



GEOPHYSICAL AND GEOLOGICAL SERVICES

FOR OIL & GAS EXPLORATION

Company profile

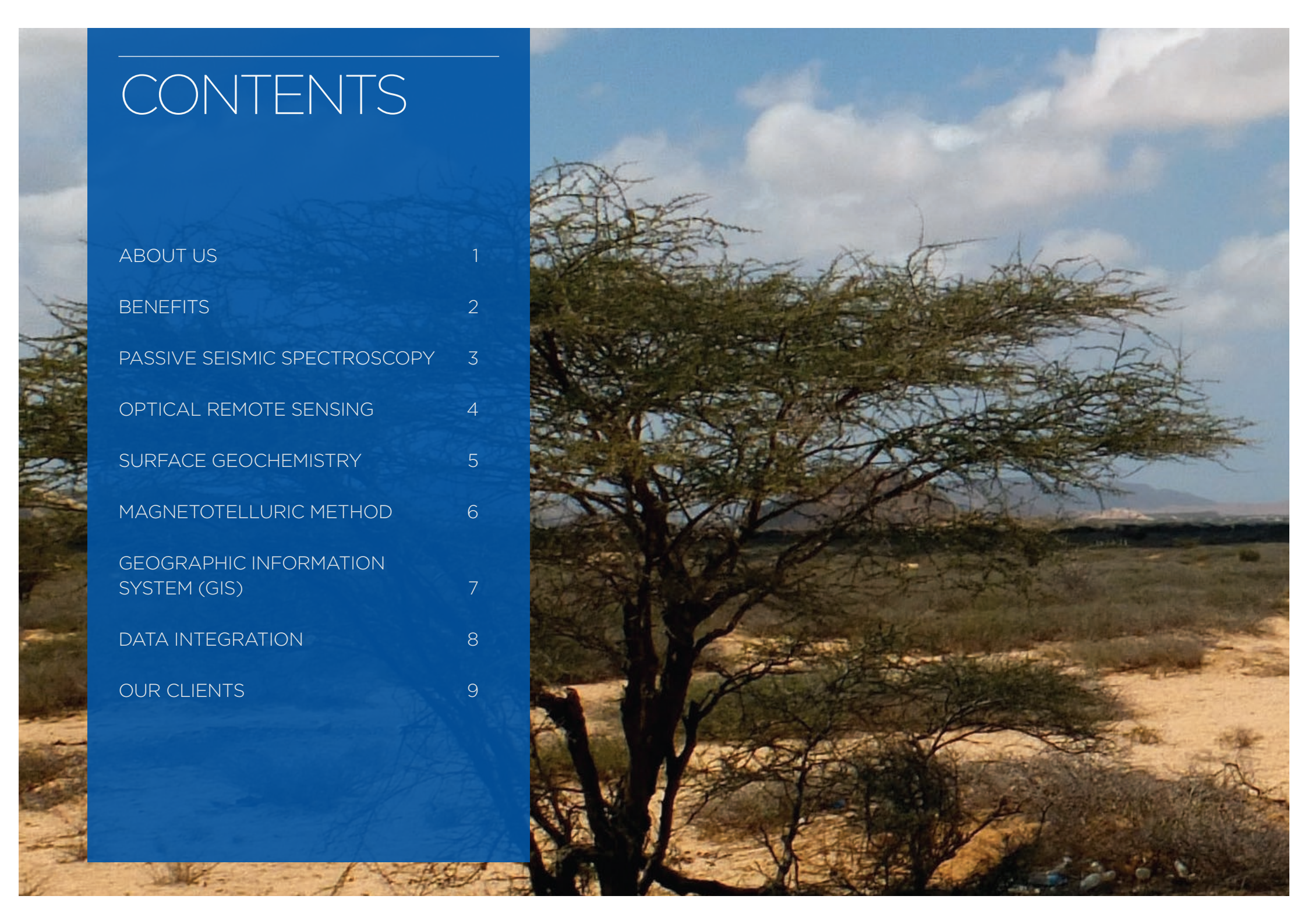


GeoDynamics
WORLDWIDE

gww.uk.com

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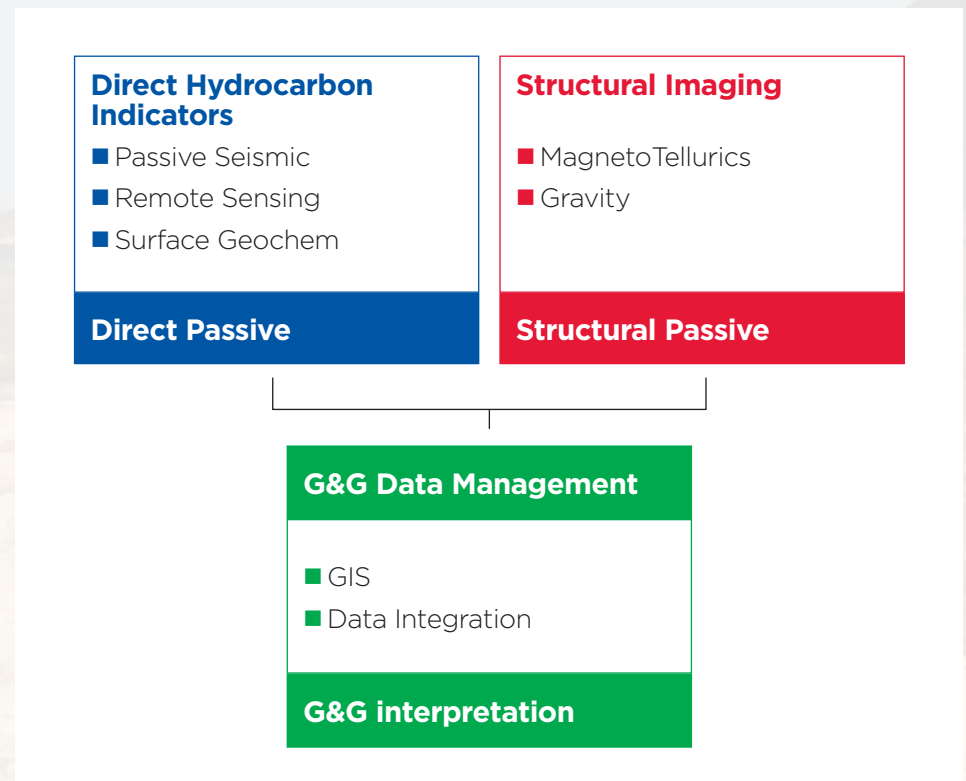


