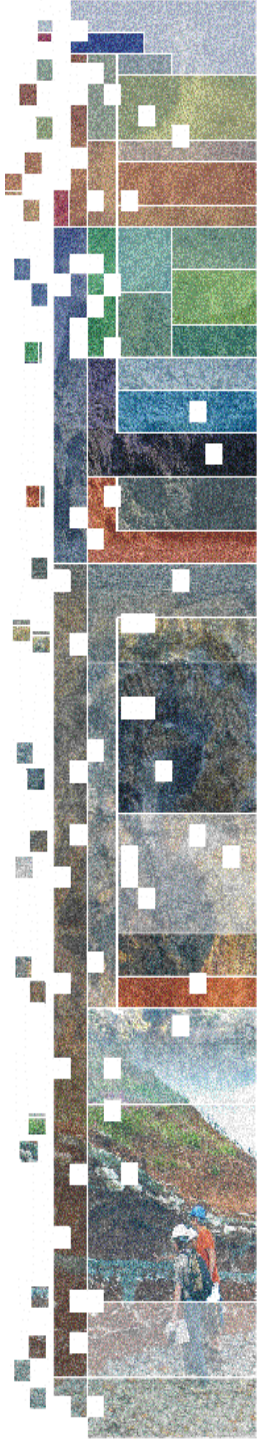


# IGI User Group 2023



The online episode ...

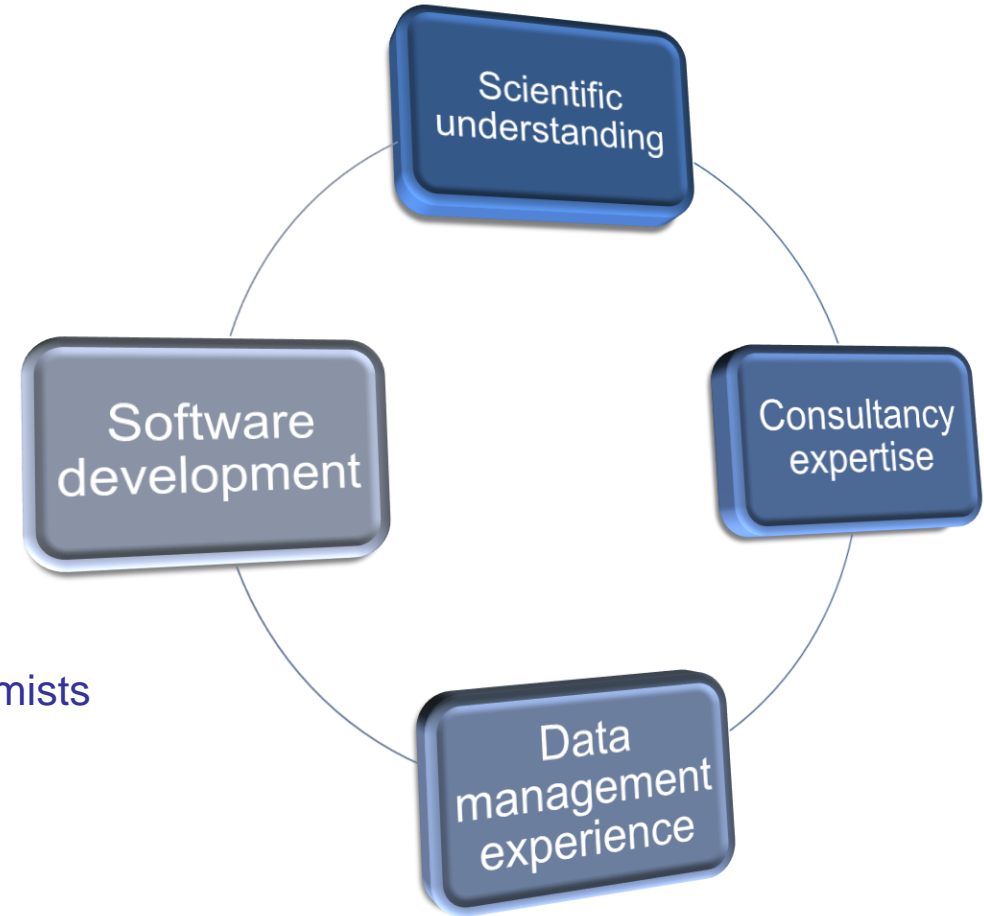
28<sup>th</sup> June 2023



# IGI in 2023

## Plus ça change ...

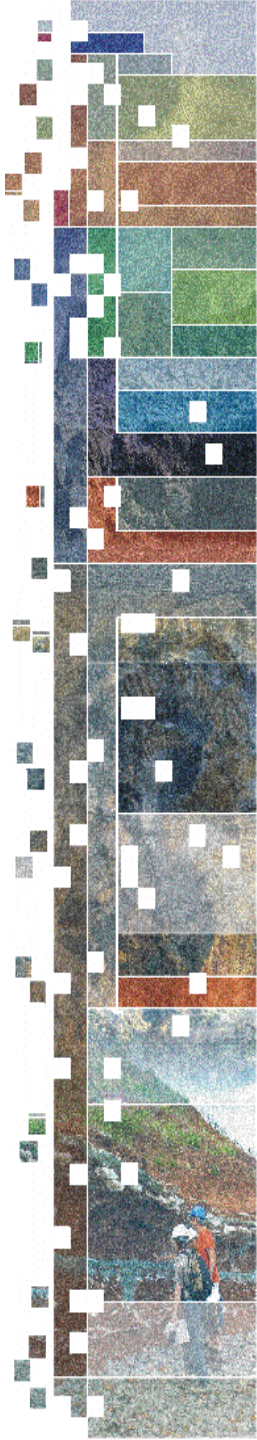
- IGI continues to work in the oil and gas sector
  - software
  - data management
  - consultancy
- We are developing our expertise in a range of new areas
  - PVT collaboration
  - carbon storage
  - H<sub>2</sub> exploration
- Specific development plans include:
  - incorporation of PVT data in Metis for reservoir engineers and geochemists
  - data management for 'new energies and net-zero'
  - building scientific expertise for the net-zero energy future
  - contributing to OSDU developments
- We'll cover the impacts on the software mostly!



# Additional Features Usability Improvements

p:IGI+

What's new since 2022



# New features in p:IGI+

## Key Release Features

### V 2.1.4 – Aug 2022



- p:IGI+/Metis integration, Rule sets, Upgraded PCA and Clustering tools, Usability improvements.

### V 2.2.6 – Feb 2023



- Machine learning, Map advancements, Updated artefact manager, Artefact window behaviour, Usability improvements.

### V 2.3 – Pre-Release

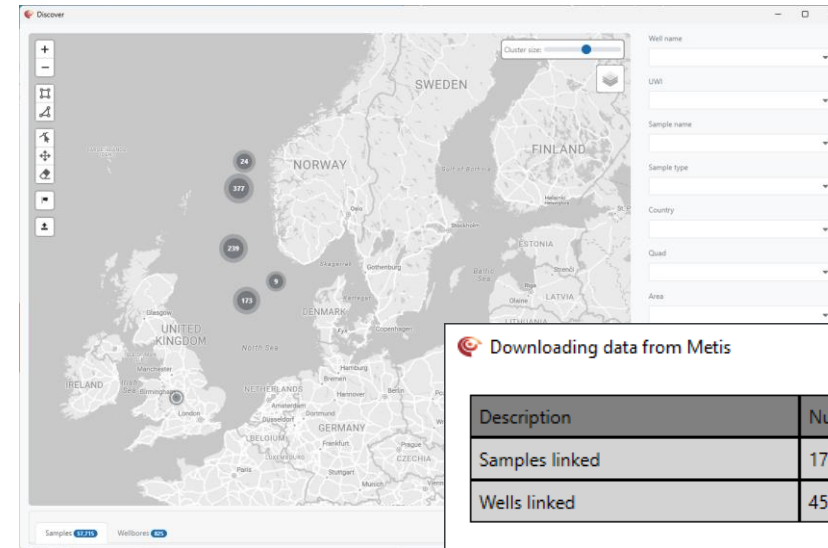


- Auto-artefact access/management, Palette styling, All properties with data page, Usability improvements.

# p:IGI+ highlights

## The 'big' features V 2.1.4

- p:IGI+ / Metis integration
  - Project can now be a 'view' onto Metis database
  - Quickly and easily select the data you want
  - Check for data updates on Metis
  - Use Metis Transform to update and improve data
- Rule sets
  - Build flexible rule sets for QC and 'interpretation'
  - Both rule label and rule name can be written to specified properties
  - Share, automatically label data
- Clustering & PCA
  - Look for clusters in your data interactively
  - Use with or without PCA
  - Export useful cluster models
  - Create directly from pages
  - No sample/property ratios



Downloading data from Metis

Description	Number
Samples linked	174
Wells linked	45

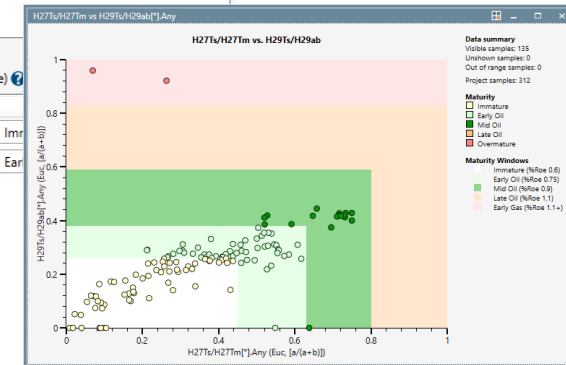
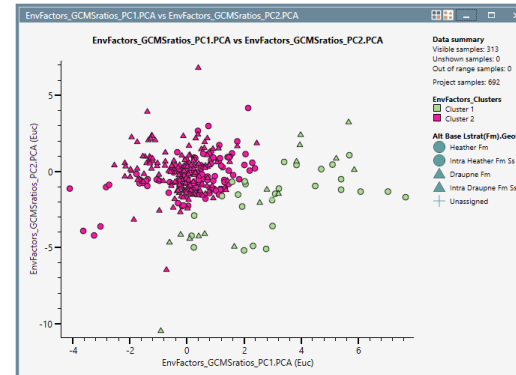
Loading data from Metis - Loading well samples...

