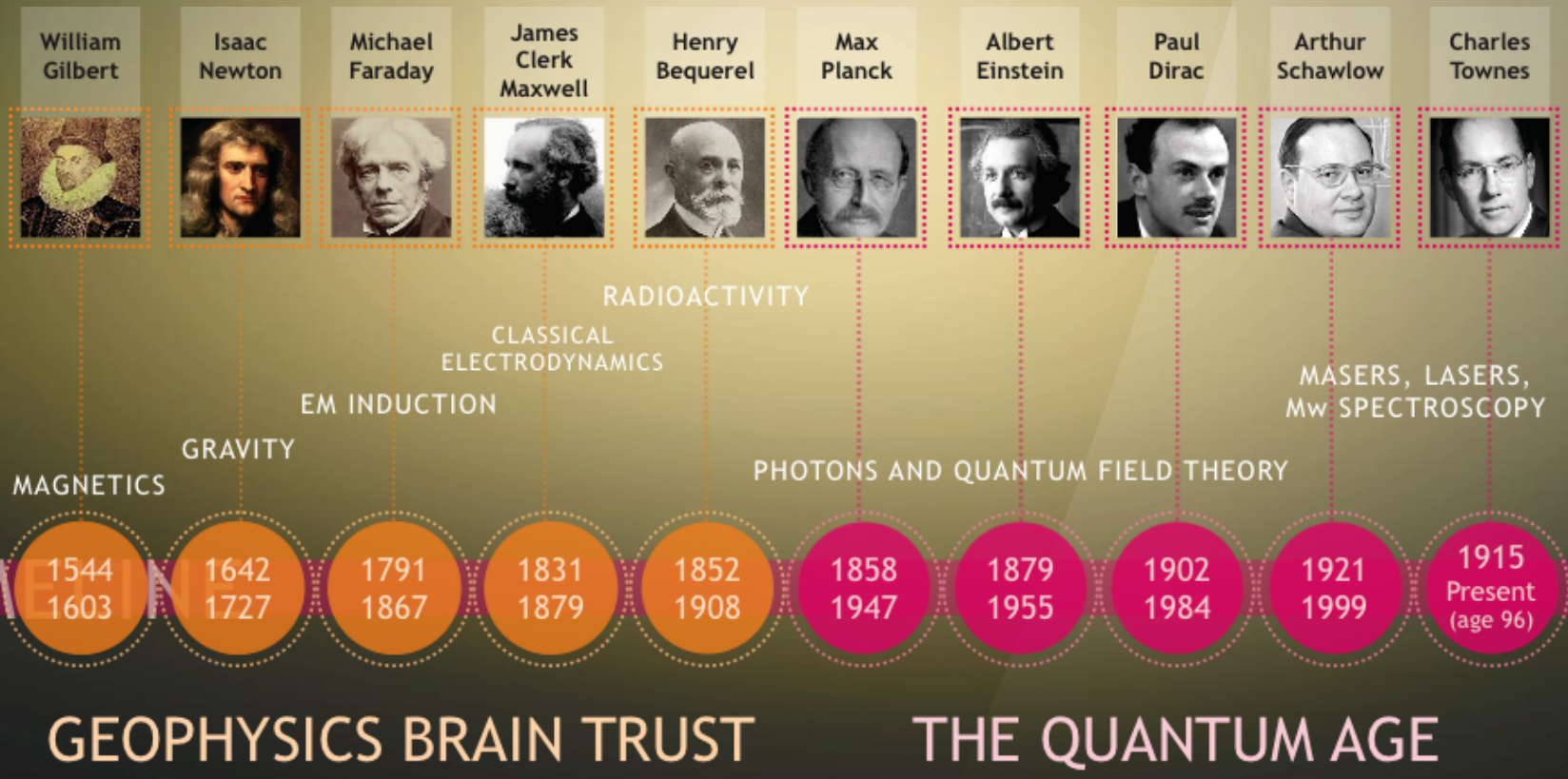
Adrok®

- Low energy used.
- Non-destructive waves to minimise chemical or biological changes to material under examination.
- No permitting issues.
- Remote sensing means no contact with the ground.
- The scanner can work through air, water and rock.
- Lightweight tool (200kg) for greater accessibility and transportation.
- Cost effective scanning solution that helps to reduce waste.

Following a Proud Story

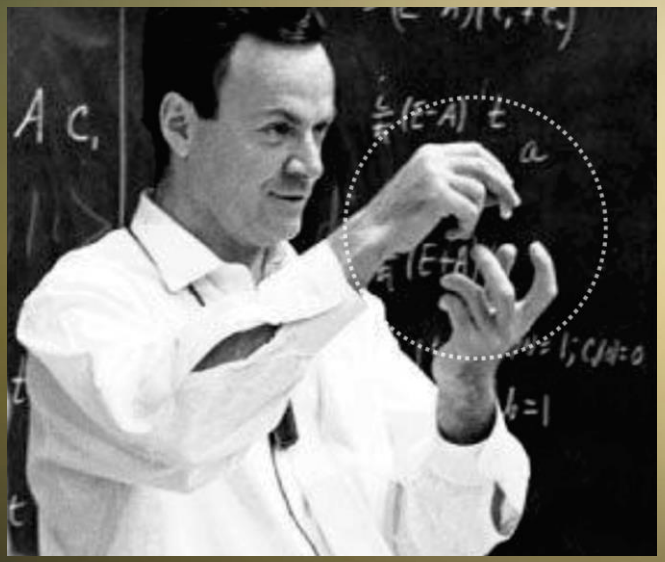
Geophysics Brain Trust / The Quantum Age

QED: “The Jewel of Physics”



Following a Proud Story

- Geophysics Brain Trust / The Quantum Age
- QED: “The Jewel of Physics”



Richard Feynman

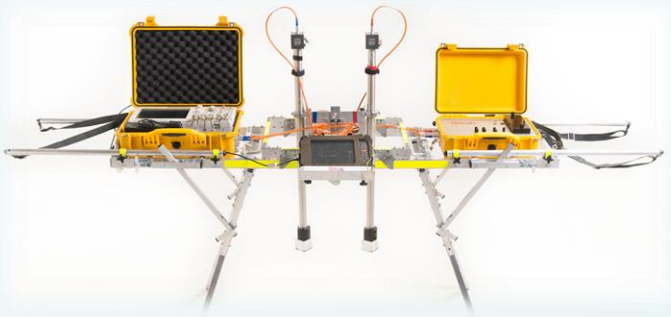
1918 - 1988

QUANTUM ELECTRODYNAMICS mathematically describes all phenomena involving electrically charged particles interacting by means of exchange of photons and represents **the quantum counterpart** of classical electrodynamics giving a complete account of matter and light interaction.

Case Studies

Effective, **V**ersatile and **A**ccurate

E.V.A.