ABOUT US

Geodynamics Worldwide s.r.l. (GWW)
is a company offering geophysical services
for Oil & Gas exploration

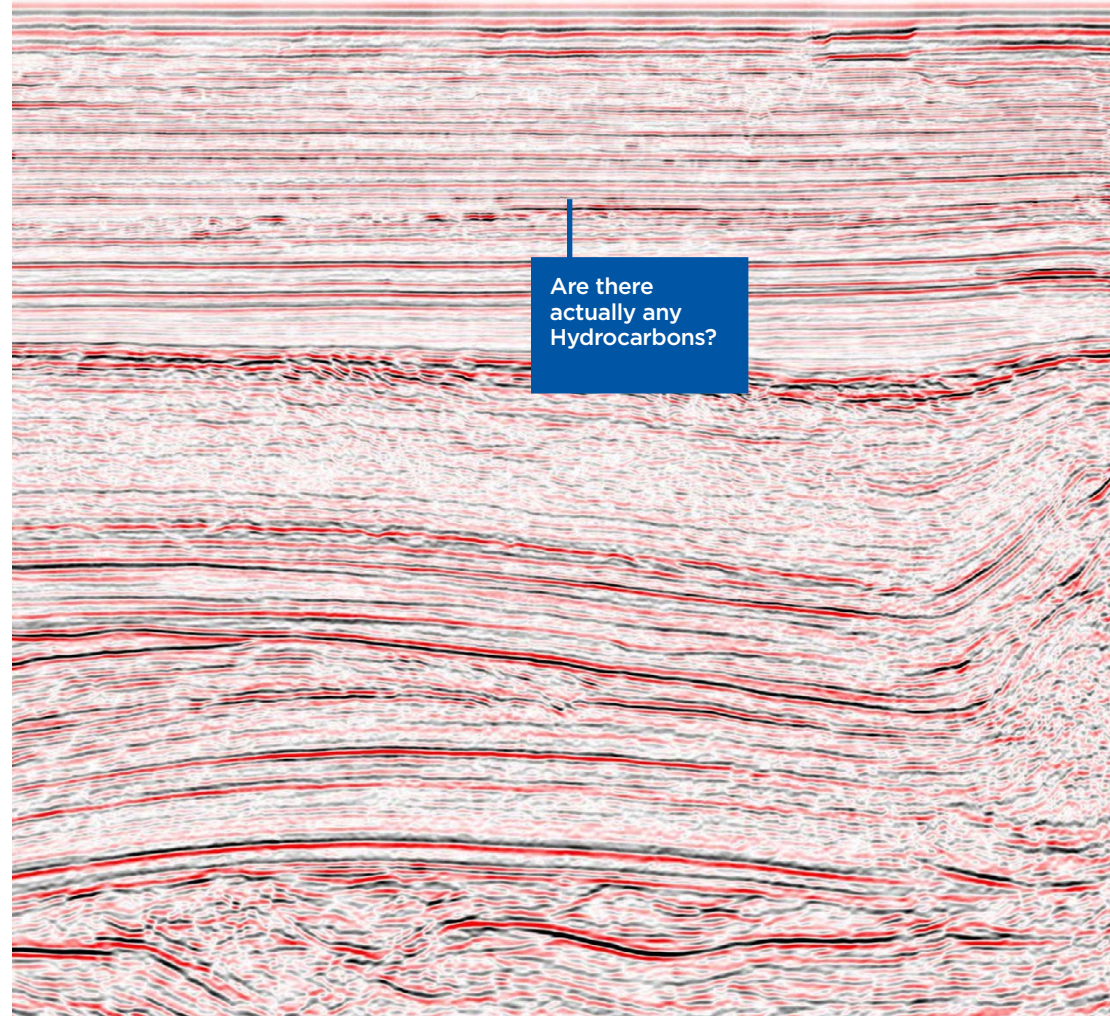
A portfolio of services for large scale reconnaissance petroleum exploration