Close

Action	Criterion Id	Criterion Element
<input checked="" type="checkbox"/>	A	$0 \leq H27Ts/H27Tm[*].Any (Euc, [a/(a+b)]) \leq 0.45$
<input checked="" type="checkbox"/>	B	$0 \leq H29Ts/H29ab[*].Any (Euc, [a/(a+b)]) \leq 0.26$
<input checked="" type="checkbox"/>	C	$0 \leq H27Ts/H27Tm[*].Any (Euc, [a/(a+b)]) \leq 0.63$
<input checked="" type="checkbox"/>	D	$0 \leq H29Ts/H29ab[*].Any (Euc, [a/(a+b)]) \leq 0.38$

Expression (use 'and', 'or', 'not' or 'inot' to combine, and brackets for precedence)

Action	Expression
<input checked="" type="checkbox"/>	A and B
<input checked="" type="checkbox"/>	C and D and not(A and B)



# p:IGI+ highlights

## The 'big' features V 2.2.6

- Machine Learning
  - Access provided to a range of machine learning tools
  - Only available to project partners until 2025
- Maps
  - Updated map shortcut icon toolbar
  - Shapefile style editing & labels from attributes
  - Project map settings
  - Well name/site name on hover
  - Georeferenced image underlays
- Artefact Manager and Windows Behaviour
  - Advanced artefact filtering
  - Updated artefacts on the filter list
  - Delete user folders & content
  - Easy move of artefacts to user folders
  - Artefacts remember size and position of last opening

Model Page Graph

- New statistics...
- New PCA...
- New clustering...
- New rule set...
- Open Model manager...

IGI Machine Learning

Preview Data View with preprocessing applied 100 of 3722 samples

Long.Any	Lat.Any	Base MD.Sample	VR.Mean.Any
count: 3722 1.575-6.168	count: 3722 56.126-59.458	count: 3722 230-5690.8	count: 3722 0.07-2.35
3.103389	56.338639	4724.399928189	1.53
2.037475	58.140717	1320.0	0.34
3.203947	56.429078	4268.7239935115	0.97
4.386417	56.542906	2505.4559961917	0.46
1.914789	58.081489	2855.0	0.53
1.890392	58.077961	2755.5	0.45
1.881483	59.200208	4030.0	0.39
2.326194	58.221817	2606.0	0.42

Training Data Selection

Remove samples with all missing features (out of 3)

Training split 85% Random Seed

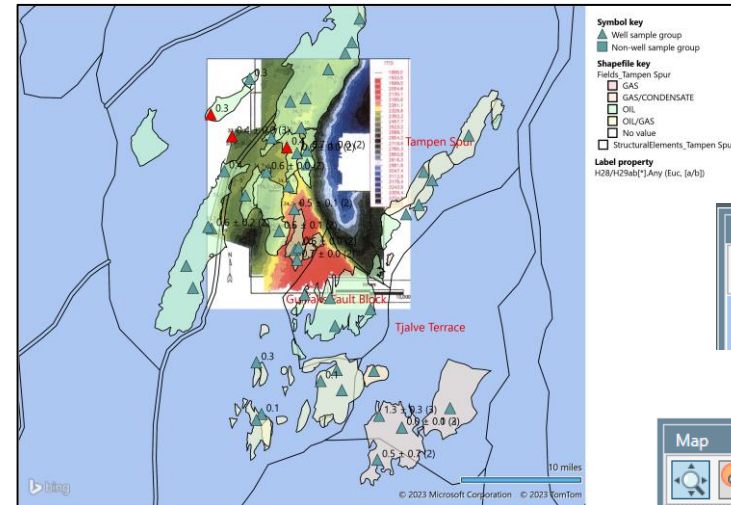
507

Preprocessing Options

Normalise data per sample

Standardise data per feature

Replace empty values with Automatic (KNN imputer)

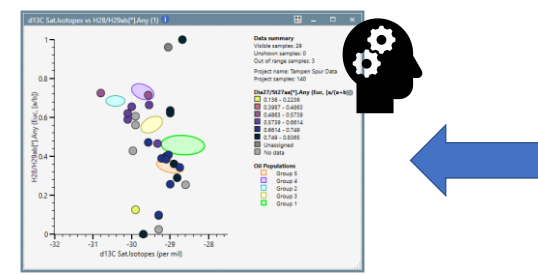


Map Old

Road

Map New

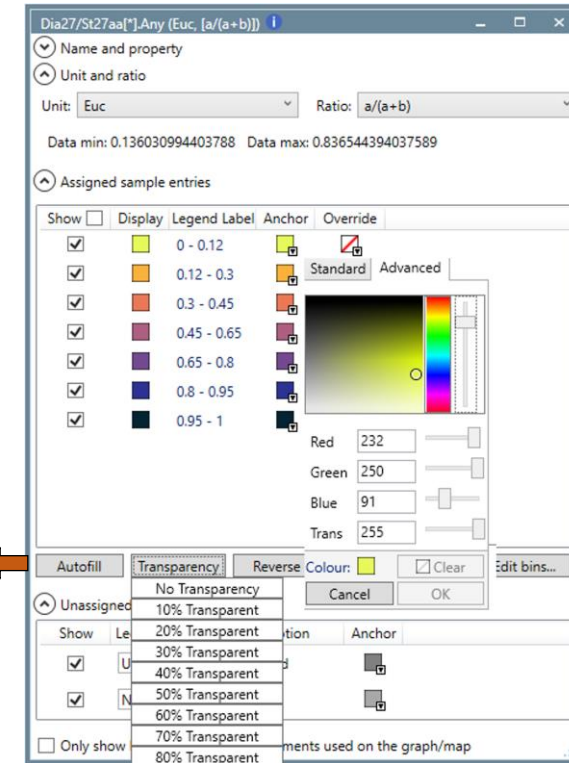
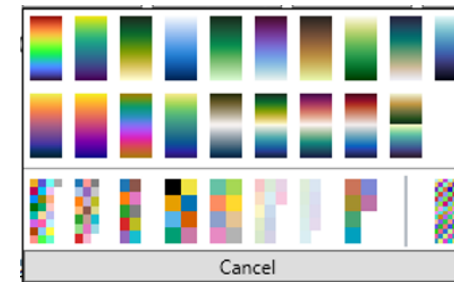
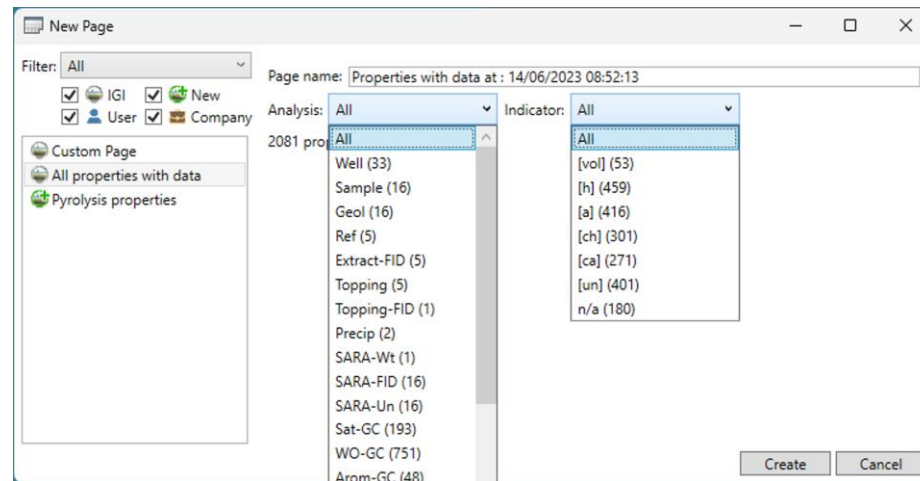
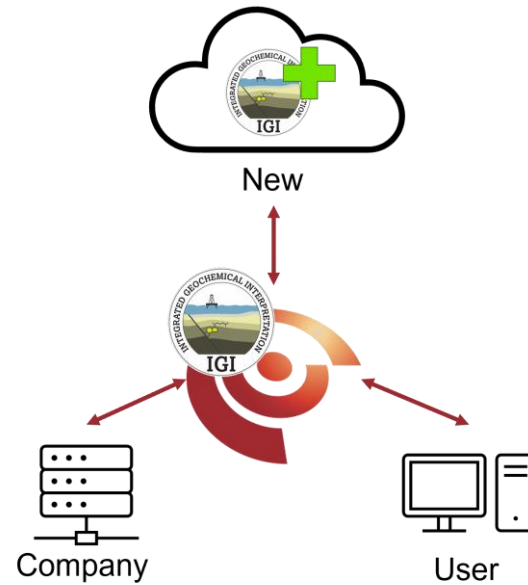
Road



# p:IGI+ highlights

The 'big' features V 2.3 (pre-release)

- **Artefact Management**
  - Expanded the range of artefacts with templates
  - Increased access routes for artefact templates
  - Artefact information & tags
  - New artefact templates
- **Palettes**
  - Improved autofill colour schemes
  - Bulk transparency
- **All Properties With Data Page**
  - Content control based on Analysis or Indicator or combination



# Metis Transform / p:IGI+

## Additional Features / Useability improvements

- Wellbores: no longer determined only by well name
  - Using well name, unique well identifier, country, lat, long, internal#, ihs# and location now allow users to have wells with the same name, from different countries or different lat, lon.
- Artefacts: when exporting an artefact as a template, the *File name:* is pre-populated with the artefact name.
- Statistics: Indicators, units and ratios can be easily edited
- User Settings: properties selected for Visual Query or set as Key Columns can be saved at the user level
  - Set as my default properties
- Graphs: Improved copy and layer editing options
  - Copy graph area only without having to hide legends
  - Layer object rotation (text, ellipses and rectangles)

