

Paetoro Consulting UK Ltd.

Dave Waters (Director)

January 2021

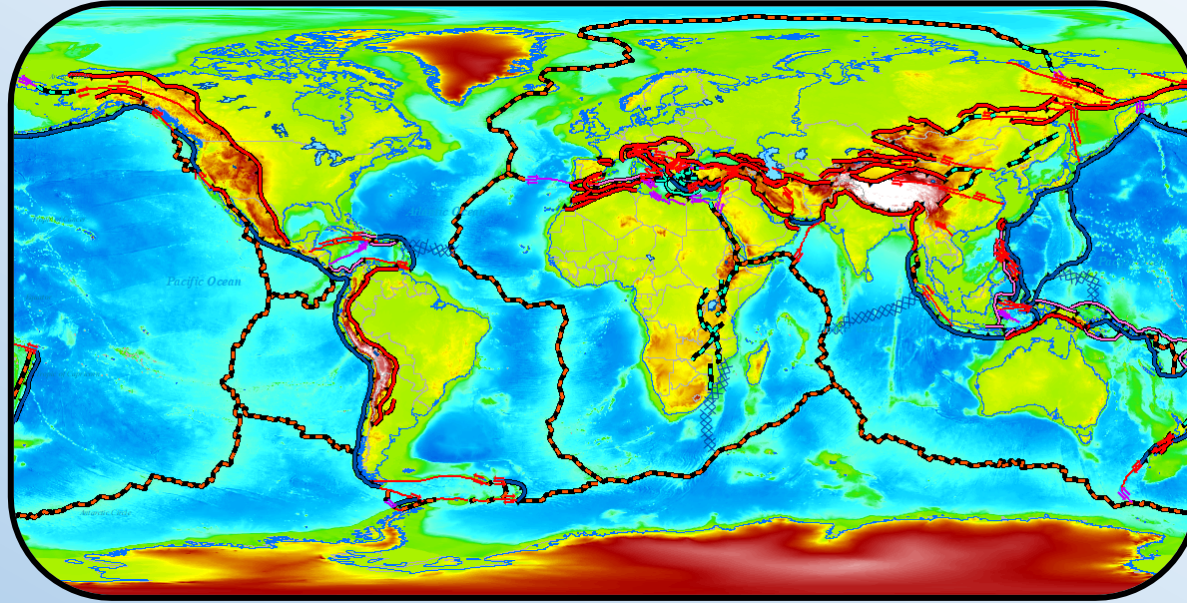
Paetoro Consulting UK Ltd



Director Dave Waters

- Paetoro was incorporated 2016, and is based in London
- The founder, director, and sole employee - Dave Waters, has 30 years of worldwide experience in exploration and production
- Paetoro has a wide network of contacts to enrol for support and sub-contracting assistance when needed.
- **A key focus of the company is structural complexity.**
 - Experience in all major basin and deformation types
 - Rift basins, fold and thrust belts, strike-slip, fractured basements, salt tectonics.
 - Onshore, shallow marine, deep-water, HPHT.
 - Clastics, carbonates, fractured reservoirs.
 - Water resource, heat resource, oil, gas, heavy oil, condensates.
 - Integration into basin modelling studies.
- **This focus includes making sure that:**
 - All relevant data is collated and incorporated into analysis, and integrated in easy to use formats.
 - Different data sets are assigned levels of confidence appropriate to their quality.
 - The risk and size implications for resource and reserves are accounted for sensibly, quantitatively, consistently.
 - New technologies are assessed and applied appropriately.
 - Any analysis is documented thoroughly so as to be auditable & repeatable by third parties

Personal Experience



- **Geographically, the directors' key focus areas have included:**

- NW Greece, Albania, and Ionian Sea
- North Africa, particularly Libya and Chad
- UK, Norway, Denmark North Sea
- UK & Ireland Atlantic margin
- Iran & Middle East
- Southern South America

- **Miscellaneous other studies have been conducted around the world**

- **Corporately, past employers include**

- Enterprise, Shell, E.ON, RWE, Endeavour, Idemitsu

- **These employments and associated acreage partnerships have involved a wide variety of corporate experience:**

- National oil companies
- Global majors
- Energy utilities
- Mid-cap E&P intermediates
- Smaller private & niche companies
- Technology & service companies
- UK/European/Asian/North American/Middle Eastern Companies