IT'S LESS BORING WITH ADROK

Case Studies

Effective, Versatile and Accurate

Onshore, Oklahoma, USA	01	02	03	04	05
Onshore, Egypt (Oil field)	01	02	03	04	05
Onshore, China (Oil Field)	01	02	03	04	05
Onshore, Canada– Mine workings and water.	01	02	03	04	05

IT'S LESS BORING WITH ADROK

IT'S LESS BORING WITH ADROK

Effective

Onshore, Oklahoma, USA

ONSHORE, OKLAHOMA, USA

IT'S LESS BORING WITH ADROK

May 2010

IT'S LESS BORING WITH ADROK

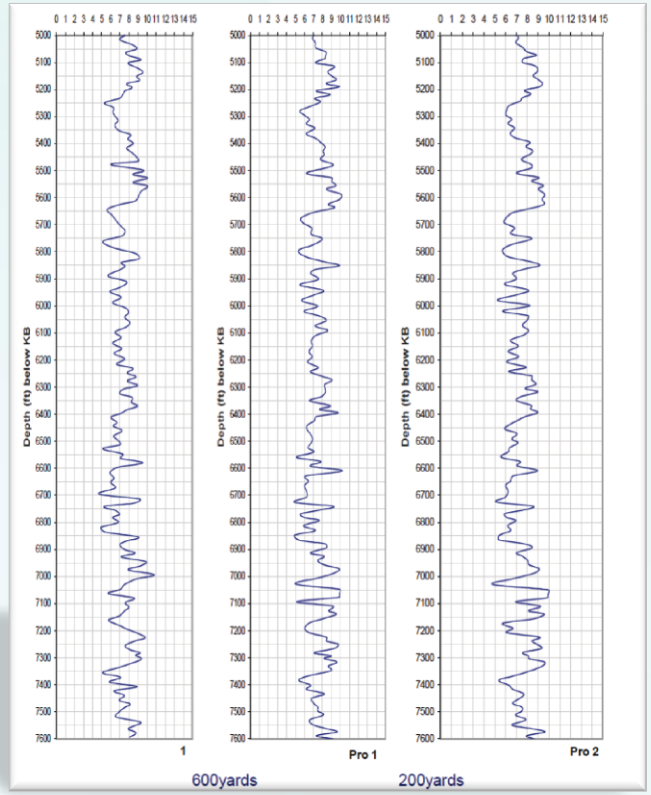
ONSHORE, OKLAHOMA, USA

- **AIM:** Adrok to find the top of Oil bearing Wilcox rock.
- Depth of ADR penetration was over 7500ft.
- The results of the Adrok survey were compared to the actual drilling results.

IT'S LESS BORING WITH ADROK

ONSHORE, OKLAHOMA, USA

INITIAL WELL. Adrok's Prognosis in March 2010 (before client's drilling).



DIELECTRIC CONSTANT LOGS (5000 - 7600ft KB)

Case Studies

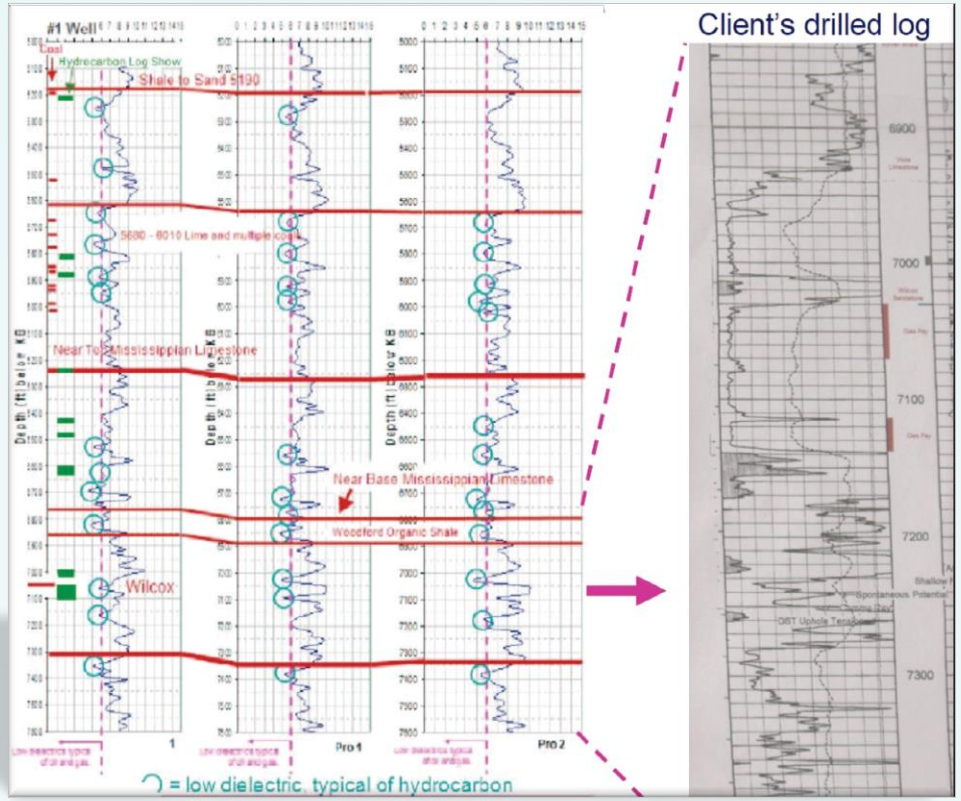
Effective, Versatile and Accurate

Onshore, Oklahoma, USA 01 02 03 04 05

IT'S LESS BORING WITH ADROK

ONSHORE, OKLAHOMA, USA

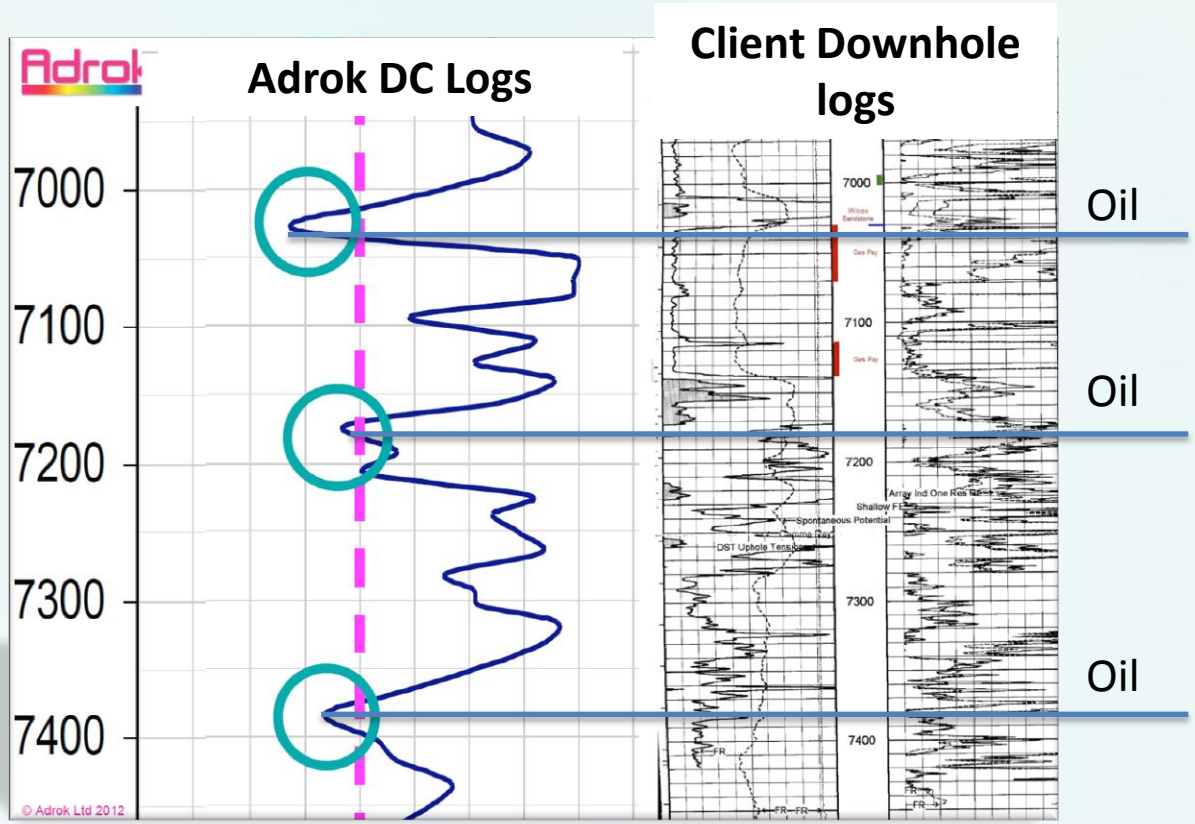
INITIAL WELL. Adrok's Prognosis in March 2010 (before client's drilling).