Well Name	Coordinates
9/12-1	[Norway, 57.19, 4.96]
10/5-1	[Norway, 57.58, 5.59]
9/3-1	[Norway, 57.83, 4.77]
11/10-1	[Norway, 57.01, 6.17]
10/7-1	[Norway, 57.47, 5.06]
10/8-1	[Norway, 57.42, 5.57]

File name:

Save as type:

Property	Indicator	Unit	Ratio	Grouping	N	Min	Max	Mean	Std Dev
Pr/Ph.Sat-GC	un	%	a/b		68	80.00	239.00	156.33	28.07

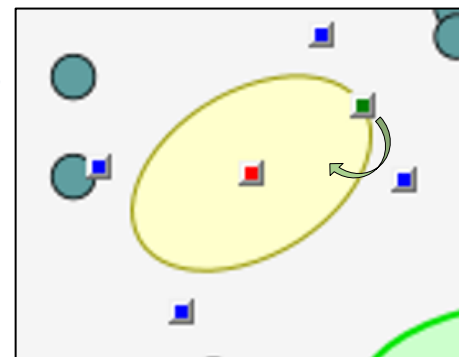
Visual Query Tool

Properties: (Graph properties are at the top)

Property	Indicator	Value	Uom	Ratio
28St.Any	*	16.75 (Sat-GCMS,h)	%	a/(a+b)
27St.Any	*	65.76 (Sat-GCMS,h)	%	a/(a+b)
29St.Any	*	17.49 (Sat-GCMS,h)	%	a/(a+b)
Well Name.Well		34/11-5 S		
Base MD.Sample			m	
Category.Sample		Oil		
Repeat.Sample				
Base Lstrat.Geol		Baulder		
Base Cstrat.Geol				
Lith.Phys				

Navigation: Sample 1 out of 3

Buttons: Configure visual query properties..., Set as my default properties, Clear brushed selection, Assign value to brushed samples..., Add to static sample set...

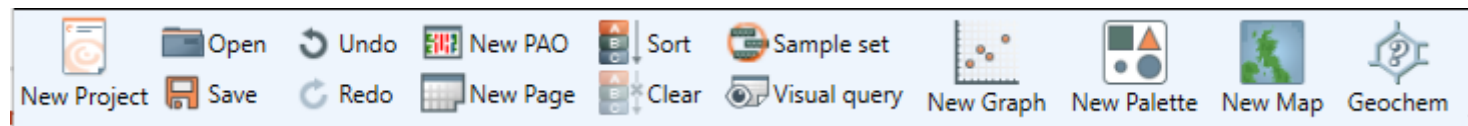
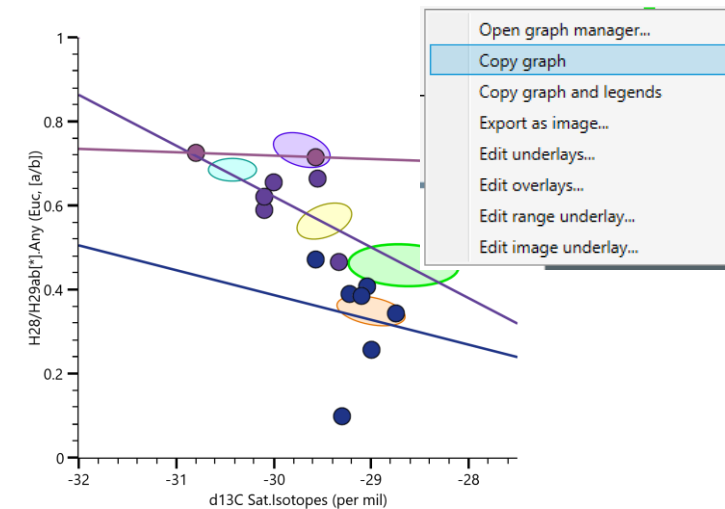
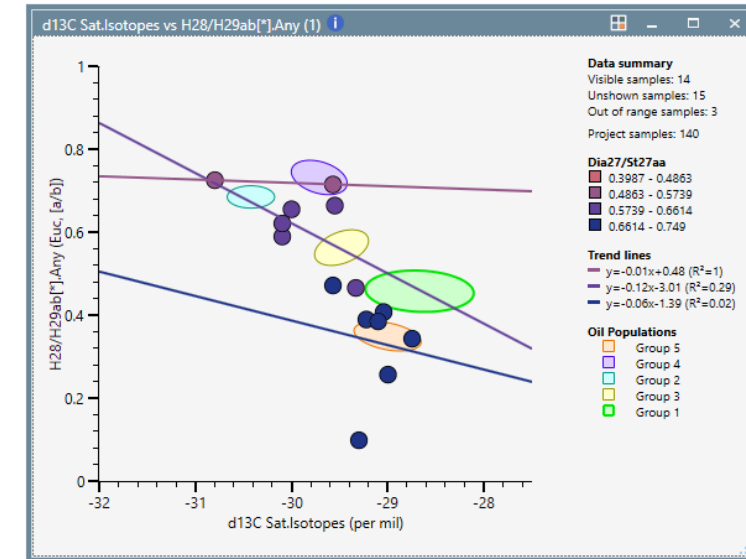




# Metis Transform / p:IGI+

## Additional Features / Useability improvements

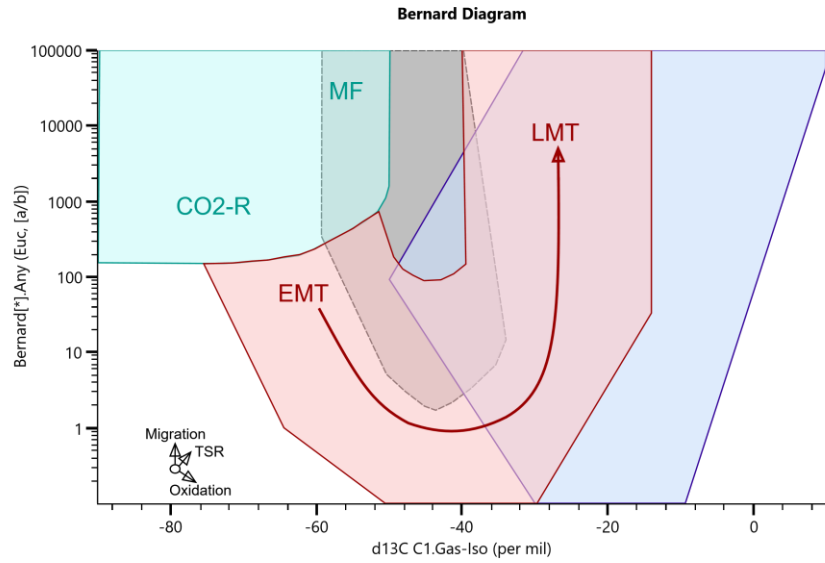
- Trend lines on graphs: Scatter Plots, Depth Plots
  - Shown for all data, or per colour palette item
    - Trend lines work in log space
  - Equation of lines and  $R^2$  values
- Graph and Map Copy
  - Right-click “Copy only graph” to copy the graph without any of the legend elements (Ctrl+Shift+C).
  - Maps have the same (Ctrl+Shift+C) functionality
- Updated application shortcut icon toolbar
  - Streamlined to accommodate forthcoming features



# Metis Transform / p:IGI+

Additional Features / Useability improvements V 2.3 (pre-release)

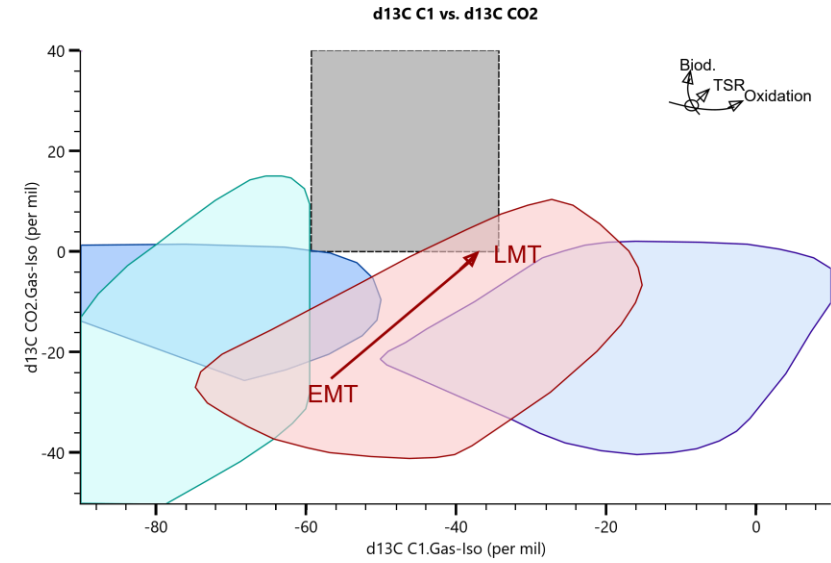
Autograph Templates



**Data summary**  
 Visible samples: 0  
 Unshown samples: 0  
 Out of range samples: 0  
 Project name:  
 Project samples: 0

**Gas Origin+Process**

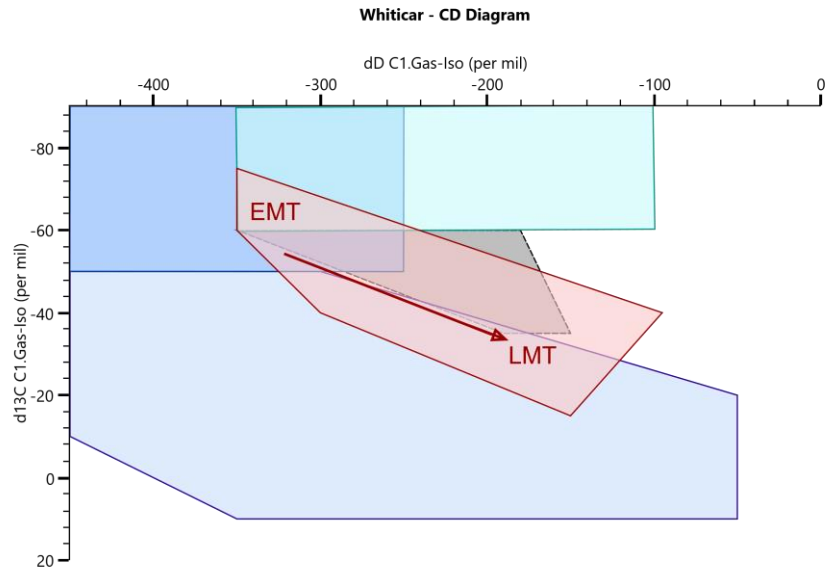
- Maturity
- Thermogenic
- 1st Microbial
- Abiotic
- 2nd Microbial



**Data summary**  
 Visible samples: 0  
 Unshown samples: 0  
 Out of range samples: 0  
 Project name:  
 Project samples: 0

**Gas Origin+Process**

- Maturity
- Thermogenic
- Microbial-CO2R
- Microbial-MF
- Abiotic
- 2nd Microbial



**Data summary**  
 Visible samples: 0  
 Unshown samples: 0  
 Out of range samples: 0  
 Project name:  
 Project samples: 0

**Gas Origin+Process**

- Maturity
- Thermogenic
- Microbial-CO2R
- Microbial-MF
- Abiotic
- 2nd Microbial

Milkov, A.V. & Etipoe, G. 2018. Organic Geochemistry, 125, 109-120.