- **As a consultant, selected clients have included**

- Adrok (EM survey tools)
- Ardent Oil (Fractured basement prospects offshore Denmark)
- Delonex (Central African fault seal study)
- Getech (Geothermal exploration workflows)
- GeoLogica (Energy Transition Geological Training)

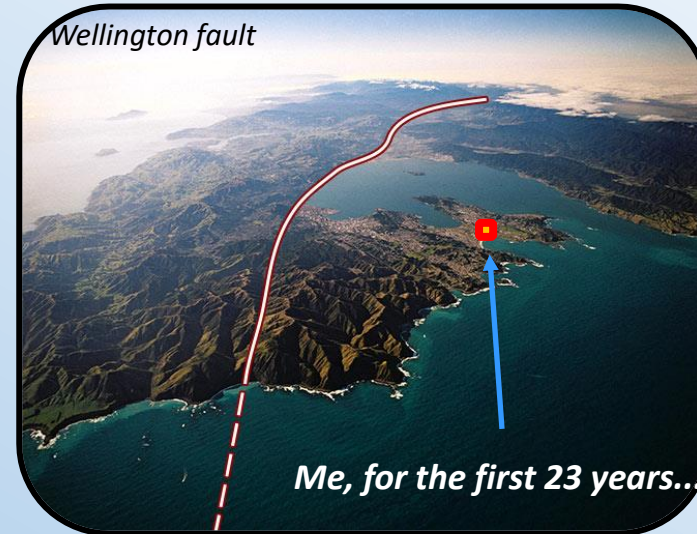
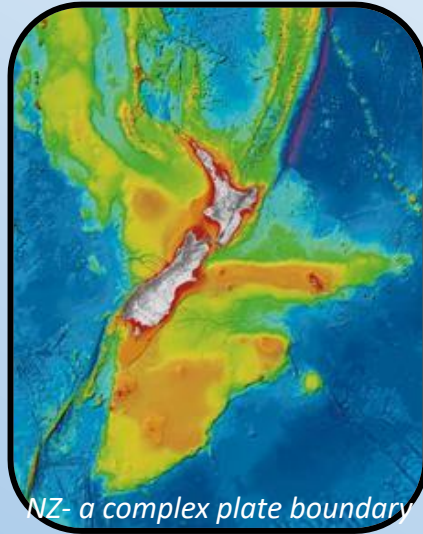
Key research themes

Key themes

- Geothermal, Critical Mineral, Geonuclear
- Realistic quantitative probabilistic resource assessment with sensible, coherent treatment of risk.
- Fluid, mineral, and thermal resource.
- Identification of key processes and controls driving fluid movements within the crust of the earth, and their PVT behaviour.
- Mineral enrichment processes in the crust – magmatic, sedimentary and diagenetic.
- Structural geology and tectonostratigraphic context.
- Geospatial workflows to best integrate these diverse data sets and marry them to the needs of practical applications by different customers.
- Interaction with site engineering constraints.
- Determined reality checking, as being in everyone's best interest for sustainable development.