DIELECTRIC CONSTANT LOGS (5000 - 7600ft KB) JULY 2010

IT'S LESS BORING WITH ADROK

ONSHORE, OKLAHOMA, USA



Low DC matching with Oil bearing horizons.

IT'S LESS BORING WITH ADROK

ONSHORE, OKLAHOMA, USA

Conclusions:

- Drilling and testing has confirmed Adrok's predictions.

ADR Prediction		Driller's Log	
Depth to top of hydrocarbons	Thickness	Depth to top of hydrocarbons	Thickness
7008.5 ft	21.9 ft	7030 ft	42 ft

- Adrok's depth accuracy to oil & gas accumulation was 0.3%
- The initial well has now been completed and is producing:
  - 1,400,000 cubic feet of gas per day
  - 22 barrels of oil per day

Case Studies

Effective, Versatile and Accurate

Onshore, Oklahoma, USA 01 02 03 04 05

ONSHORE, OKLAHOMA, USA

IT'S LESS BORING WITH ADROK

February 2014

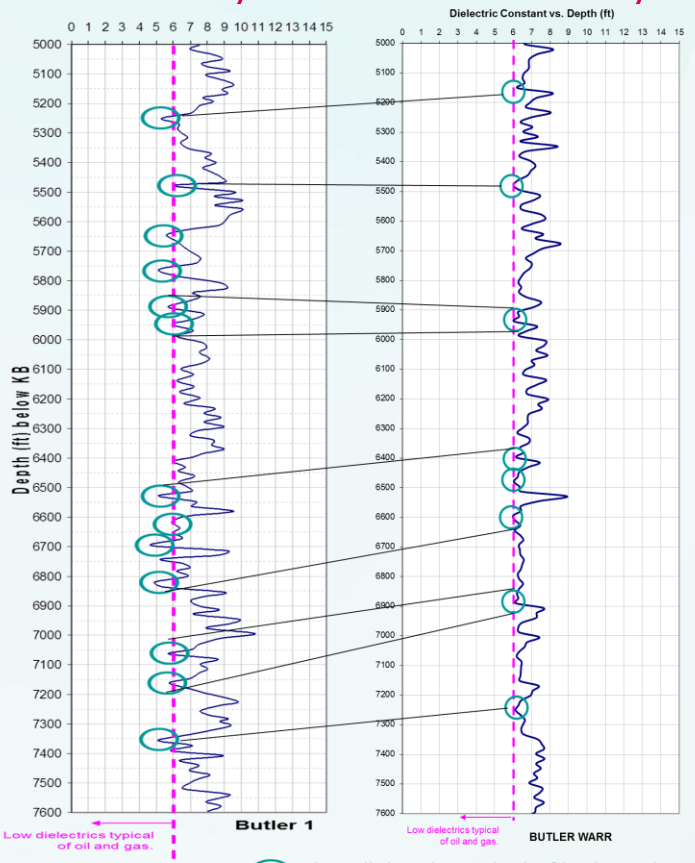
Case Studies

Effective, Versatile and Accurate

Onshore, Oklahoma, USA 01 02 03 04 05

IT'S LESS BORING WITH ADROK

ONSHORE, OKLAHOMA, USA

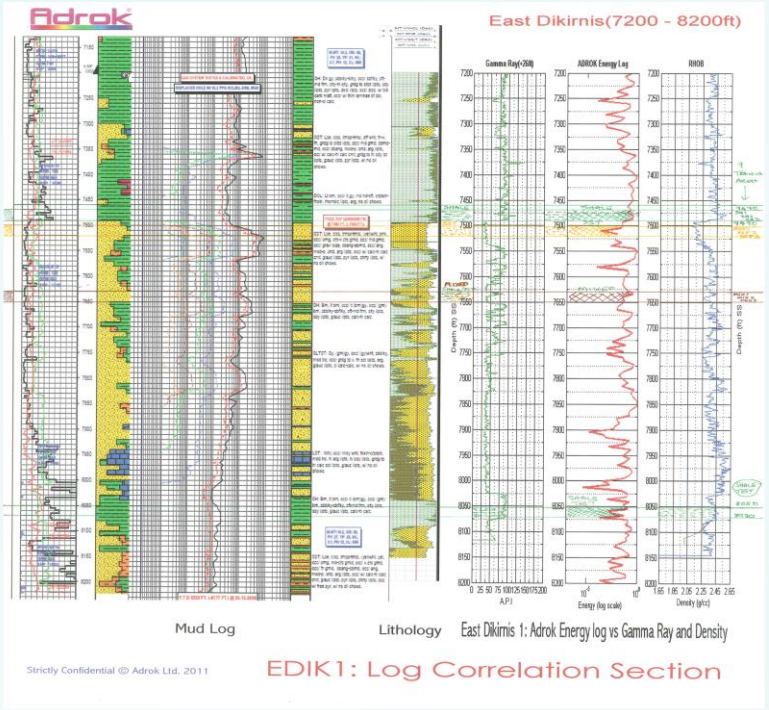


Dielectric Constant Logs (5000-7600ft)

IT'S LESS BORING WITH ADROK

Accurate

Onshore, Egypt (Oil field)



Case Studies

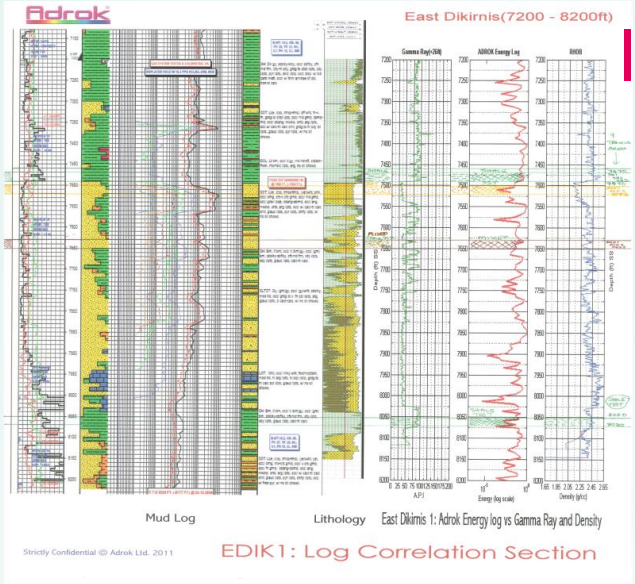
Effective, **V**ersatile and **A**ccurate