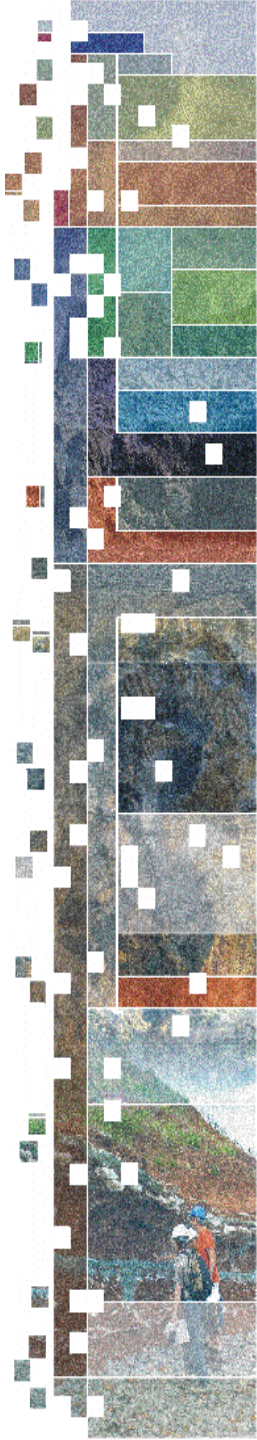
A series of revised gas origin/process plots fit for modern data





## Data management

What's new and coming soon



# Metis highlights

- What's new since 2022
- 4 new companies are now using Metis
- Scalability
  - Increased scalability of adding, editing or deleting data in Metis.
  - Larger data changes can be processed
  - Actions that change data occur one at a time
- Harmonisation:
  - Correct typos, fix inconsistencies or simply delete erroneous values to ensure consistency
- Update history:
  - Metis now keeps track of all data changes that have occurred in the system.
- Project merge within a sampleset
  - Rather than entire project a set of samples can now be merged
- Integration with 3rd Party Apps
  - Begun to create an integration API so that other applications can consume data from Metis

Current query: 96 wellbores 936 samples

Count ▲	Current value	New value
96	USA	<input type="text" value="United States"/>

**Update History** Last refreshed 3 minutes ago

When	Who	What
24th Feb 2023 13:13	Ria Cutler	Harmonise Pro
24th Feb 2023 13:07	Ria Cutler	Upload data to
24th Feb 2023 11:45	Aaron Wingfield	Harmonise Pro



# Metis highlights for 2.3

- Quick Search Criterion

- Simplifying querying in Discover
- Make in intuitive to non-expert users
- Covers 80%+ of the most common queries
- Can include polygons

Well Name.Well
n/a
7324/10-1
7321/8-1
7321/7-1
7324/8-3
7321/9-1
7324/6-1
7319/12-1
7322/7-1



Well name

7324/10-1 × 7321/8-1 × 7321/7-1 × 7324/8-3 ×

7321/9-1 × 7324/6-1 × 7319/12-1 × 7322/7-1 ×

Well name

7/11-5 × 7/12-3 × 7/12-6 ×

UWI

Sample name

Sample type

Cuttings ×

Country

Norway ×

Quad

Area

Basin

Cod Terrace ×

Country

Norway ×

Quad

Area

Basin

Al Basin × Bjørgvin Arch × Brage Horst ×

Breiflabb Basin ×

Richard Price

Cluster size: [slider]

Well name

UWI

Sample name

Sample type

Country

Quad

Area

Basin

Field

Lithostrat

Chronostrat

Add advanced criterion

Query Export



# To PVT & Beyond

- Companies are approaching us about using Metis to manage PVT data
- We have started to extend Metis to enable the management of PVT data and files
- Working with **Calsep** a leading provider of PVT simulation services
  - The company behind PVTsim Nova
- Goal: Effective data management for geochem and PVT data
- Opens Metis to a whole new audience of users
- It also benefits our existing users who can leverage PVT data for exploration
- This extension will be a paid for upgrade
  - Not part of the annual S&M payments
  - Companies do not get the PVT extension automatically
  - Companies opt into the PVT extension upgrade
- Property model PVT changes are not exclusive to the extension. Everyone gets them.

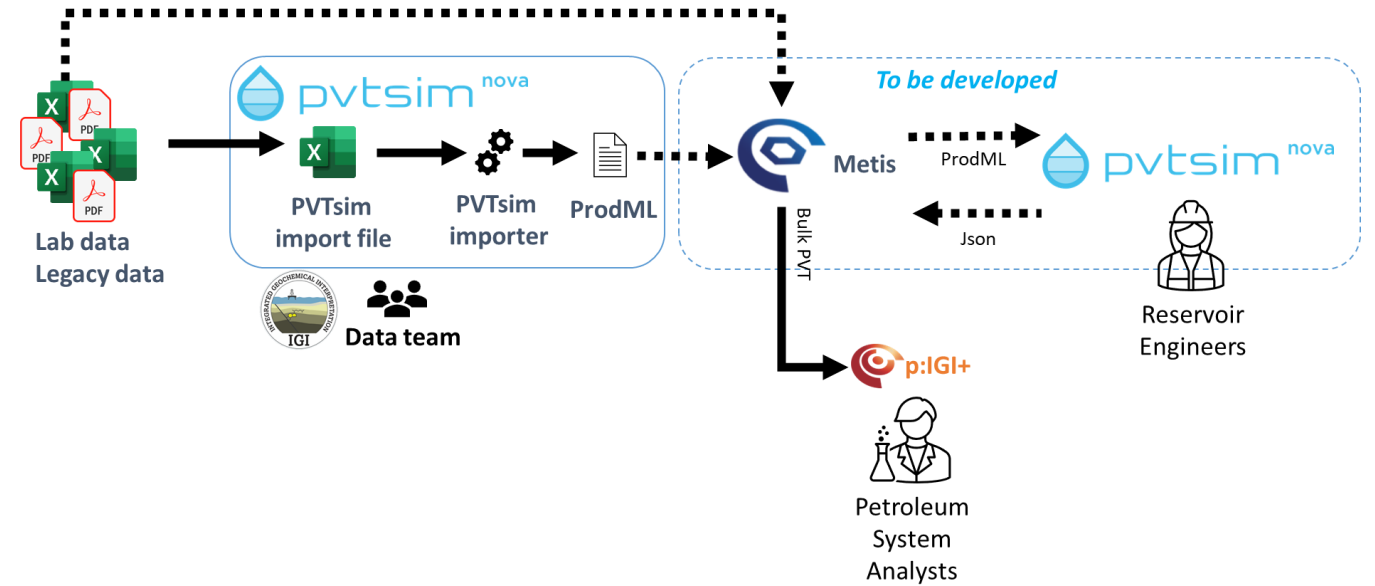


Reservoir  
Engineers



# How to get involved

- **Metis: PVT foundation partnership**
- A 3-year foundation partnership
  - Starting in 2024
  - Aiming for 4 clients initially
- Open to:
  - Existing Metis clients: who want to upgrade
  - New clients: Who are considering Metis
- Opportunity to:
  - Get early access to the PVT extension
  - Influence the priorities and roadmap
  - Include 10 days of data loading each year
  - Discounted rate for additional data loading
  - IGI will work with a data vendor (lab) to streamline data ingestion



## Aims:

1. Effective data management for geochem and PVT data
2. Create an efficient integrated workflow for reservoir engineers using both Metis and PVTsim Nova
  1. Intuitive access to data
  2. Make existing models discoverable
  3. Upload new models easily
3. Understand complex data using machine learning tools
4. Ingest into and consume data from OSDU data platform

Contact us to find out more



# Metis Tooling

- Continue to invest to enhance and extend the tools
- Discover to continue to be the main application for users to find data
- Developing **Transform Online**
  - A new web application for data loaders
  - For managing data in Metis
- Longer term
  - Staging App
  - Towards automatic ingestion of data
  - We want to work with data vendors (i.e labs) to:
    - Be able to automatically import data
    - Whilst keeping the quality of data high

## Discover:

- Query for existing data
- Export



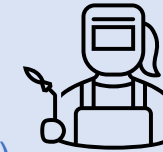
Petroleum  
System analysts



Reservoir  
Engineers

## Transform Online:

- Query and export existing data
- Update existing data (harmonise)
- Delete existing data (wellbores and samples)
- Create new data (Upload PVT files)
- Manually process uploaded files