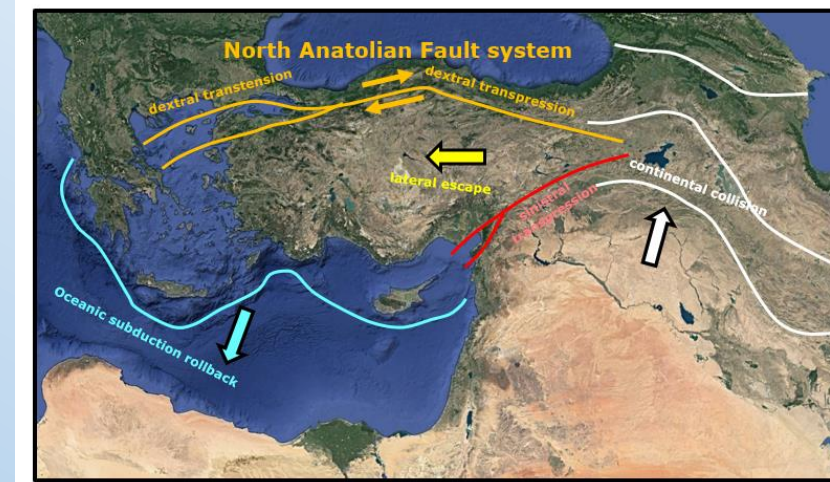
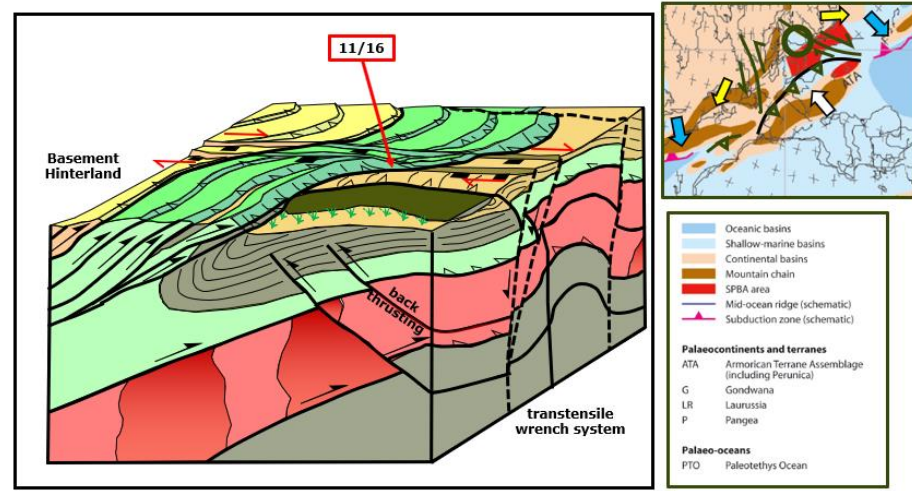
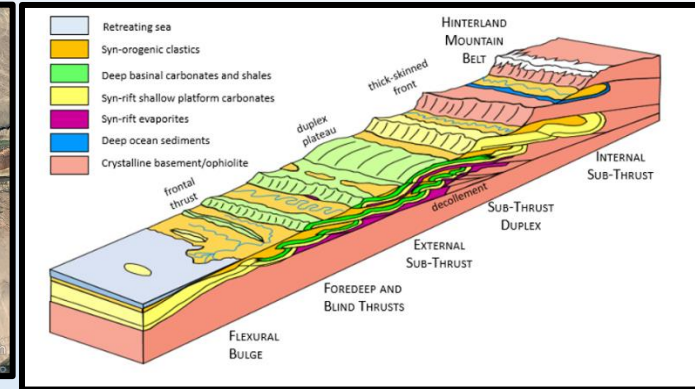
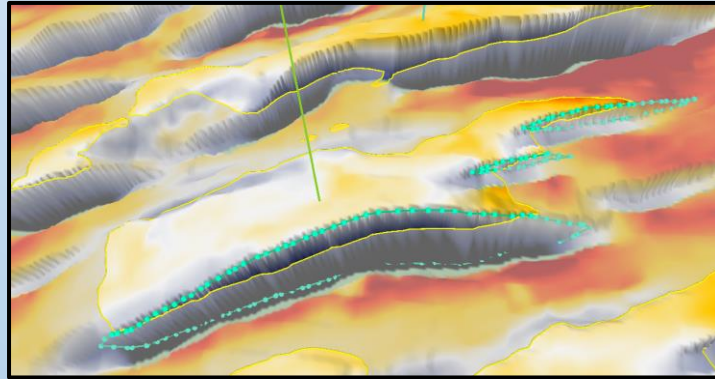


