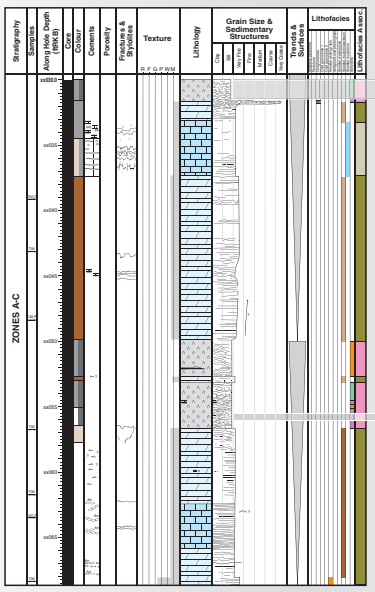
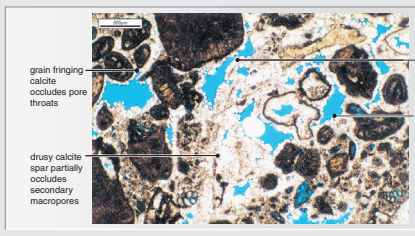
Carbonate Reservoir Characterisation

CORE SEDIMENTOLOGY



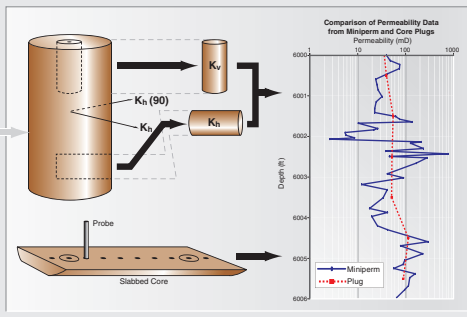
- Identification of key surfaces for correlation
- Calibration of lithofacies to openhole log responses
- Application of lithofacies to palaeoenvironmental interpretation
- Description of lithofacies focusing on:
  - Textures
  - Skeletal and non-skeletal allochems
  - Trace fossils
  - Sedimentary structures
  - Pore types
  - Diagenesis

PETROGRAPHIC ANALYSIS



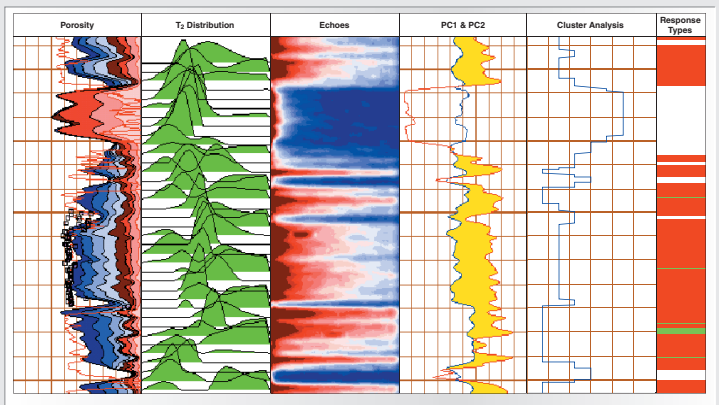
- Constrain textures and lithofacies defined in core
- Constrain allochem identification to enhance core-based environmental interpretation
- Expand description and interpretation of diagenetic overprint

ROUTINE AND SPECIAL CORE ANALYSIS (SCAL)

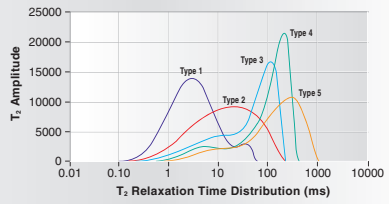


- Definition of appropriate sampling and analytical techniques maximises data value
- Extending routine core analysis through special core analysis procedures including: capillary pressure, minipermeametry, relative permeability, wettability, saturation, *etc.*
- Integrating sedimentological and core analysis data to produce geologically realistic reservoir models
- Enhancing production through accurate prediction of reservoir characteristics