Data  
loaders

## Staging App:

- Bulk upload files
- Automatically process files



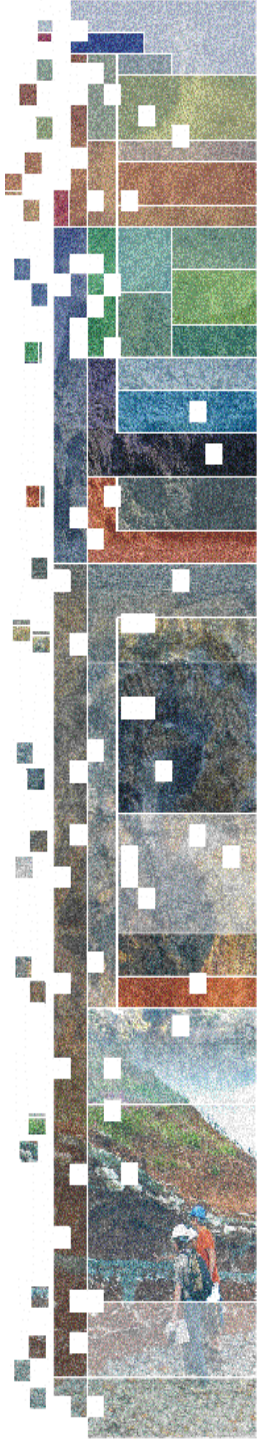
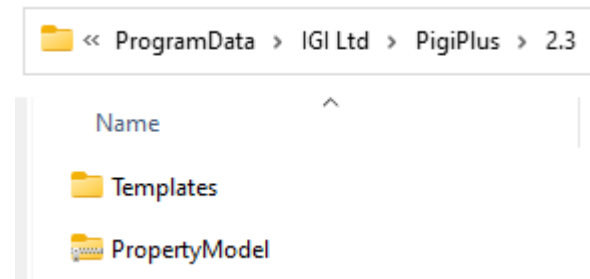
Lab techs



# IGI Property Model Additions and Edits

Metis / p:IGI+

- **Property model:** has been completely removed from the application code and resides in your PC profile, enabling the model to be updated more efficiently between releases.

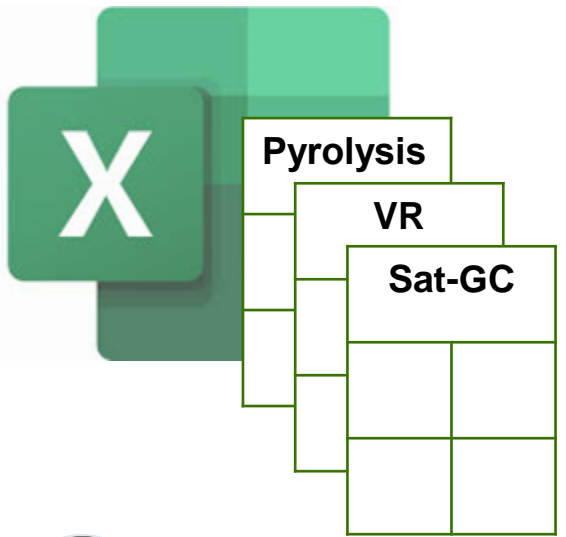


# IGI Property Model: Service Lab Collaboration



- Collaboration with APT & Stratum Reservoir that allows them now to offer an IGI import-compatible data file
- To ensure users get the most out of the labs analytical output, we have expanded and edited our property model in some key places:

- VR
- VisK-TL & -RL
- K-Colour
- Diam-GMS
- Arom-GCMS
- WO-GCMS
- The Pol-GCMS
- Py-GC-Extr



Multiple user imports  
& merge

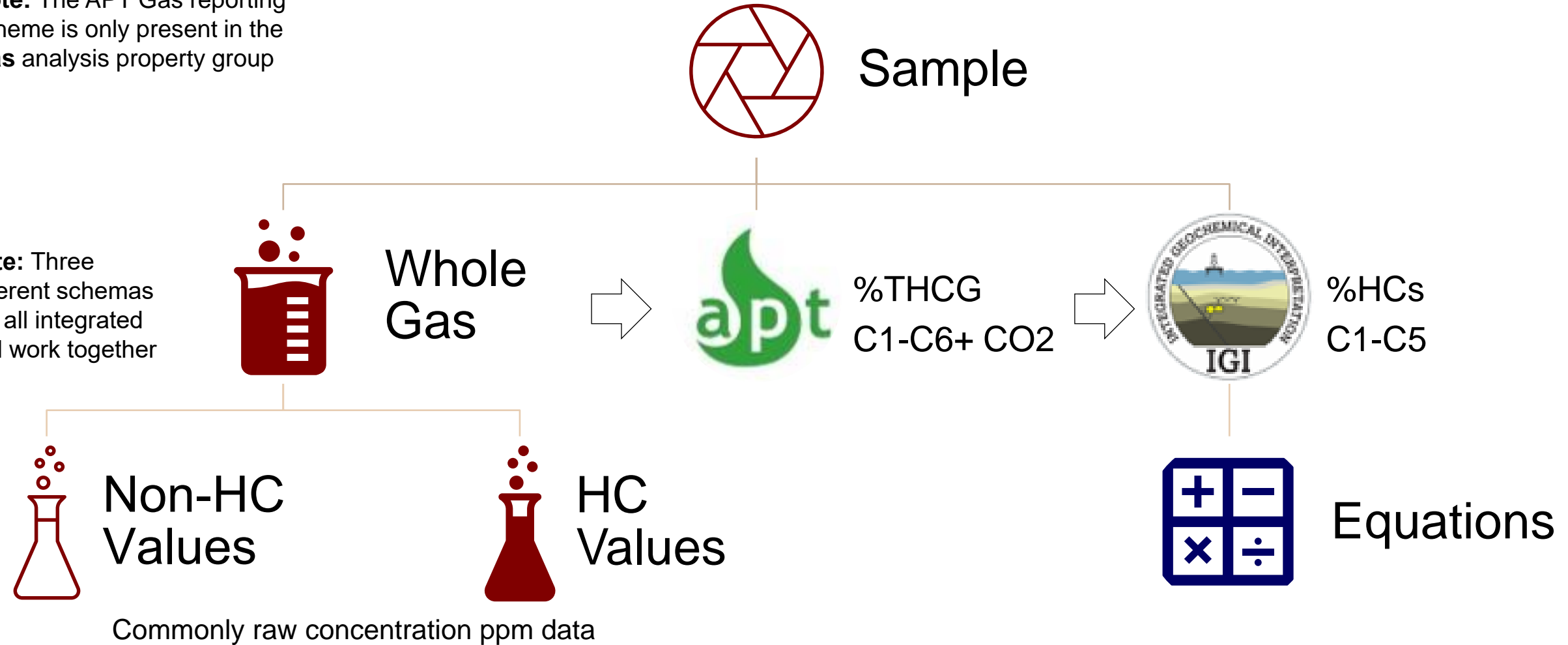


# Analytical Property Model

## Sample Gas Model

**Note:** The APT Gas reporting scheme is only present in the **Gas** analysis property group

**Note:** Three different schemas are all integrated and work together

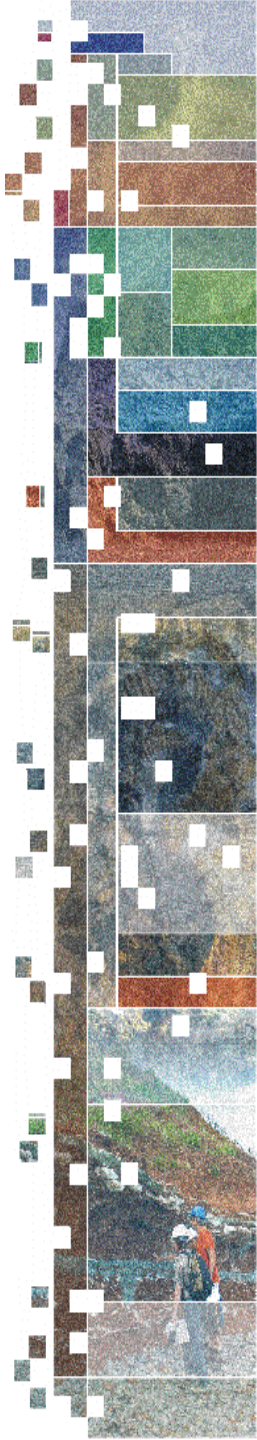


In p:IGI+ Gas data for a sample can be stored against different indicators:  
- **Vol (common)**



# IGI Software and Data Services

Supporting efficient working



# IGI data loading tools and services

- **Data management:**

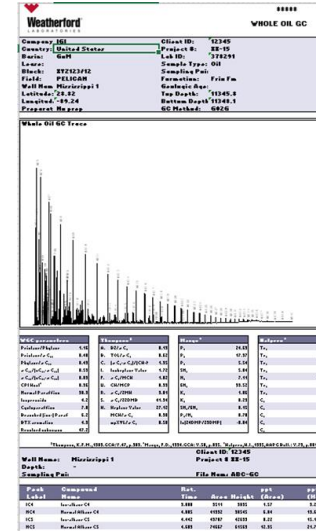
- IGI's dedicated database team is available to fully manage your geochemical data and/or provide support to assure an up-to-date, quality controlled database

- **File Transformation Service:**

- We have been developing in-house data loading tools for a range of often awkward data files and are now making these tools available to clients through our File Transformation Service:
  - GC 'data' files from labs look nice, but are horrible to import to anything
  - DISKOS (NPD-95) have an interesting block structure making cross plotting challenging
  - LAS files are great if you have a well log viewer, but hard to use in other software
  - GeoMark data don't have unique column headers and include a mix of well and non-well location

- **Global Data Service:**

- Publicly available geochemical data can enhance an interpretation and provide valuable additional information but is often difficult to integrate with existing data
- Available through Metis, IGI's 'Global Data Service' provides easy access to public geochemical datasets straight from your p:IGI+ project