- Passive Seismic Spectroscopy
- Optical Remote Sensing
- Surface Geochemical Analysis
- MagnetoTellurics and Gravity
- Geographic Information System (GIS)
- Data Integration



BENEFITS

- ✓ **Portfolio optimization through a quick evaluation of the value of an asset**
- ✓ **Risk reduction during exploration:**
 - Structural data + DHI data
 - Multiple methods
- ✓ **Reduction of expenditure by focusing conventional seismic to prospective areas**
- ✓ **Full coverage of the area-of-interest, not merely on seismic lines**
- ✓ **Limited men and equipment on the ground, particularly suitable for:**
 - Vast acreages
 - Mountain areas
 - At the boarder with neighbouring countries
 - High-risk areas
- ✓ **Environmental-friendly**
- ✓ **Reduces cost - \$/Barrel**



PASSIVE SEISMIC SPECTROSCOPY

A low-frequency seismo-acoustic spectroscopy for hydrocarbon exploration applied as a Direct Hydrocarbon Indicator (DHI)

Different surveys over different oil and gas fields have established the presence of spectral anomalies in a low-frequency window (1.5 – 10 Hz), i.e. micro-tremors [Dangel et al:2003] [Holzner et al:2003] [Akrawi and Bloch:2006] [Biraltsev et al:2006] [Rahced:2006]. [Suntsov et al:2006] [Graf al:2007] [Lambert et al:2008].

GWV, by using Broad Band Seismometers, detects the areas where the probability of presence of hydrocarbons is higher. This technology, applied in more than 100 locations worldwide, has ultimate benefit to oil companies and petroleum authorities throughout the life of their hydrocarbon assets.

Passive Seismic Spectroscopy is not affected by problems of velocity inversions, such as in basalt and evaporitic settings or very complex geology.

It is environmental friendly, and does not require any explosions, vibrations or similar.

It requires a limited field crew, max 5-10 operators.

A grid of data points is designed to cover the target area. Spacing of the grid begins from 250m and can reach up to 2km.

The output is a contour map of the most prospective areas in terms of hydrocarbon exploration.