A passion for geology, with integrity



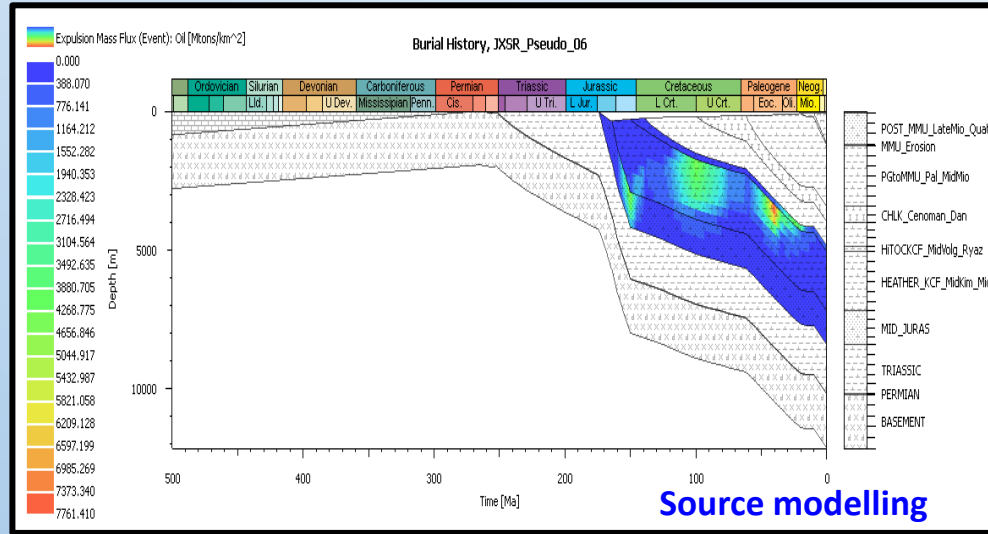
- **Paetoro is driven by a passion for geoscience.**
 - Though based in London now, the roots of this passion go back to NZ origins, one of the most geodynamically active areas of the planet.
- **Paetoro's product is a personal one – we value integrity.**
 - Long term relationships are built on trust.
 - Paetoro values that, more than any short term gain.
- **When we think we don't know the answers, we'll say so.**
 - And recommend those whom we think might know – we want our clients to find solutions.
- **When we think we do know the answers, we'll want to share them generously with the client.**
 - Our passion is not just to understand geoscience, but also to enable efficient and safe utilisation of subsurface resources for the communities and nations where they exist.

Structural geology



- Paetoro works with all aspects of exploration
- A particular differentiator is structural geology, working from outcrop/well scale through to prospect scale, to basin and then intercontinental scale, ensuring that a story is consistent at all of these.
- Good seismic is a great start, but understanding structural implications for exploration and production is more than that.
- Paetoro utilises our mathematical experience to ensure that risk and resource estimations are conducted in a quantitative and mathematically sensible fashion.

Total system & tectonostratigraphic context



Source modelling

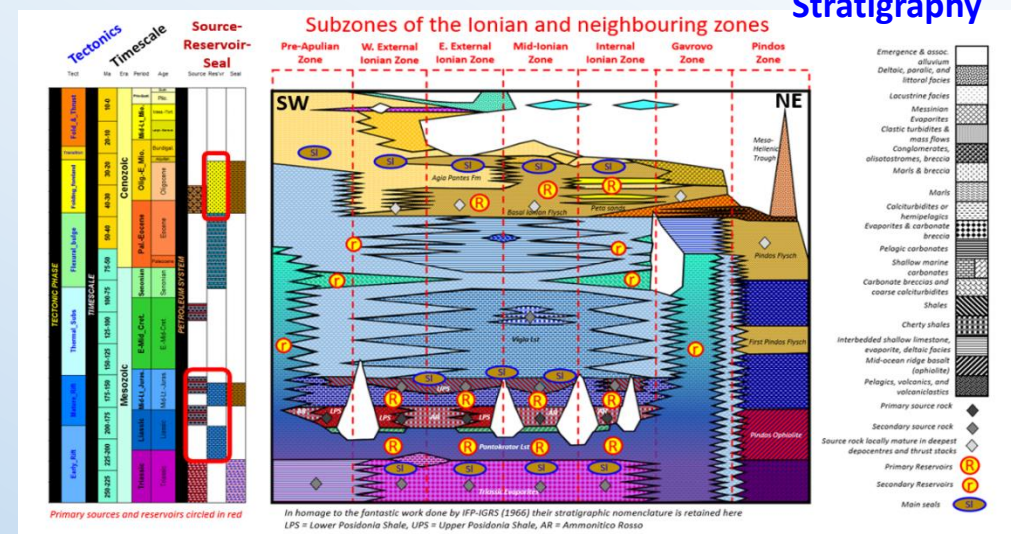
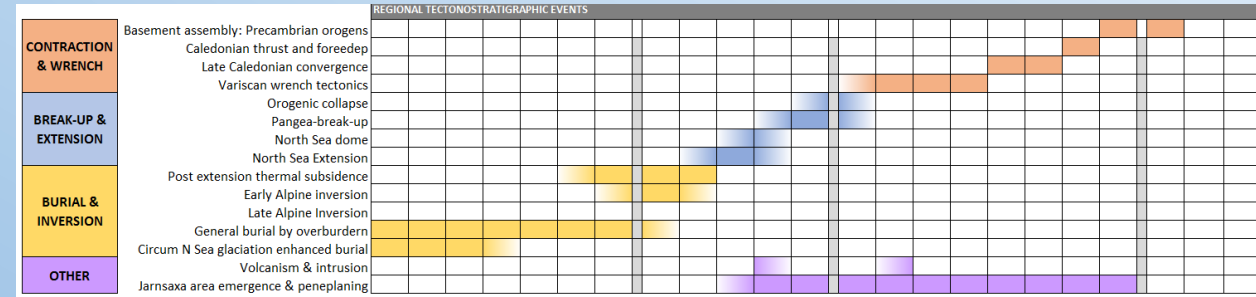
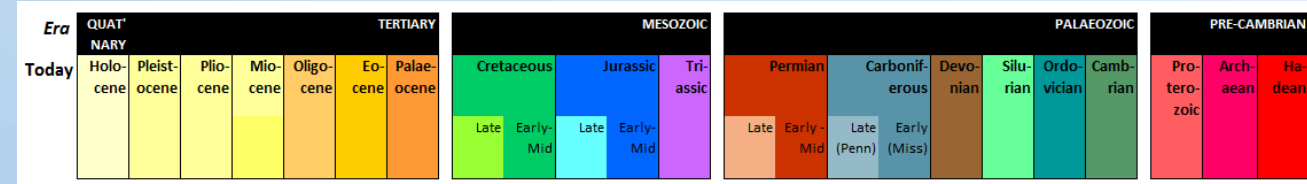