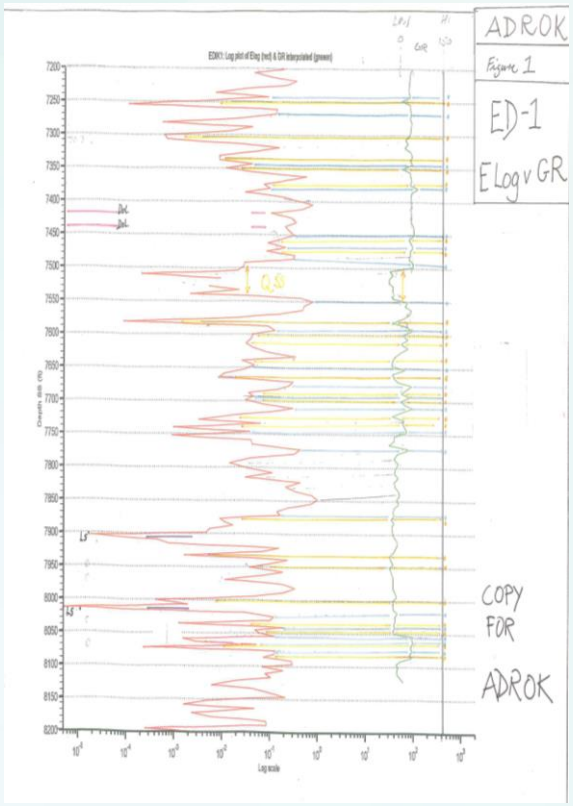
Dikirnis wells in Egypt 01 02 03 04 05

Dikirnis wells in Egypt

IT'S LESS BORING WITH ADROK

Correlate Adrok Logs to Oil bearing Dikirnis downhole wireline logs: GR, RHOB and the mudlog.





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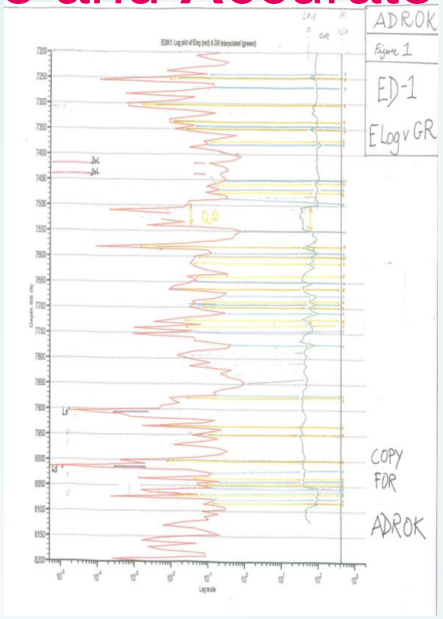
Dikirnis wells in Egypt 01 02 03 04 05

IT'S LESS BORING WITH ADROK

Dikirnis wells in Egypt

"The results of this project are of real importance to geophysical/geological exploration for oil and gas."



"These results are quite remarkably accurate and unequalled by any other system."
-Jim Ward

Mr Jim Ward, is an expert knowledge of Worldwide Hydrocarbon Geology and was the Chief Exploration Geologist behind the discovery of the Buzzard field in the North Sea, UK.

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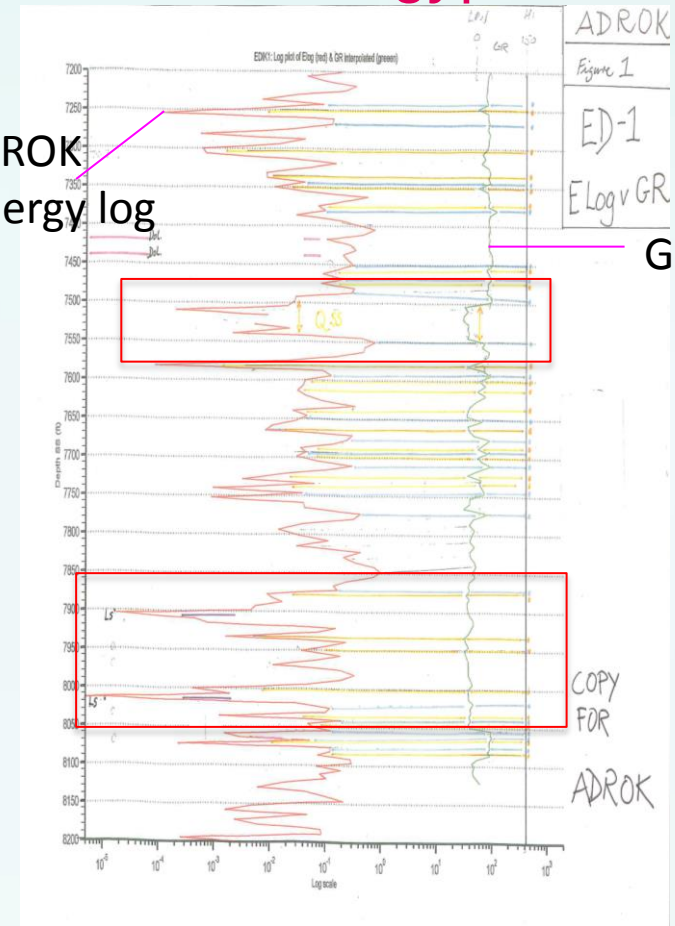
Dikirnis wells in Egypt

The ADROK ADR Energy log (Elog)



GR log (Aug. 2011)

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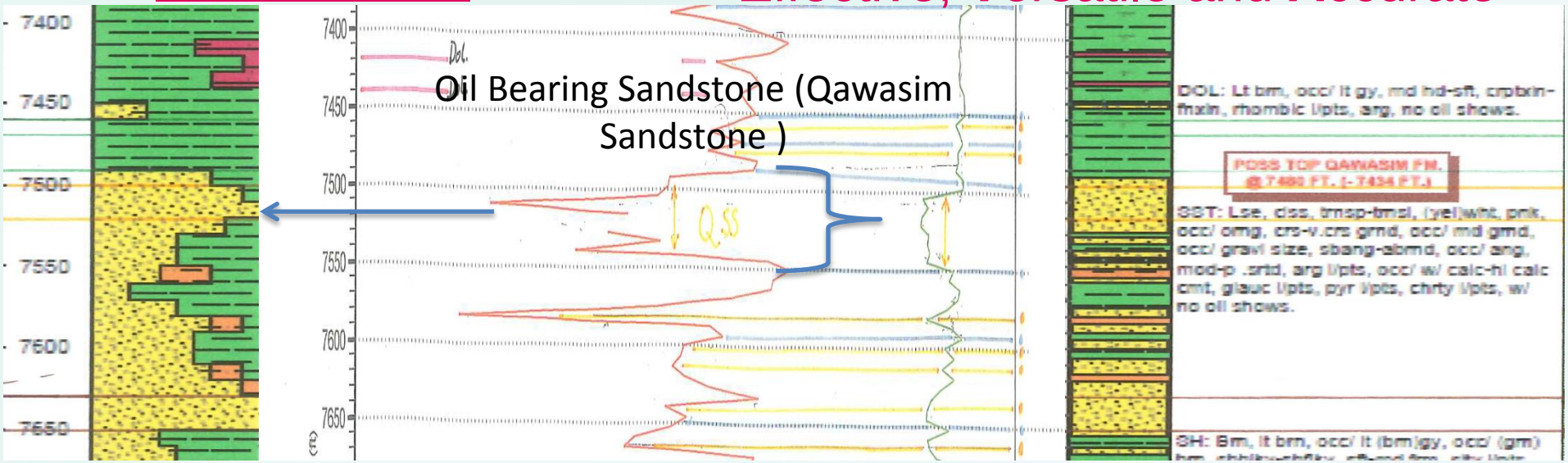