NMR FLOW UNIT CHARACTERISATION†

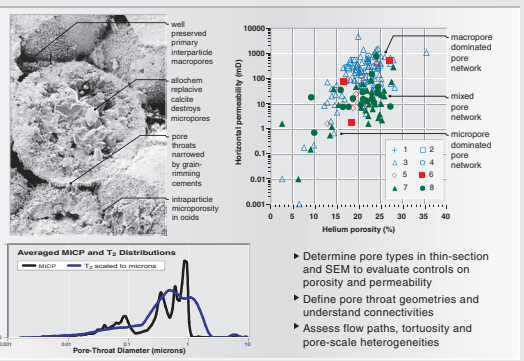


- Integration with sedimentology, pore-scale and borehole image observations
- Calibration of flow unit properties in uncored intervals



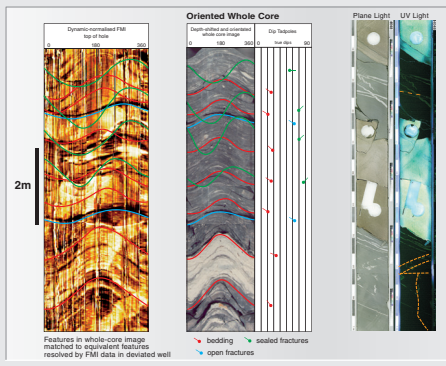
† *In conjunction with ResLab ART*

POROSITY AND PERMEABILITY ANALYSIS



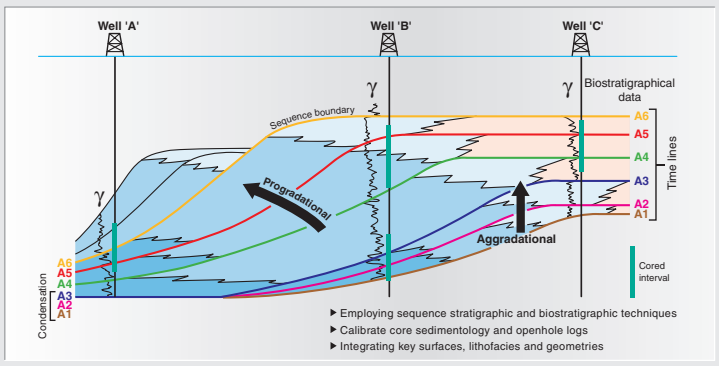
- Determine pore types in thin-section and SEM to evaluate controls on porosity and permeability
- Define pore throat geometries and understand connectivities
- Assess flow paths, tortuosity and pore-scale heterogeneities

FRACTURES FROM CORE AND BOREHOLE IMAGES



- Core and borehole images give different but complimentary information
- Core gives information on fracture fill (*eg.* cement, clay smear), but borehole image data can reveal if fractures are open (fluid pathways) or cemented (fluid barriers)
- Borehole images also reveal the relationship of fractures to stress fields

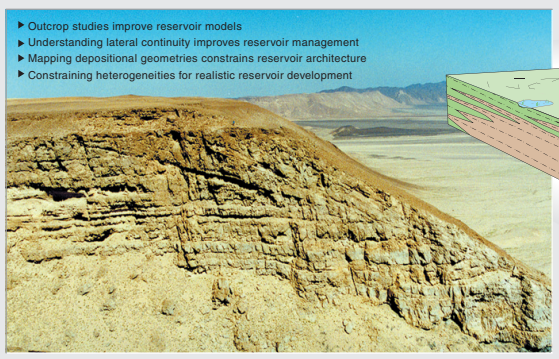
STRATIGRAPHIC CORRELATION



- Employing sequence stratigraphic and biostratigraphic techniques
- Calibrate core sedimentology and openhole logs
- Integrating key surfaces, lithofacies and geometries