Figure 4: (Very) Schematic stratigraphy and petroleum system(s) of the Ionian and neighbouring zones. Those interested further should chase references by Karakitsios.

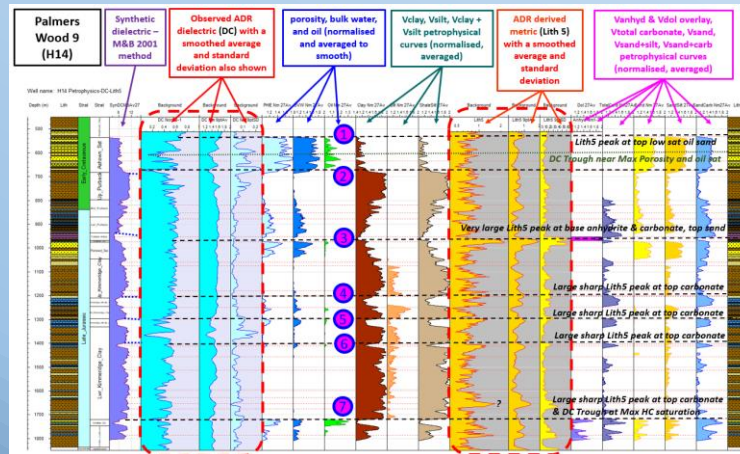
- Understanding the asset and its reservoir is important.
- Paetoro works to build in aspects of bigger picture fluid and heat systems and the tectonostratigraphic evolution.
- Permeability, heat, lithology and structure are always key.
- These are what empower further exploration.