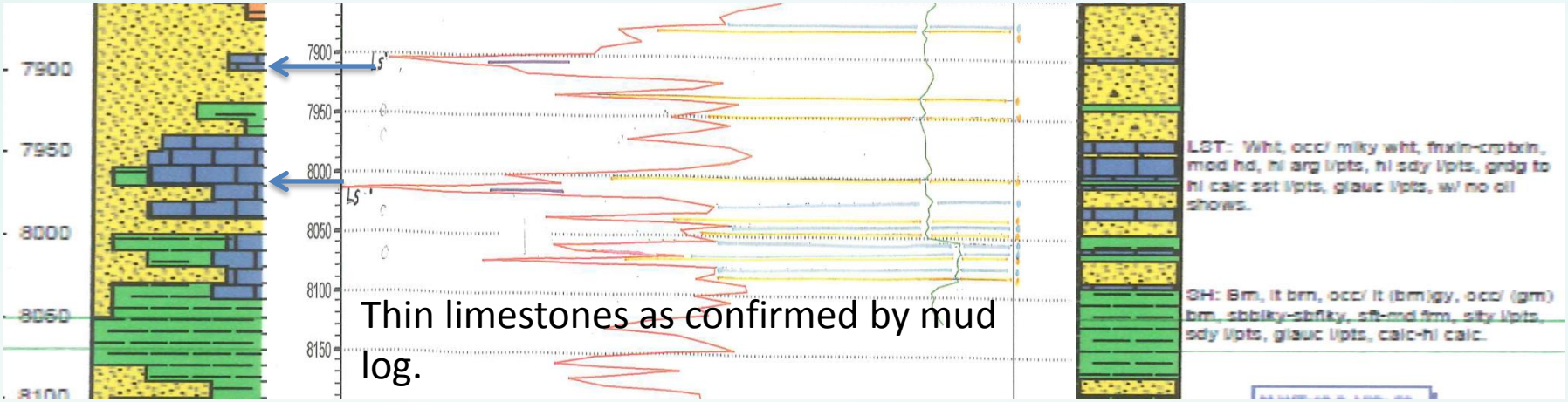

Conclusions

- Comparison between the E-log and the GR and RHOB logs suggests that the E-log is mimicking the Gamma Ray and to some extent the RHOB log.
- Good correlation of the cleanest sandstones from E-log to GR and RHOB
- The cleanest shales (100% shale) on the other hand give good correlation from E-log to GR.
- Sharp Elog, LHS peaks with values of 10^{-5} to 10^{4} occur within the zone where the mud log shows limestone's.

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Oil field survey
for
Sinopec Limited

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Oil horizons correlate with a drop in Dielectric Constant

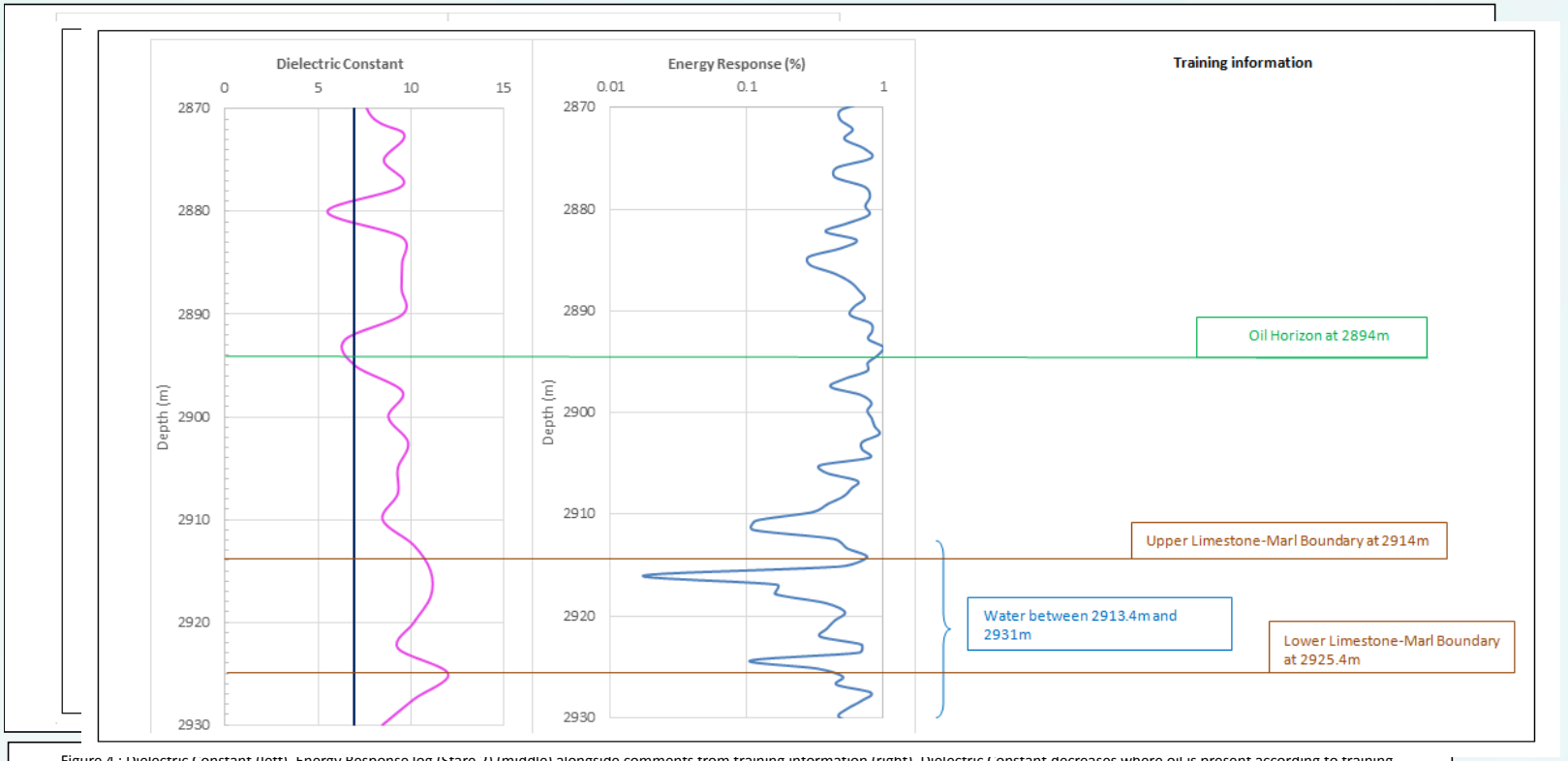
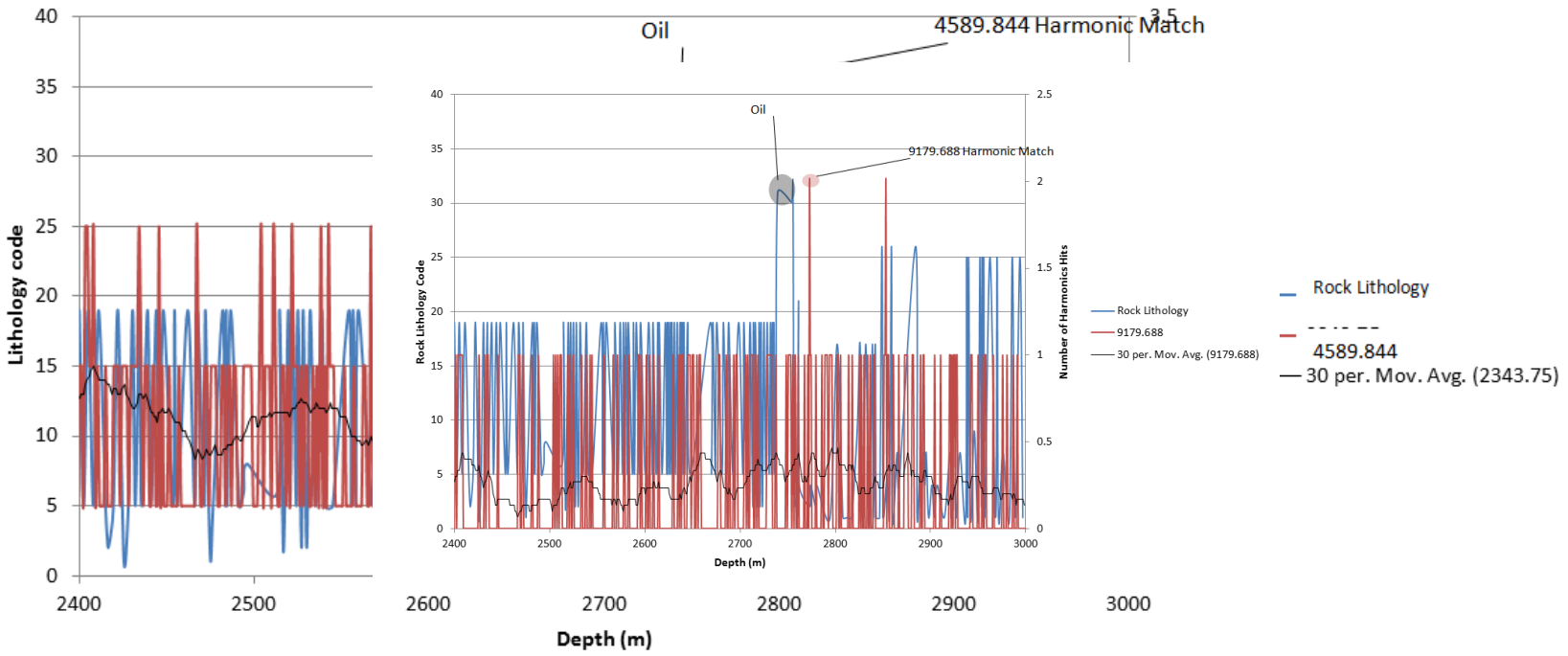