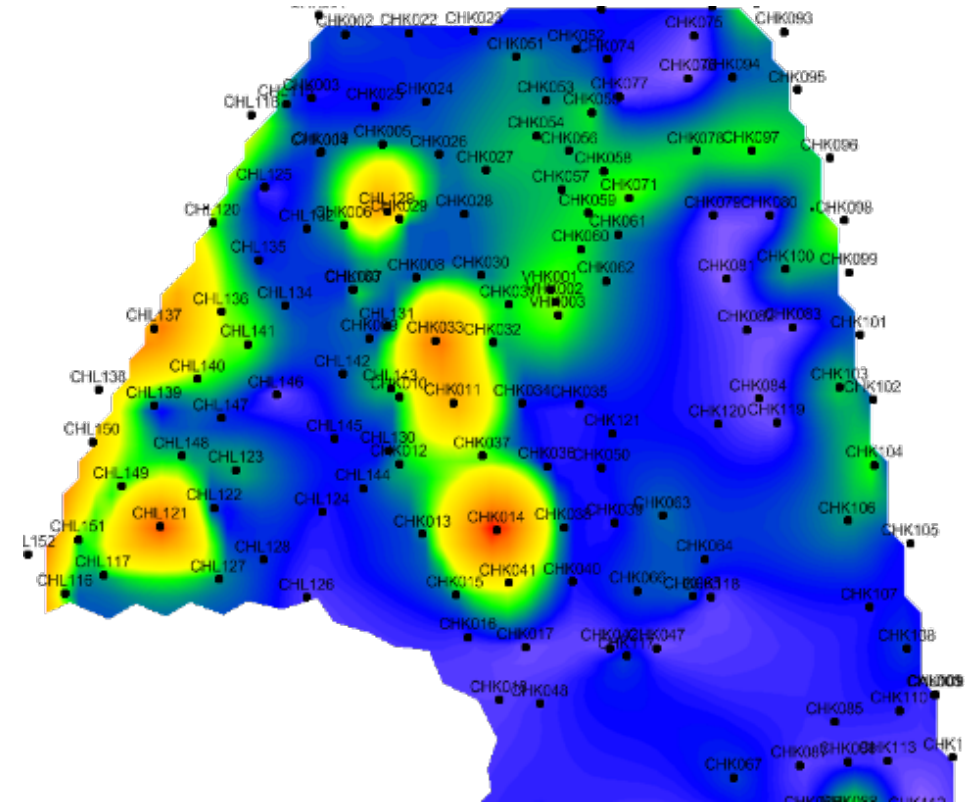


Figure 1. Map of hydrocarbon potential distribution.

OPTICAL REMOTE SENSING

Remote detection of biochemical and geochemical surface alterations caused by microseepage of light hydrocarbons migrating to the surface from a petroleum system

Microseepage can generate long-term biochemical and/or geochemical and/or botanical surface alterations, such as reduction from ferric to ferrous oxide (FeO), alteration of carbonate cements, as well as alteration of clay minerals, stress-related symptoms on vegetation. These invisible signals can be detected and monitored with Remote Sensing.

Satellite's imagery is able to give a quick and cost-effective preliminary assessment of new ventures, and can quickly assess large areas in a short time and cost-effectively.