Tectonics





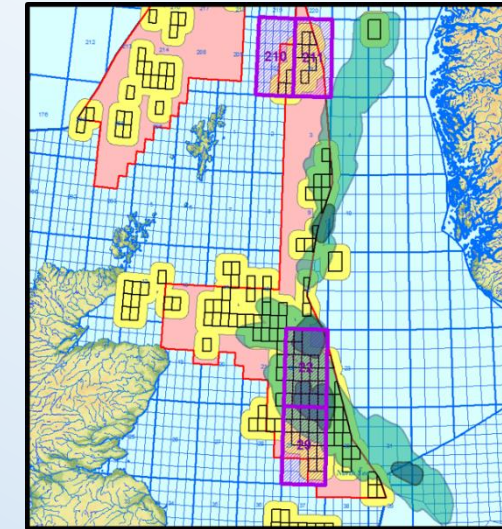
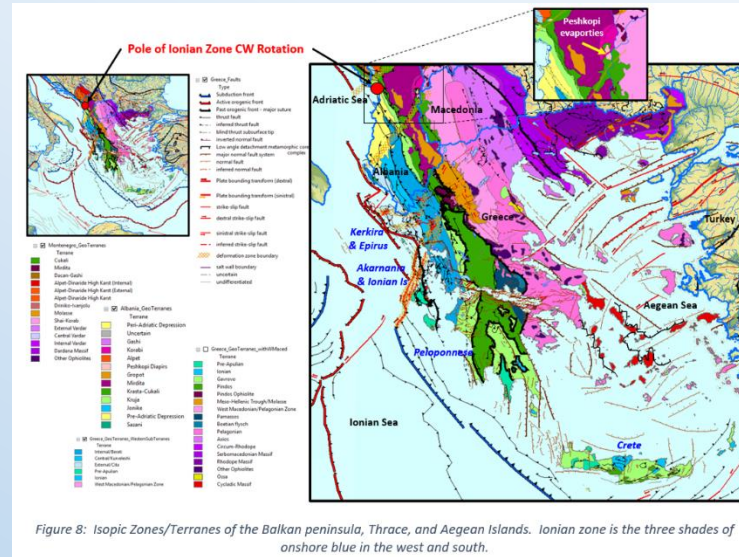
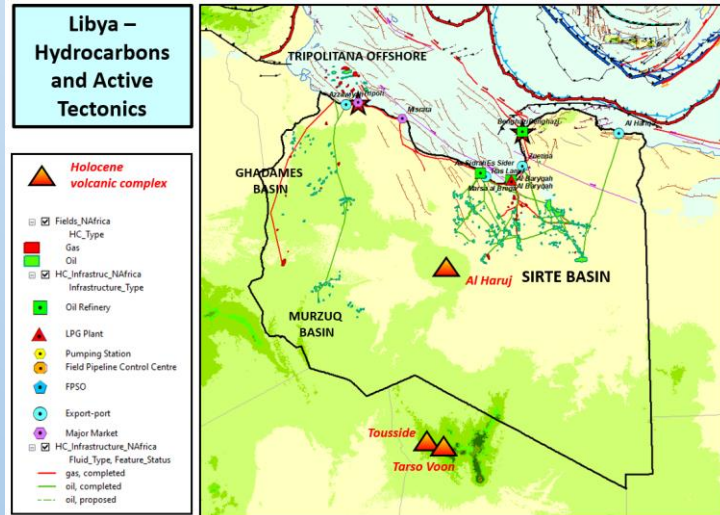
Artificial intelligence: one of many new technologies with increasing application in geoscience



Application of innovative radio wave technologies for remotely imaging the subsurface

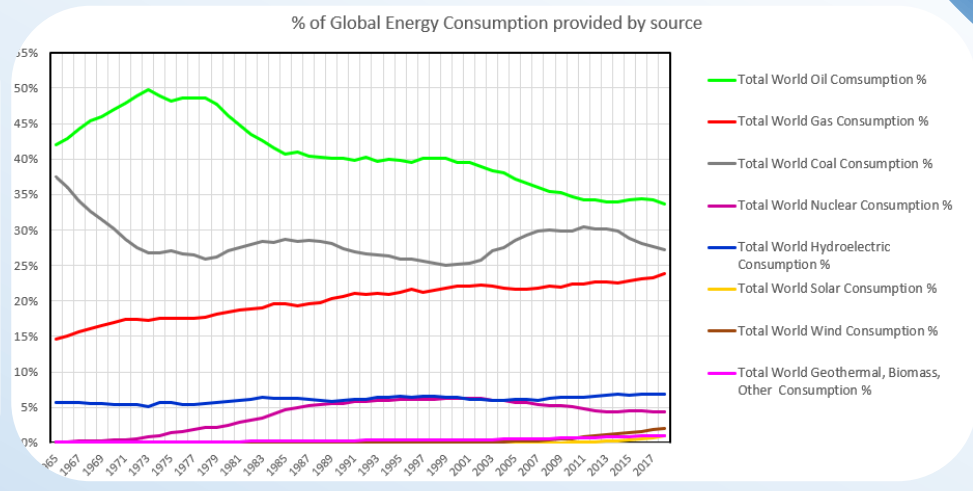
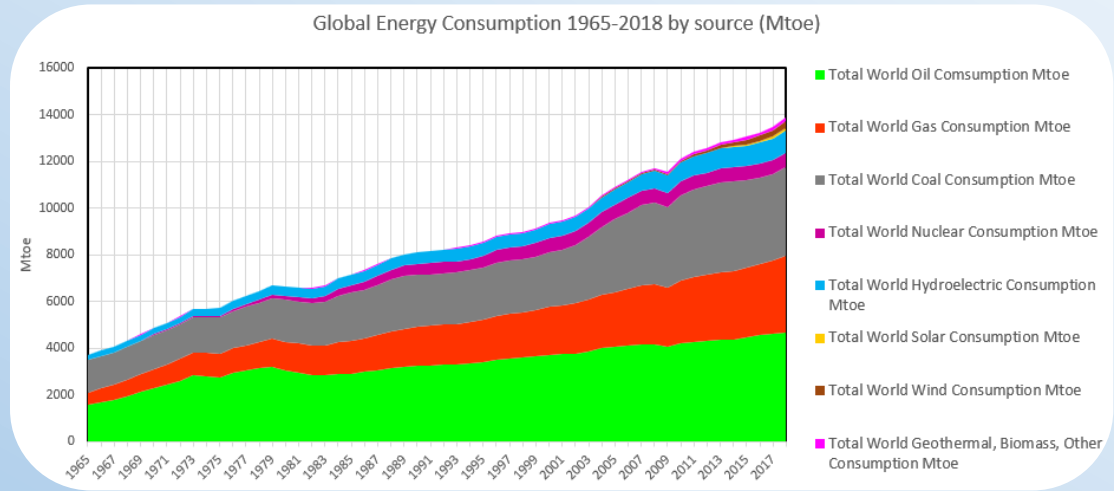
- **Paetoro is committed to keeping up to date with the latest technological developments in geoscience**
 - In such a fast moving science, it is impossible to keep up with every new technological development
 - But it is possible to maintain contacts with those involved
 - Through a wide variety of employments and contacts over the years, Paetoro knows where to turn when additional specialist expertise is required
- **In house software capabilities**
 - ArcGIS for regional mapping and geospatial data collation
 - Zetalog for well-log analysis
 - Petromod-1D Express for 1D basin modelling
 - Crystal Ball for probabilistic resource & reserves assessments
 - FaultRisk for probabilistic fault seal juxtaposition and SGR analysis
 - OpenTect for seismic and 3D visualisation (licensing of DUG software also possible for extended projects)
 - We maintain close contacts with software vendors to keep abreast of new software developments
- **User experience:**
 - In addition to the above: Petrel, Kingdom, MATLAB, ODM, GeoX, Rose, REP, Trinity, Petromod, Basinmod, 3D Move & 2Dmove, GeoSec
- **Paetoro is actively involved in new R&D**
 - Paetoro is particularly interested in new onshore remote sensing techniques and developments in onshore seismic – particularly in structurally complex areas.
 - We work to understand and integrate these new techniques with older tried and tested ones.