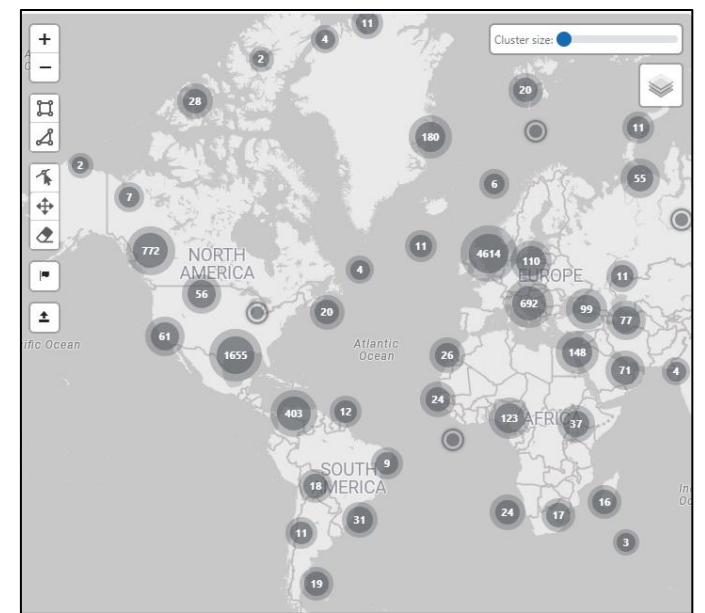


→

R	S	T	U	V
IC4[a].WO-GC<count>	IC4[h].WO-GC<count>	IC4[ca].WO-GC<ppt>	IC4[ch].WO-GC<ppt>	NC4[a].WO-GC<count>
9511	9035	1.573	3.196	41332



The screenshot shows a data management interface with a table of geochemical data. The table has columns for 'Company', 'Client ID', 'Country', 'Project #', 'Basin', 'Lab ID', 'Sample Type', 'Rock', 'Field', 'Formation', 'Well Name', 'Latitude', 'Top Depth', 'Longitude', 'Bottom Depth', 'Preparation', and 'GC Method'. There are also various filters and options available for the data.



# The File Transformation Service

simple, secure and supported

- How will this work?
  - companies subscribe on an annual basis
    - pricing: up to £4K per year
- Why is it a service / web based tool?
  - file types are very diverse, we can quickly update the service if new formats are seen
  - we can extend the range of files supported on request (within reason) without you needing to deploy new software
  - anyone within the company can access the system
- Of course if you prefer to use our human data services these remain available!
  - we routinely use these tools internally to deliver better value and efficiency



## File Transformation Services



The IGI file transformation services are secure, stateless services (we do not ever store files or data) which transform complex files to simpler structures to allow easy import and further usage.

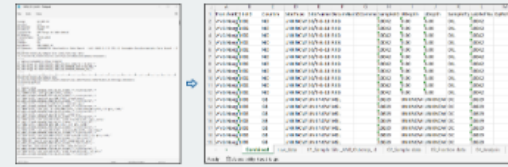
### Gas Chromatogram (GC, GCMS and MSMS)



### Log ASCII Standard (LAS)



### Diskos (NPD-95)



### Geomark



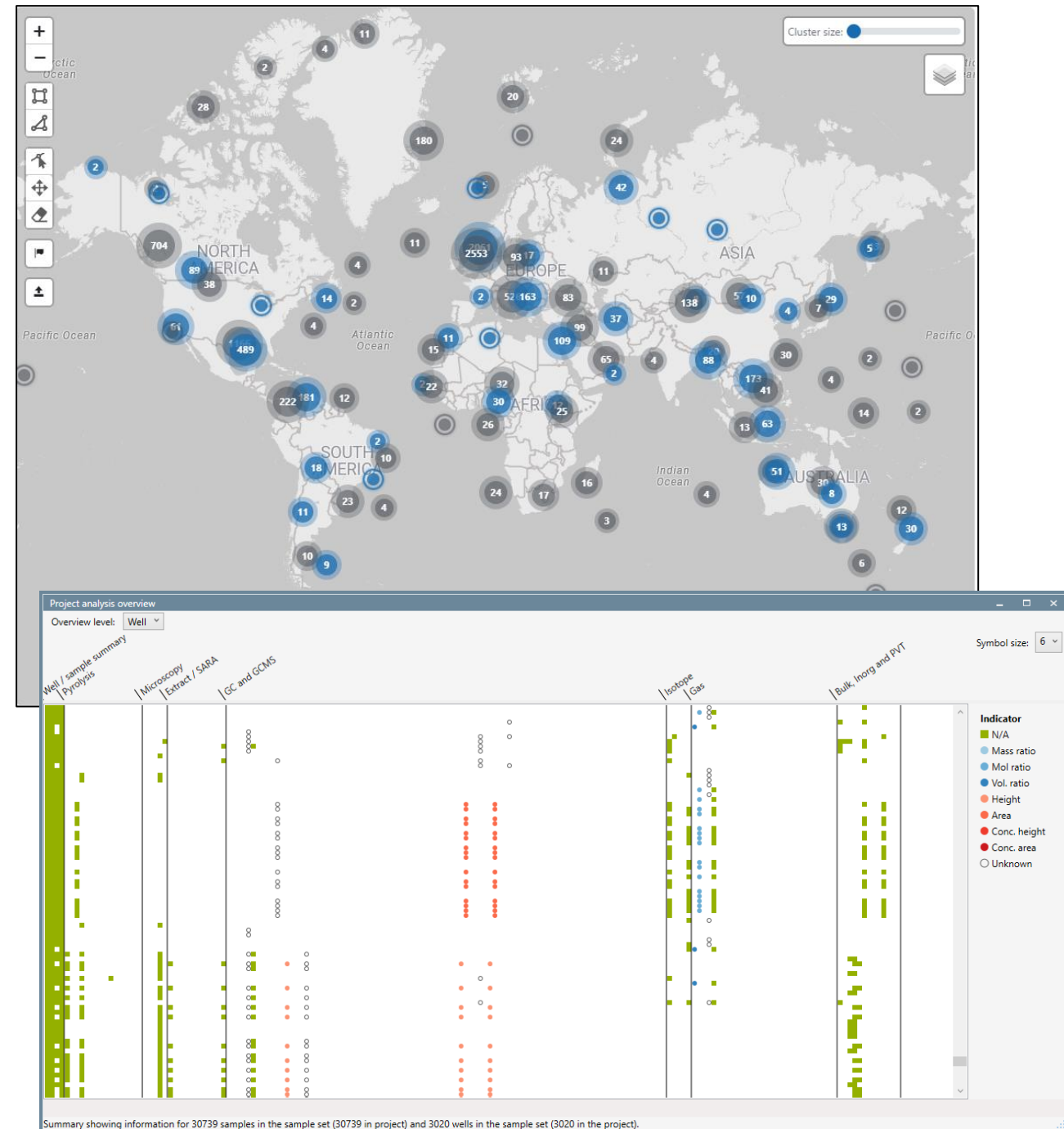
The site is live at: <https://fts.igiltd.com/>

Contact [dataservice@igiltd.com](mailto:dataservice@igiltd.com) for a login / trial



# IGI's Global Data Service

- How it works:
  - Hosted on Azure to give easy access
  - Can be directly accessed from p:IGI+ (v2.1 onwards)
  - Companies subscribe on an annual basis
    - pricing: up to £6K per year
- Current contents
  - Data from DSDP/ODP, NLOG Netherlands database & various publications
  - 133k+ samples from 6,800+ wells, including ~2,290 oil/condensate and ~1,520 gas samples
  - TOC, Rock-Eval, VR, GC, GC-MS and isotope data have been captured
  - Well header data and stratigraphy have been applied where available
- Additional datasets will be added over time
- Create a free account to see what data are available: <https://gds.igiltd.com/>
  - You will be able to query for data, but need to subscribe to download it



Contact [dataservice@igiltd.com](mailto:dataservice@igiltd.com) for more information