Figure 4 : Dielectric Constant (left), Energy Response log (Stare 2) (middle) alongside comments from training information (right). Dielectric Constant decreases where oil is present according to training information. The boundary between mudstone lithology and conglomerate lithology is shown by a decrease in Energy Response.

Unique Spectral lines from type-casted oil sample correlated with Oil Horizons.



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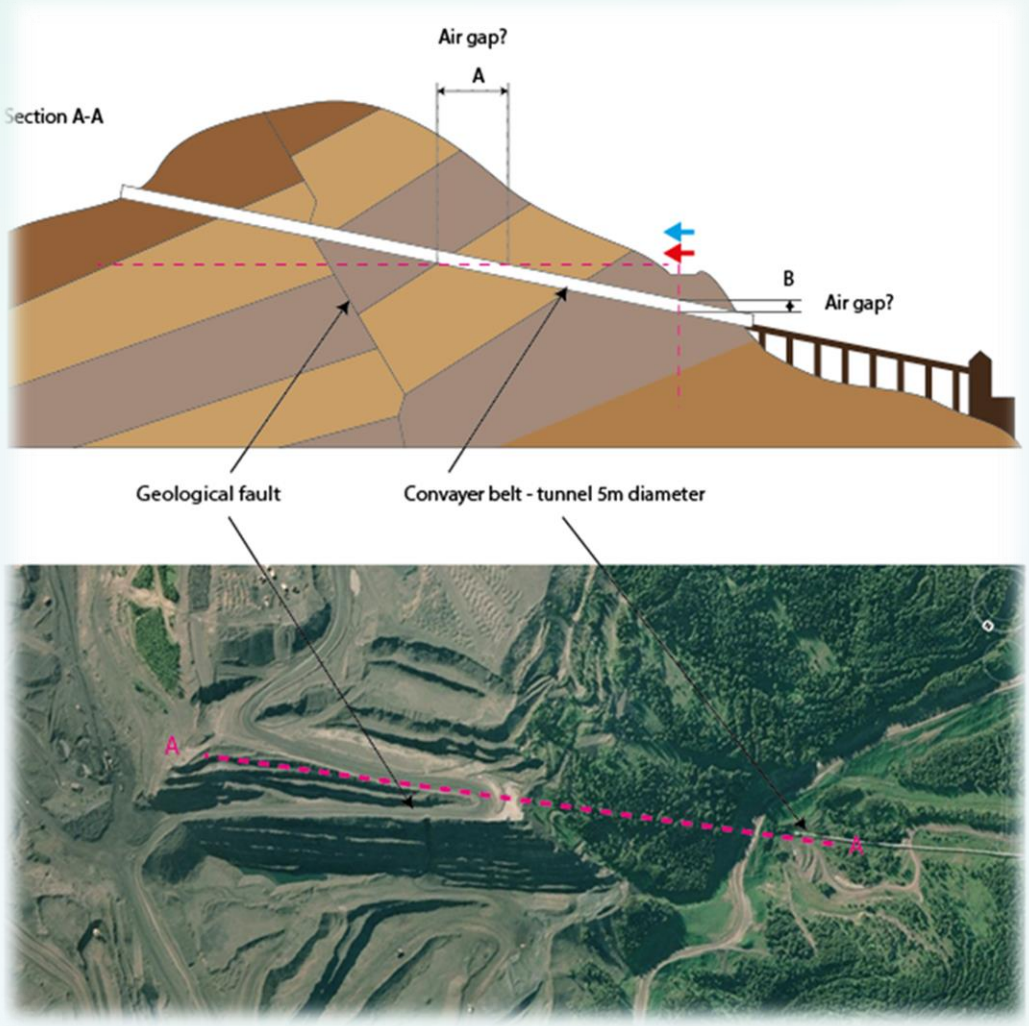