Back to Basics



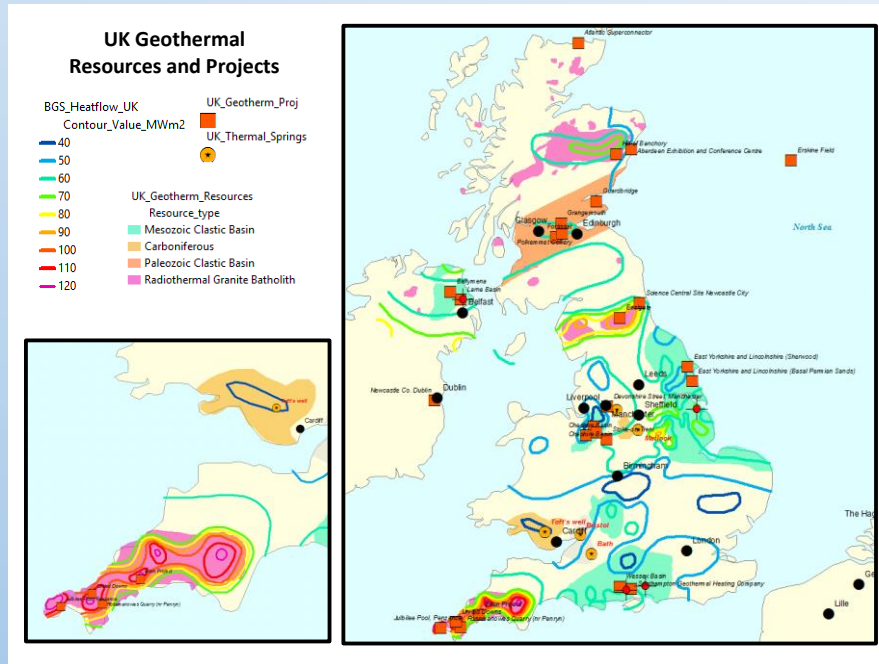
- One of the major problems confronting subsurface exploration and production today is the sheer amount of data
- One of the amazing advantages of geoscience today is new technology and modelling techniques
- However... Paetoro is firmly of the belief that key to the successful management of subsurface resource is:
 - *Efficient organisation of the data*
 - *Consideration of the data – though it is always important to move quickly – thinking about the data carefully is often the most neglected aspect*
 - *Getting the basics right first*
- It can be tempting to rush into sophisticated models – but most of the time, getting the simple things right can take us a long way before we need to get complicated.
- Exploration & Production successes, more often than not, come when organisations 1) get good data; 2) sort their data; 3) think about their data; 4) keep going! Stamina is important – success doesn't always come immediately.