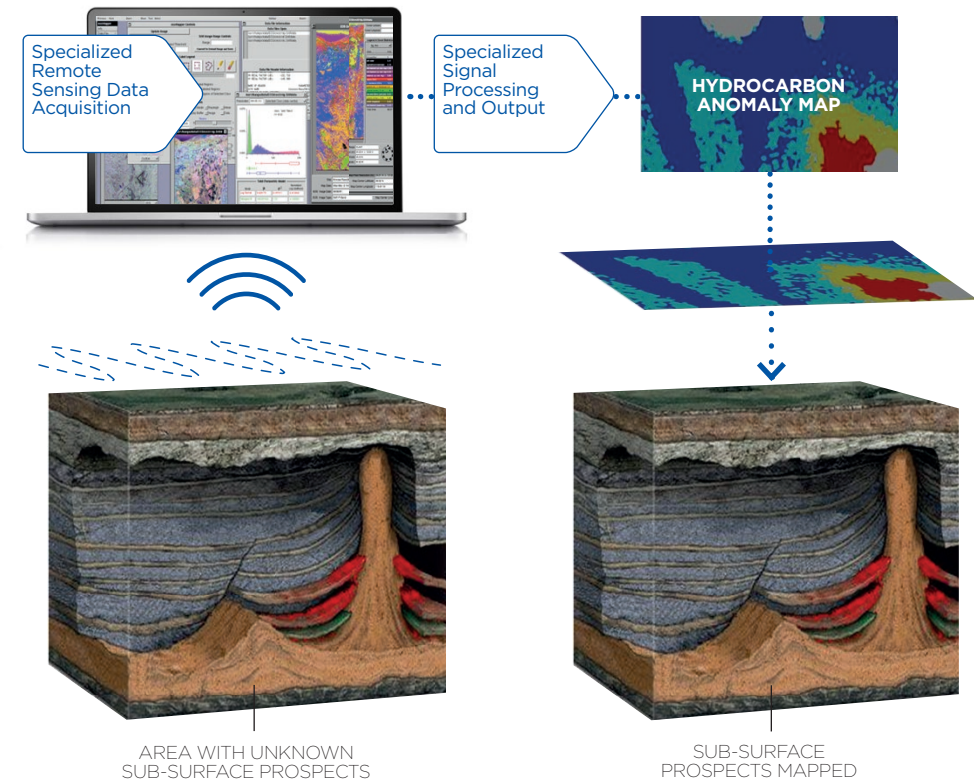


Figure 2. Remote sensing workflow

SURFACE GEOCHEMISTRY

Land-based detection of biochemical and geochemical surface alterations caused by microseepage of light hydrocarbons migrating to the surface from a petroleum system

Many petroleum basins show some type of surface hydrocarbon leakage, since seals are imperfect and hydrocarbons, driven by buoyancy, move mainly vertically through thousands of meters. Locally also lateral migration occurs.

GWG collaborates with E&P Geo Field Services, a company held by Dr. Dietmar Schumacher and Luigi Clavareau, known as worldwide experts in geochem exploration.

E&P Geo Field Services unique approach involves using sensitive and precise microbiological techniques in tandem with soil gas and fluorescence methods, to identify the areas of anomalous active thermogenic hydrocarbon microseepage, and determine the composition of the hydrocarbon microseepage source (oil, gas, and condensate).

The discovery of a geochemical anomaly establishes the presence of a working petroleum system in the area of interest.

Surface geochemistry permits a fast and effective ranking of different leads or prospects.

It provides results applicable both to structural and stratigraphic traps.

Have little or no environmental impact.

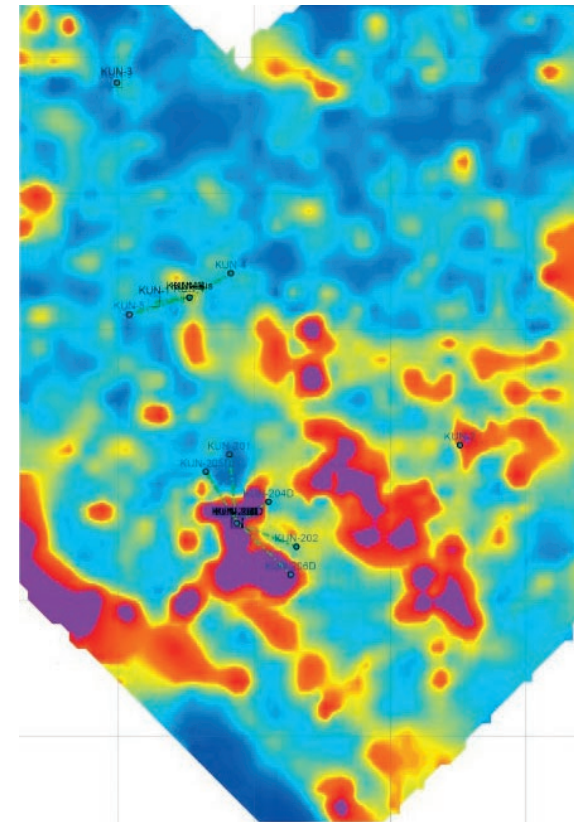


Figure 3. Example of Geochemical Anomaly Map

MAGNETOTELLURIC METHOD

Electromagnetic (EM) geophysical exploration for structural imaging of the subsurface

In hydrocarbon exploration, MT is used by Oil&Gas companies mostly as a complement to the primary technique of 2D/3D seismic for a cost-effective reconnaissance of sedimentary basins and for exploration in areas where seismic surveys are difficult (Colombo et al., 2012).

GWW collaborates with PBG Geophysical Exploration Ltd for MT surveys.

While high-velocity layers are an acoustic barrier and make seismic less effective, their electrical resistivity means the magnetic signal passes through almost unimpeded. This allows MT to see deep beneath these acoustic barrier layers, complementing seismic.