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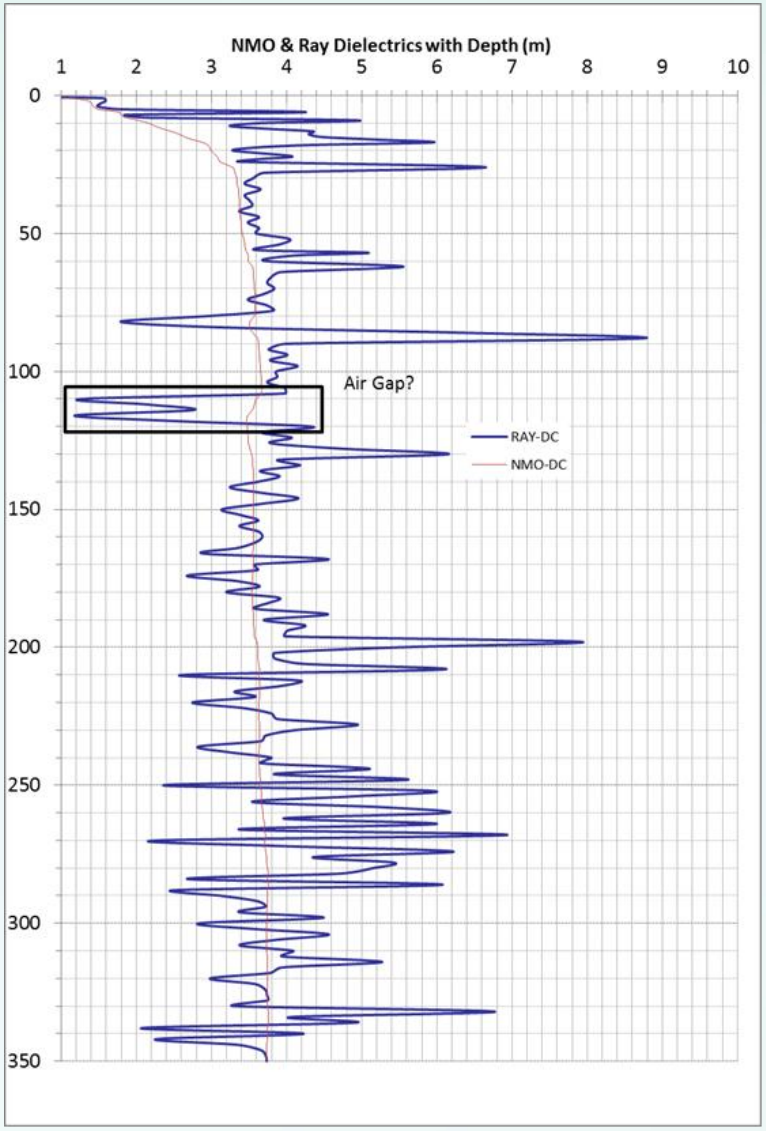

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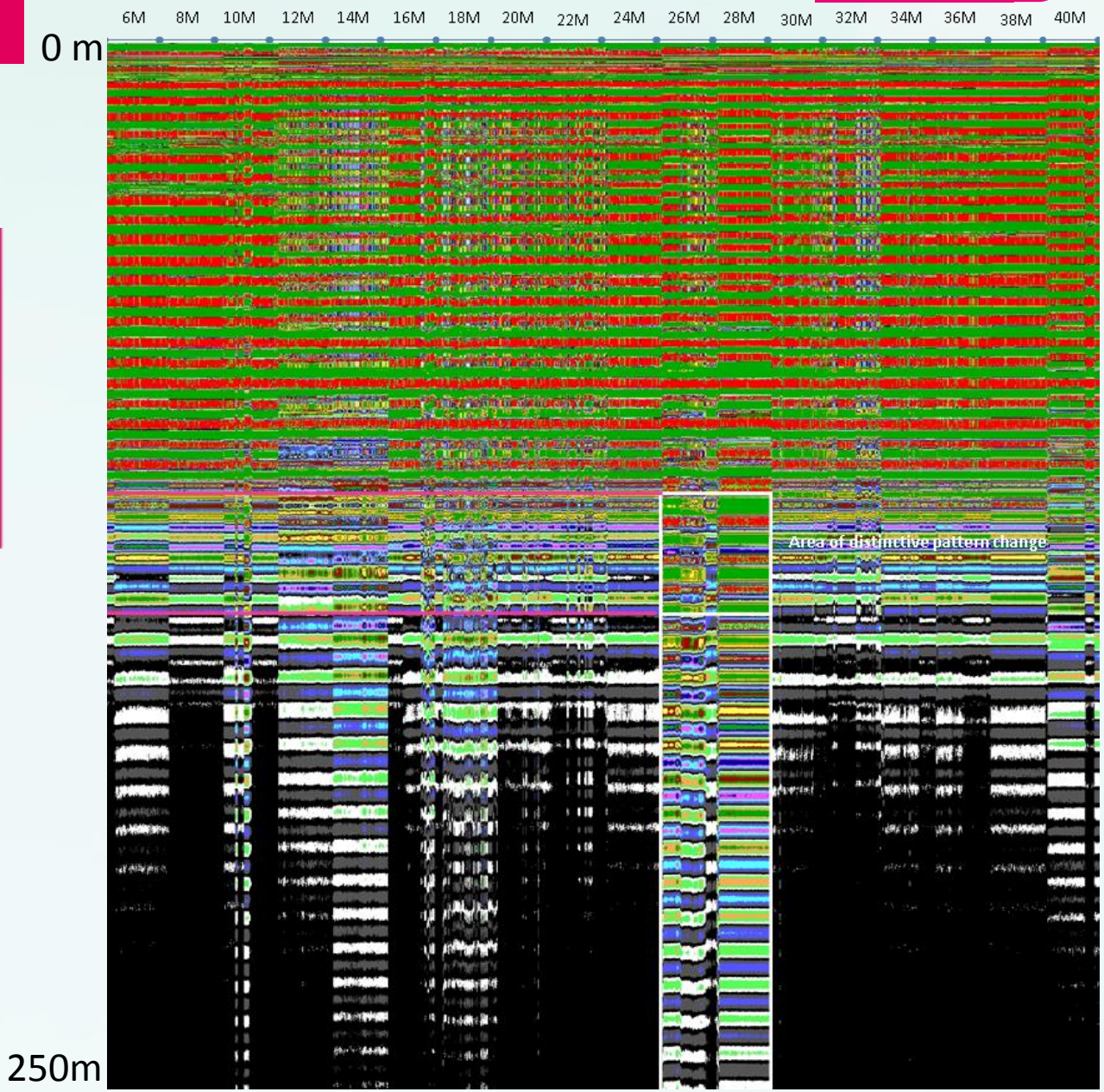