An Energy Transition

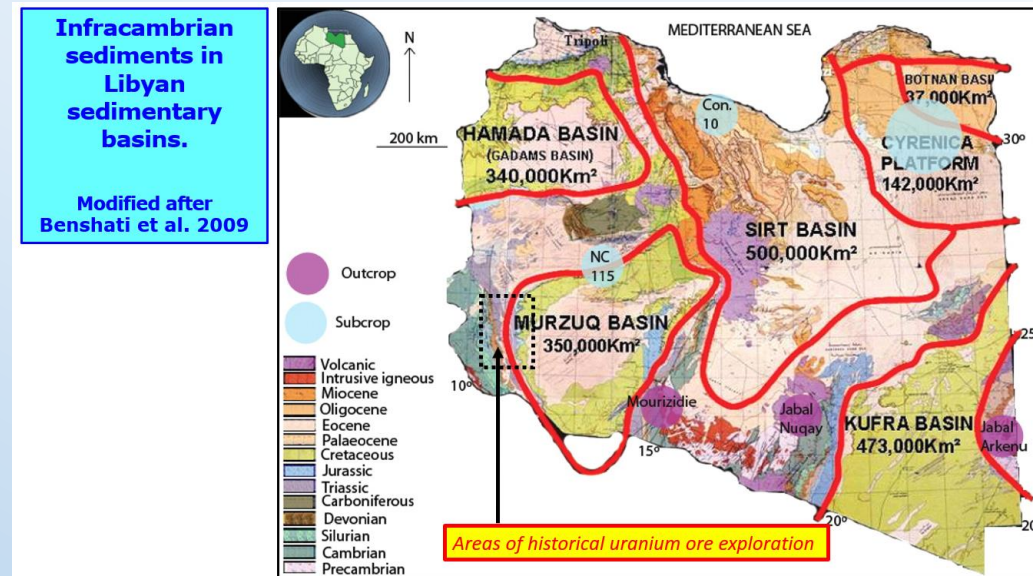


- A global energy transition is happening.
- The world is in a search for energy sources that will decrease global emissions.
- The innovation and widespread deployment of renewable energy sources means historical energy sources no longer have a monopoly on energy.
 - This means long term price commodity behaviour is entering new and uncharted territory.
- Yet transitions will take time, so demand for traditional commodities will continue.
 - This is likely to become increasingly concentrated in places where extraction of resource is most cost efficient.
- Paetoro’s experience working in different sizes and styles of E&P company means it is very aware of the important commercial and regulatory aspects of the business.
 - Our consideration of an opportunity doesn’t stop with the rocks.
- The lower margins on heat and power mean customer-driven exploration is key – which involves understanding and mapping socio-economic constraints right from the onset of exploration.

Subsurface Resource – a big picture



Hydrocarbon provinces are also good sources of aquifers, sometimes hot



An age of growing renewable, battery, and nuclear technology innovation, necessarily requires exploration for new mineral resources

- With the advent of modern technologies the opportunity to integrate all subsurface data has never been greater.
- Paetoro is client focussed, but we maintain a wider geological and energy interest in whichever areas are studied.
- We are always alert for exploration or production “synergy” with other geothermal, hydrogeological, or mineral resources and integration with other renewable energy sources.
 - Resources working together can sometimes create a sum greater than the total of the parts
 - Geothermal brine minerals, thermal energy storage in shallower reservoirs, multi-application cascaded heat projects, hybrid project integration of geothermal with intermittent wind and solar renewables – these are just some examples of options.

Training

- The core focus of Paetoro is analysis. It is not a training organisation.
- However, Paetoro passionately believes in knowledge sharing.
- We happily work to assist emerging young talent in client organisations and affiliated state or academic institutions - to help them understand and repeat the workflows Paetoro has found useful.
- The more that we all collectively understand, the more opportunity for all.