MT can contribute to effective hydrocarbon exploration in two distinct ways, to image the subsurface structural setting, and in certain cases, give evidence for direct indication of the presence of hydrocarbons – DHI (Ingerov et al, 2003).

Data is acquired at each point for a period of time: from several minutes to 6 hours (MT), less for Audio MagnetoTellurics (AMT), which have higher frequencies (1 Hz to 90 kHz). The physical spacing between points depends on the target size and geometry.

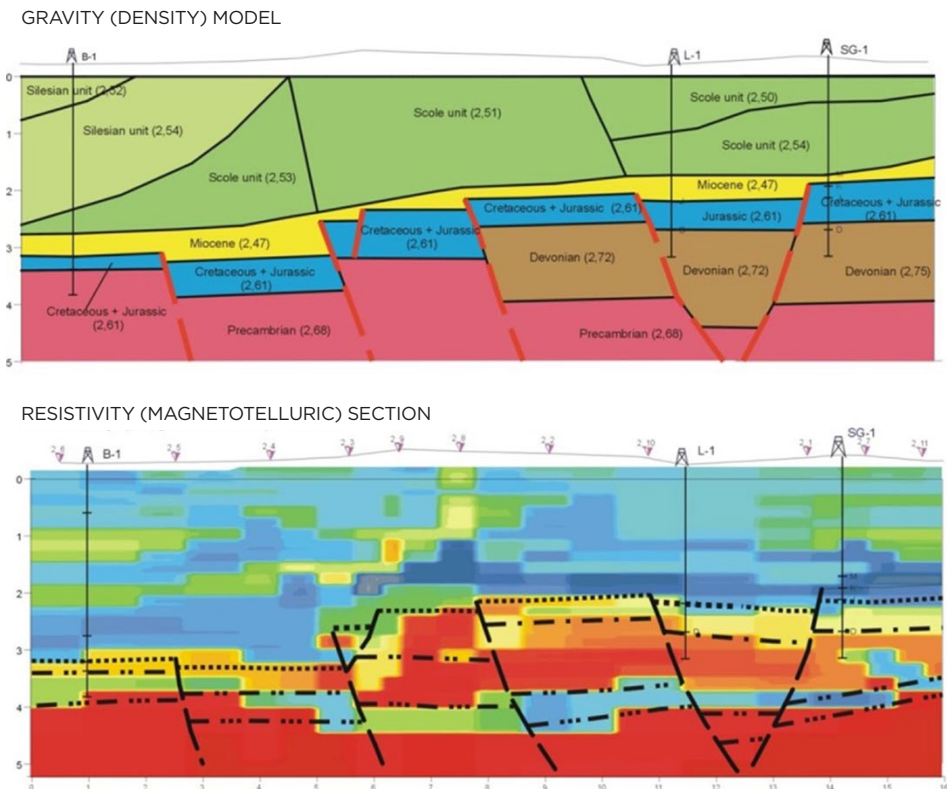


Figure 4. Example of a combined Magnetotelluric and Gravity Survey

GEOGRAPHIC INFORMATION SYSTEM (GIS)

Design and production of geographically referenced data and GIS consultancy to oil companies, authorities, service companies

In the petroleum industry large amounts of data have to be managed to cope with the complexity of the process of discovering new resources and managing producing assets.

A GIS-based information system provides digital products for data integration, query and analysis by using all forms of geographically referenced information.

The best way to manage such a large amount of data is GIS.

It allows the client to visualize, understand, question, interpret, data in many ways that reveal relationships, patterns, and trends in the form of maps, reports and charts.

The benefits of GIS-based map products are better decision making, cost savings, improved efficiency, Improved communication, better record keeping.

GIS technology has applications throughout the oil life-cycle, from bid round organization,, new ventures acquisition, exploration, production to abandonment.

GWW is specialized in providing clear and powerful map, as well as georeferenced digital data in any format, such as .kml, .shp, .gpx, (points, lines, polygons), .jpg, .tiff (rasters).

GWW can acquire the data and information from the client's dataset, as well as from GIS Browsers and National Cartographic Services.