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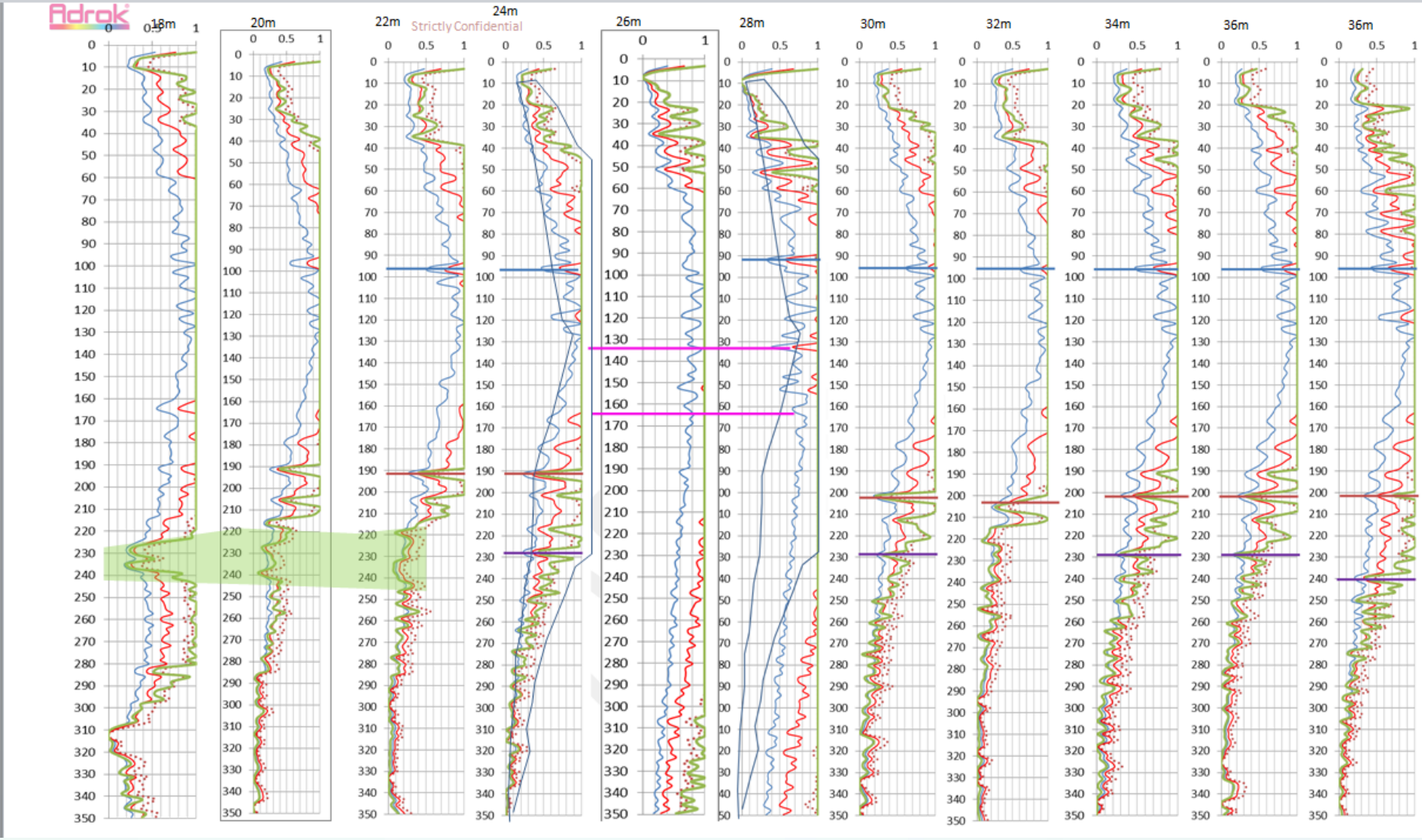

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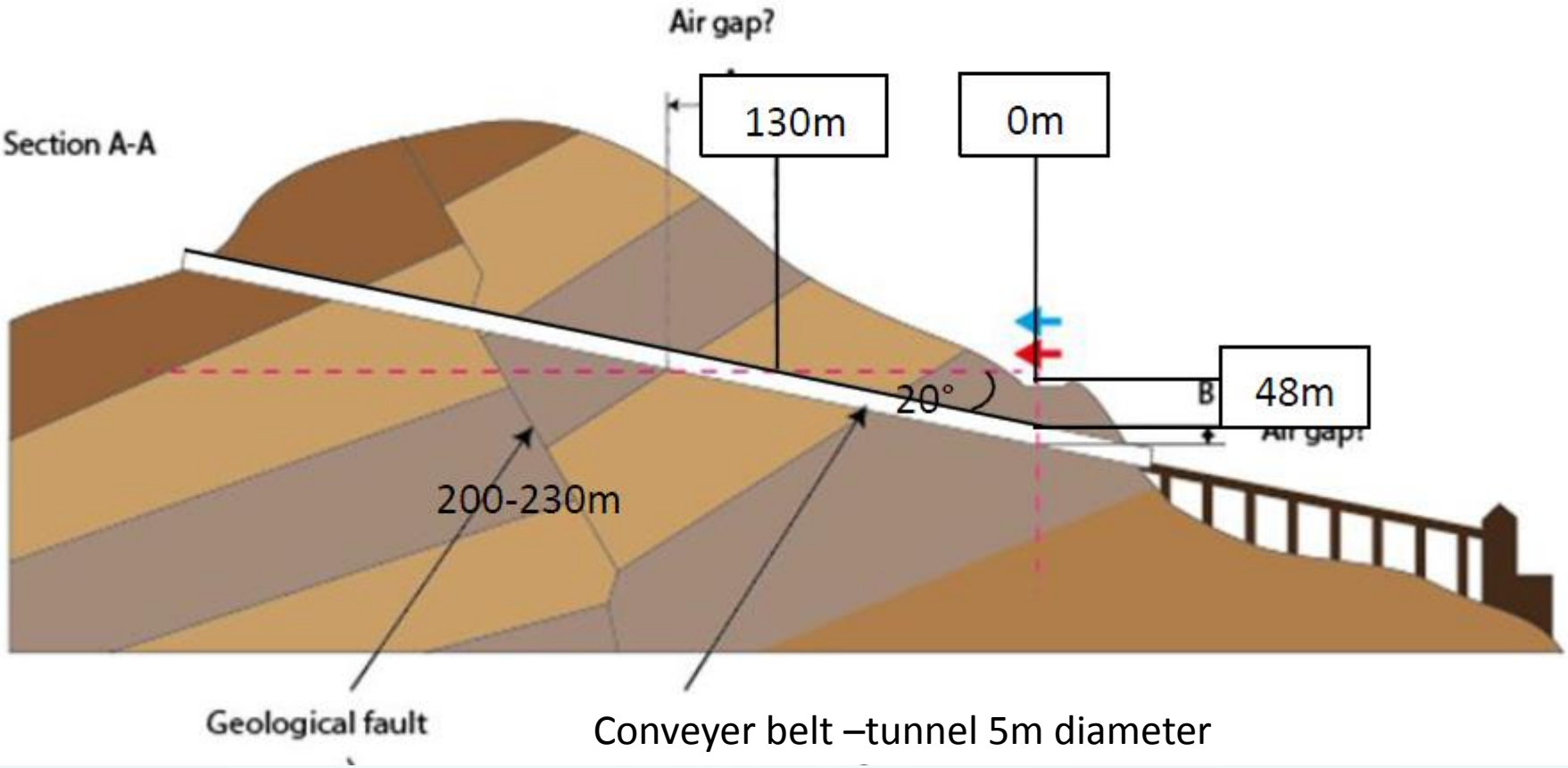

Conveyer belt –tunnel 5m diameter

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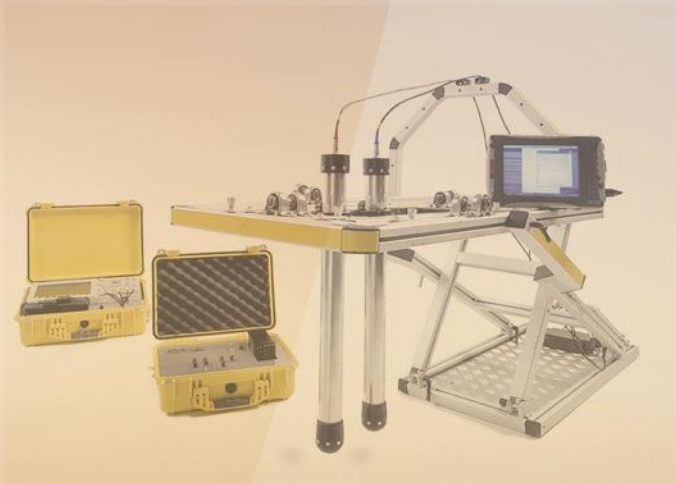

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