# IGI Activities:

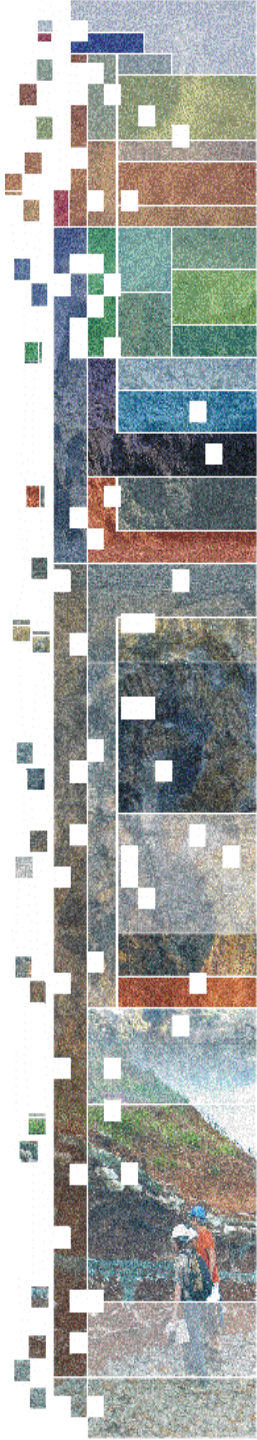
Energy transition

OSDU

and

Machine Learning

Supporting the community

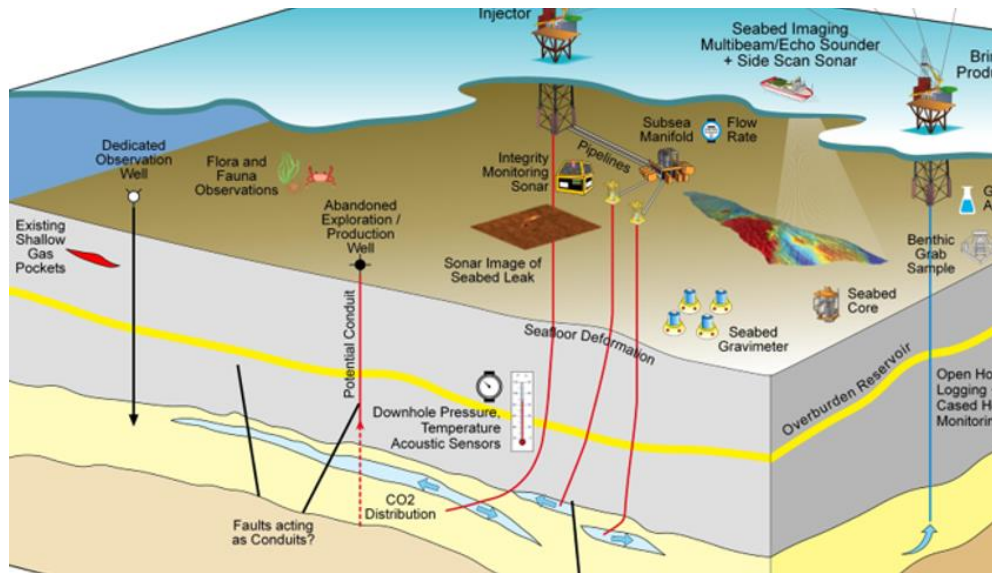




# Developments in net-zero & environmental energy services

Consultancy for a low carbon, environmentally responsible energy industry

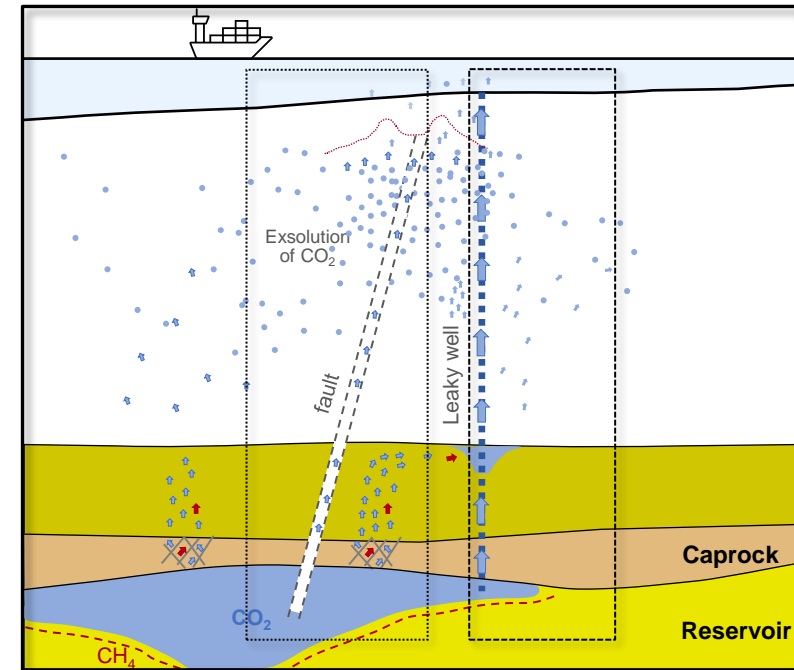
## Data management in support of CO<sub>2</sub> storage monitoring



See [online survey](#) of your monitoring and data management needs.

## Modelling CO<sub>2</sub> migration in the overburden (R&D project in preparation)

2-D schematic illustration of the model principle

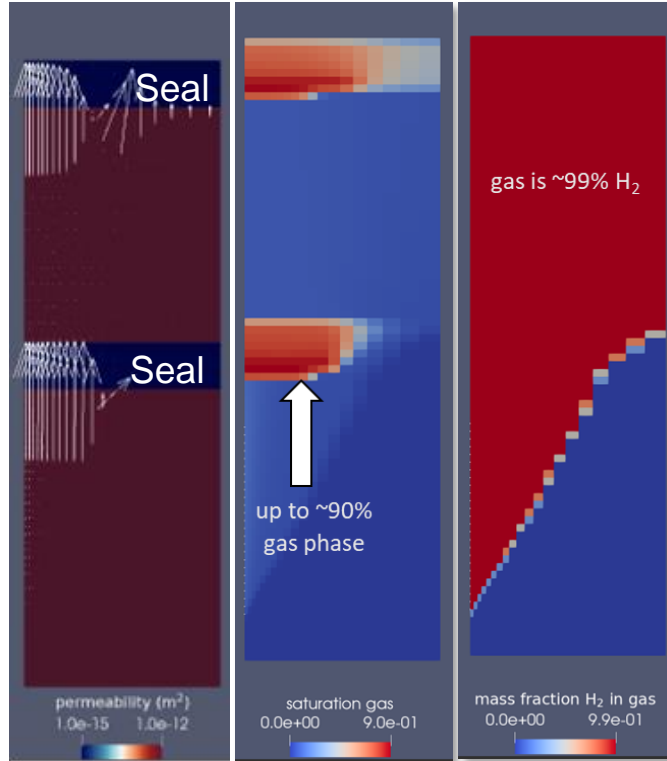


- ✓ Multi-physics model to predict CO<sub>2</sub> migration in the overburden; uncertainty analyses and mitigation of monitoring costs.
- ✓ Local- to basin-scale modelling integration.

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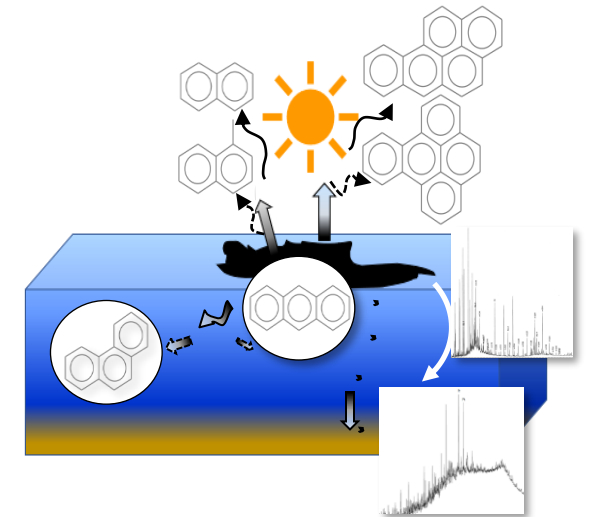
## Monitoring natural H<sub>2</sub> systems from source to trap (on-going R&D project)



- ✓ Numerical experiments to understand hydrogen migration and trapping in the sedimentary column.

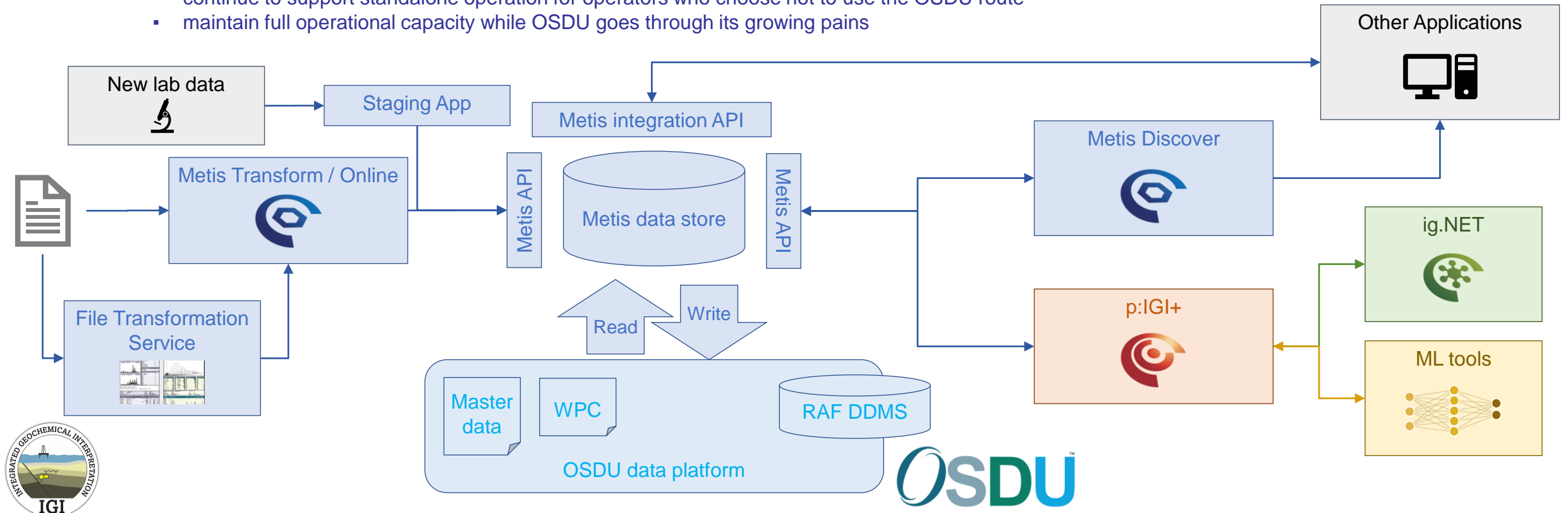
## Forensic geochemistry (on-going)

- ✓ We're developing forensic geochemistry services supported by our well-established expertise in molecular geochemistry.