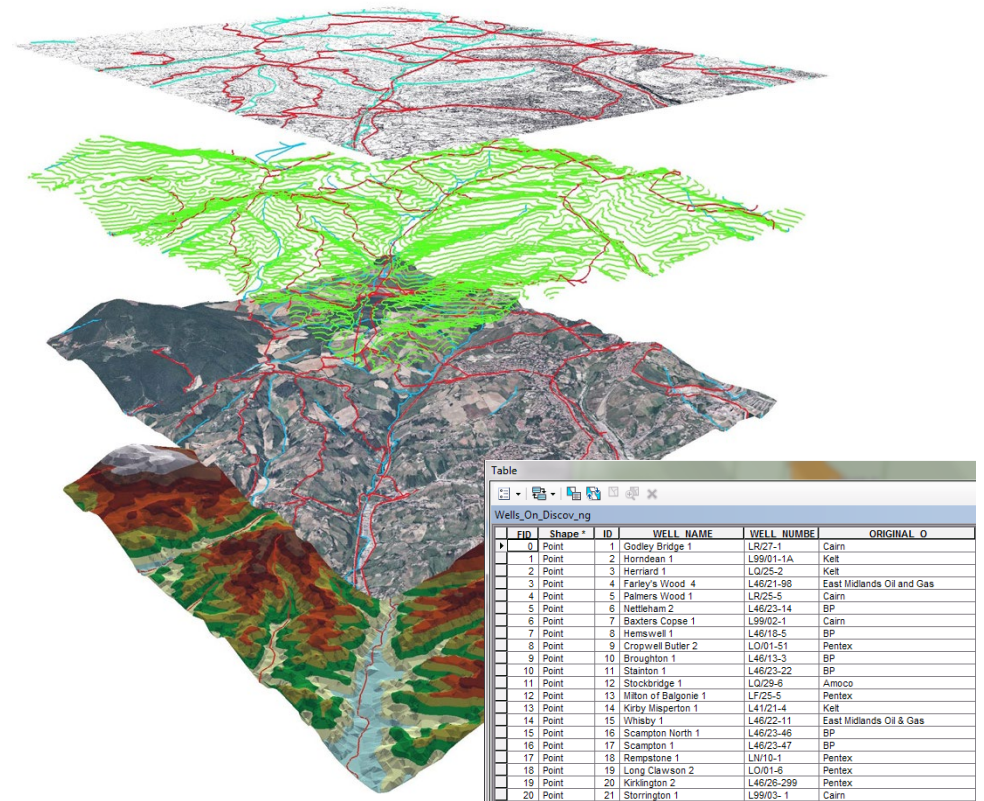


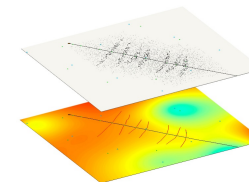
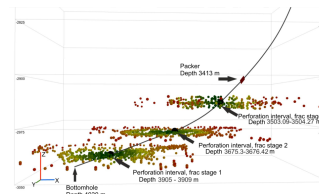
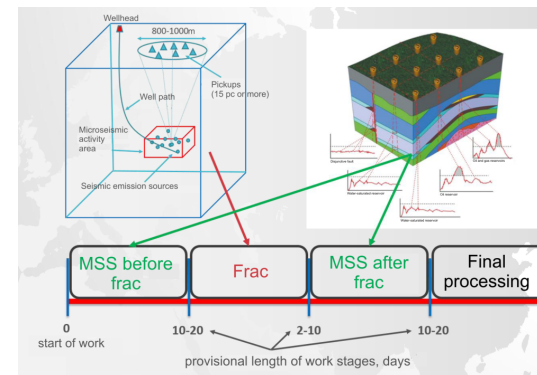
Figure 5. Attribute table of a wells' database (<https://www.gov.uk>), and overlap of different GIS layers for data comparison

PASSIVE MICRO SEISMIC

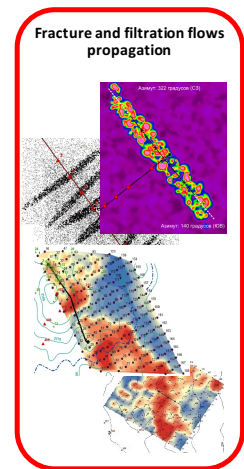
Micro Seismic (MSI) shows micro-seismic activities associated with fracture formation, and images epicenters of events with reliability characteristics (signal-to-noise ratio) and event magnitude (intensity) for different phases of the fracturing operation, as well as maps of microseismic wavefield parameters distribution with selection of promising area with high porosity and formation permeability.

GWW, with its partner Geodinamika, uses Broad Band Seismometers for processing and analysis also in time domain, known as Micro Seismic (MSI). This method is applied in Frac monitoring, Identification of fractures zones, Reservoir management. It can help identify areas of oil potential at the stages of prospecting, exploration, operational exploration, and field maturity and revival.

Micro Seismic detects the hydrodynamic coupling of wells, determines the direction of filtration flows, controls of fracturing efficiency, identifies prospects of oil and gas deposits, reduces the risk of dry-holes.



Result

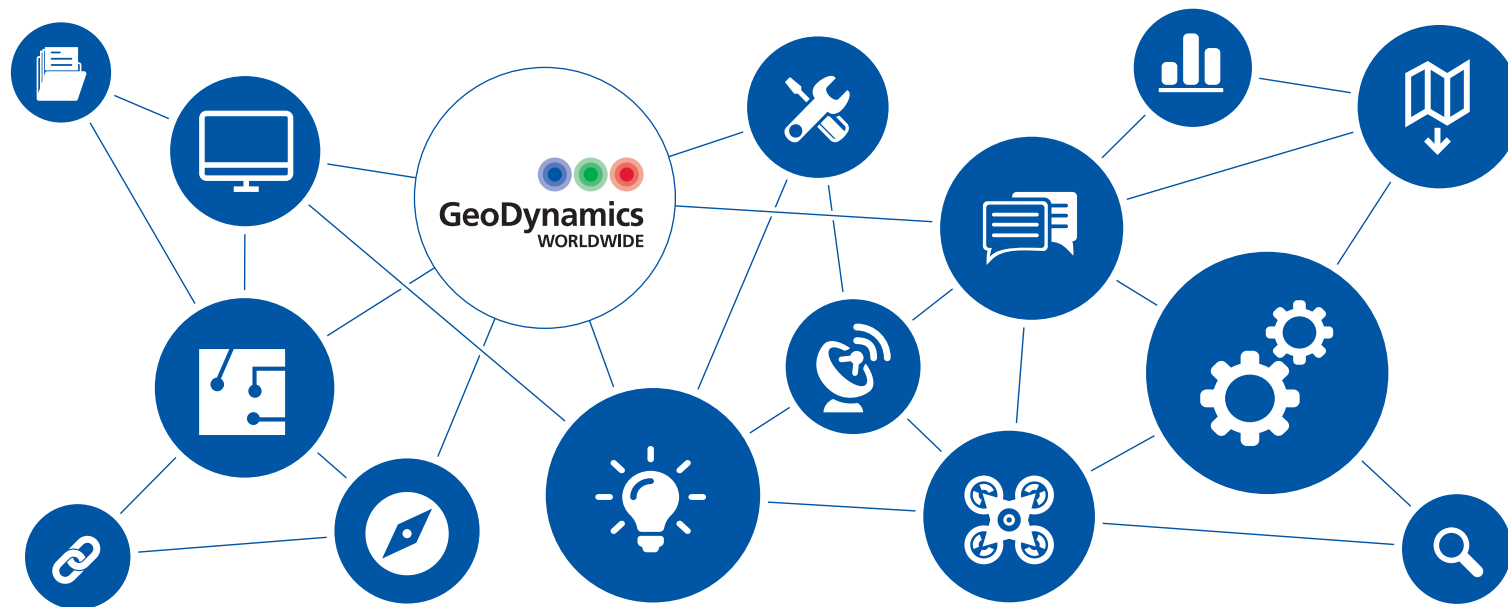


Micro Seismic Capabilities

- + Binding of micro-seismic activity to the time diagram of the fracturing process
- + Determination of the propagation and linear dimensions of fracturing on the basis of localization of sources of micro-seismic radiation in the fracturing zone
- + Determination of penetration zones of proppant
- + Dynamic visualization of micro-seismic activity in the process of formation and development of hydraulic fracturing
- + Estimation of the compliance of the propagation and linear dimensions of the fracture to the design project of hydraulic fracturing
- + Identification of intensely fracturing zones of productive reservoirs (high permeability reservoirs)

DATA INTEGRATION

The added value of a GWW survey does not stop at geophysical data processing, but it continues with the integration of existing information available to the client, to the critical thinking applied to every step



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