# OSDU – Open Subsurface Data Universe

- OSDU developments are proceeding in the fluid and rock sample groups
  - IGI actively contributing to both
  - Exxon / EPAM are building Rock And Fluids Domain Data Management System
    - other domains, e.g. wellbore, reservoir are developing maturity
- IGI products intended to remain in the OSDU competitive space
  - Metis will act as an ingestion and discovery tool on top of the OSDU data platform
    - we plan to create both read and write mechanisms
    - continue to support standalone operation for operators who choose not to use the OSDU route
    - maintain full operational capacity while OSDU goes through its growing pains



# Machine learning partnership

## Quick summary

- 3 year research and development partnership with 8 companies
  - started in October 2022
  - will be available to all clients in 2025

base Geol	Type	Sample	S1.Any d.p. 2 ppt (mg/g)	S2.Any d.p. 2 ppt (mg/g)	S3.Any d.p. 2 ppt (mg/g)	TOC.Any d.p. 2 %wt	T-max.Any d.p. 2 °C	HI.Any d.p. 2 wt%
Cretaceous	Cuttings	813	1.63 (PyroE)	4.58 (PyroE)	4.38 (PyroE)	1.71 (PyroE)	426 (PyroE)	267.64 (PyroE)
Cretaceous	Cuttings	813	2.08 (PyroE)	15.42 (PyroE)	1.33 (PyroE)	2.83 (PyroE)	412 (PyroE)	544.88 (PyroE)
Cretaceous	Cuttings	813	1.30 (PyroE)	10.12 (PyroE)	1.24 (PyroE)	1.93 (PyroE)	416 (PyroE)	524.35 (PyroE)
Cretaceous	Cuttings	813	1.59 (PyroE)	11.44 (PyroE)	1.20 (PyroE)	2.19 (PyroE)	414 (PyroE)	522.17 (PyroE)
Cretaceous	Cuttings	813	1.71 (PyroE)	15.02 (PyroE)	1.39 (PyroE)	2.73 (PyroE)	413 (PyroE)	550.18 (PyroE)
Cretaceous	Cuttings	813	0.53 (PyroE)	1.96 (PyroE)	1.88 (PyroE)	0.54 (PyroE)	424 (PyroE)	362.96 (PyroE)
Cretaceous	Cuttings	813	0.08 (PyroE)	0.32 (PyroE)	1.22 (PyroE)	0.43 (PyroE)	420 (PyroE)	120.52 (PyroE)
Cretaceous	Cuttings	813	0.09 (PyroE)	1.78 (PyroE)	2.88 (PyroE)	0.70 (PyroE)	420 (PyroE)	254.29 (PyroE)
Cretaceous	Cuttings	813	0.53 (PyroE)	9.70 (PyroE)	2.37 (PyroE)	2.07 (PyroE)	413 (PyroE)	472.64 (PyroE)
Cretaceous	Cuttings	813	1.09 (PyroE)	21.14 (PyroE)	2.86 (PyroE)	3.33 (PyroE)	413 (PyroE)	652.65 (PyroE)
Cretaceous	Cuttings	813	0.49 (PyroE)	14.56 (PyroE)	2.39 (PyroE)	2.35 (PyroE)	411 (PyroE)	419.57 (PyroE)
Cretaceous	Cuttings	813	0.62 (PyroE)	15.43 (PyroE)	2.58 (PyroE)	2.40 (PyroE)	410 (PyroE)	642.52 (PyroE)
Cretaceous	Cuttings	813	1.16 (PyroE)	26.57 (PyroE)	3.31 (PyroE)	4.03 (PyroE)	409 (PyroE)	659.21 (PyroE)
Cretaceous	Cuttings	813	1.94 (PyroE)	49.86 (PyroE)	3.17 (PyroE)	7.13 (PyroE)	410 (PyroE)	699.30 (PyroE)
Cretaceous	Cuttings	813	0.51 (PyroE)	9.70 (PyroE)	2.10 (PyroE)	1.67 (PyroE)	413 (PyroE)	580.84 (PyroE)
Cretaceous	Cuttings	813	0.78 (PyroE)	1.86 (PyroE)	2.15 (PyroE)	1.25 (PyroE)	428 (PyroE)	132.80 (PyroE)
Cretaceous	Cuttings	813	0.62 (PyroE)	1.67 (PyroE)	1.93 (PyroE)	1.25 (PyroE)	431 (PyroE)	133.60 (PyroE)

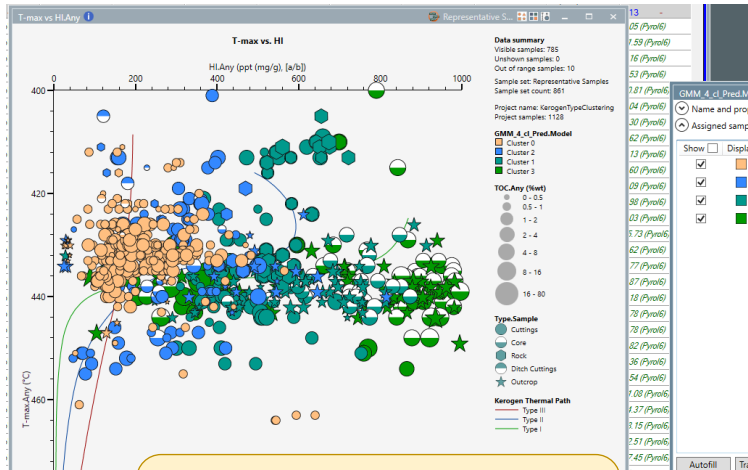
Define the data of interest in p:IGI+ using pages / sample sets, or send to the web UI as a csv file

Make sensible modelling choices using the tool UI

Model the data in the integrated machine learning tool



Bring the model results back into p:IGI+ for deeper interpretation and further use



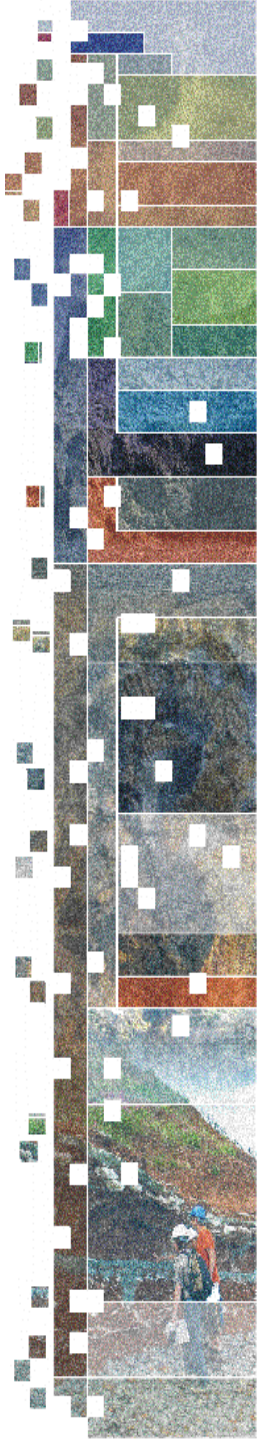
Manage the models in p:IGI projects, associated with the data used to train them

Currently have added support for regression and clustering, and working on classification



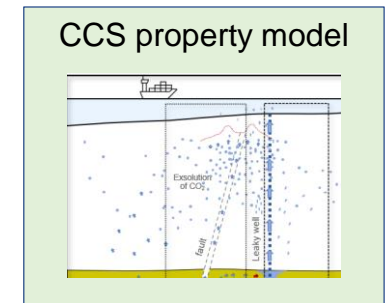
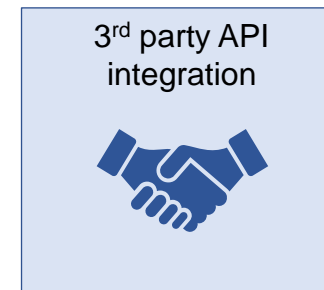
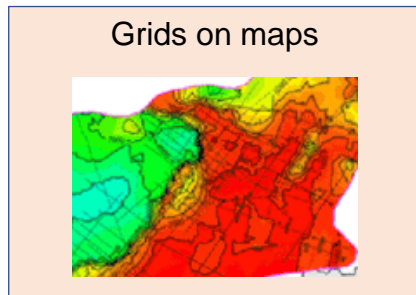
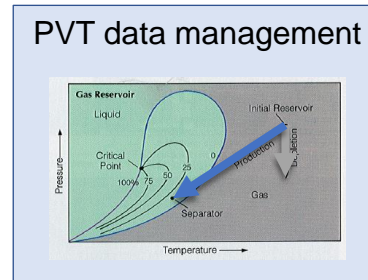
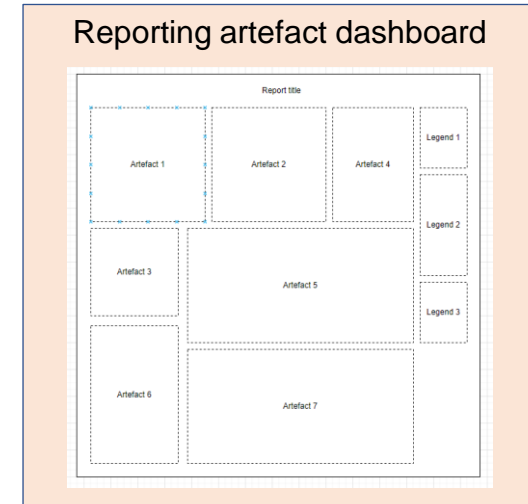
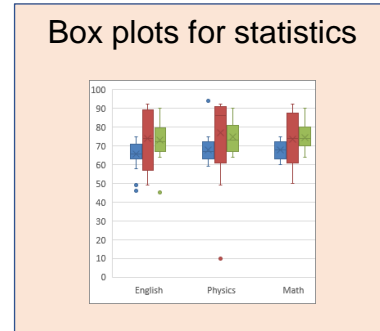
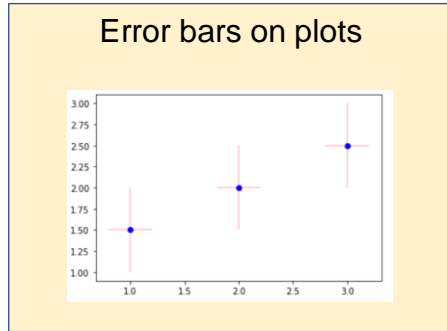
# User Group 2023: Preliminary outcomes

Tentative priorities for 2023/24




# Key features and functions requested

... in no particular order ...



# Next steps ...

- IGI is consolidating the outcomes from the user group – your input is welcome

 Contact us at: [support@igiltd.com](mailto:support@igiltd.com)

- Following from the user group we will compile a list of targets for the coming year
  - and share this with you
  - plus the video of this session and slides
- We plan to release version 2.3 of **p:IGI+** and Metis in **September 2023**
  - will include the features described earlier
    - plus updates to the **PVT property model**
  - and recognise that too frequent releases can cause issues for your IT
    - **ML tools** will be updated more frequently





# Thanks

Consolidated priorities for 2023 – 2024  
will be summarised shortly

... and we don't disappear after the user group – get in touch any time!