OUTCROP STUDIES

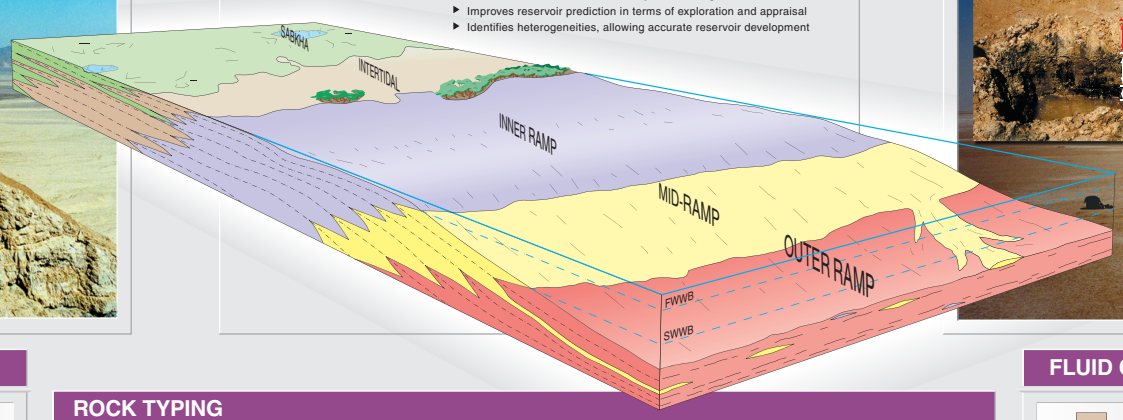
- Outcrop studies improve reservoir models
- Understanding lateral continuity improves reservoir management
- Mapping depositional geometries constrains reservoir architecture
- Constraining heterogeneities for realistic reservoir development



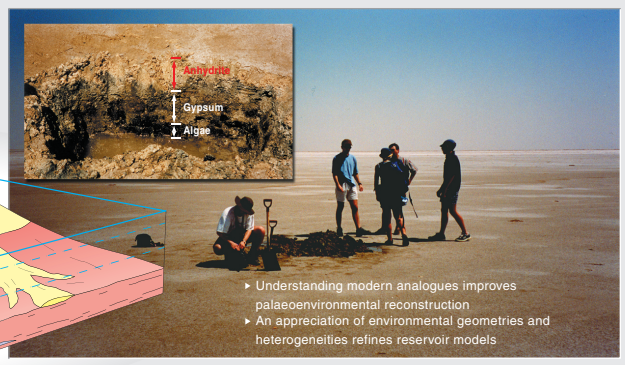
DEPOSITIONAL MODEL

An understanding of depositional environments:

- Predicts facies distributions thereby constraining reservoir architecture
- Improves reservoir prediction in terms of exploration and appraisal
- Identifies heterogeneities, allowing accurate reservoir development

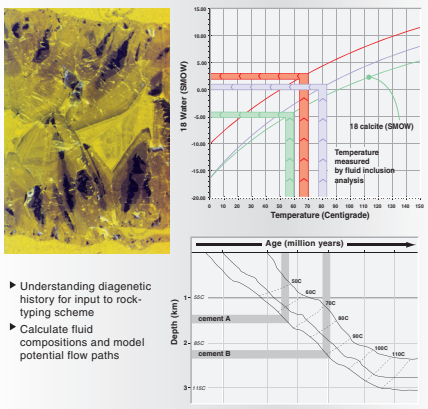


RECENT ANALOGUES



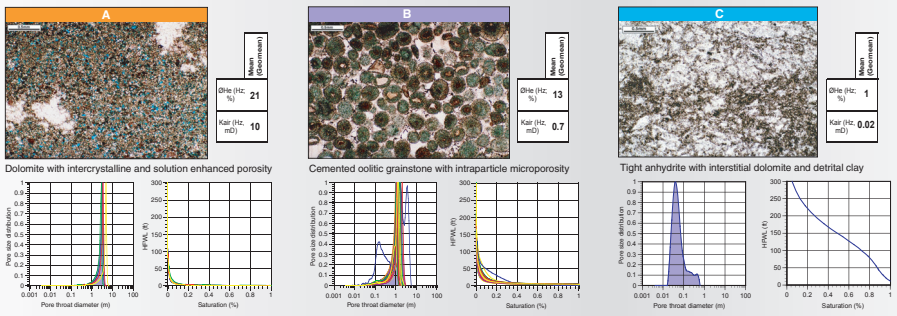
- Understanding modern analogues improves palaeoenvironmental reconstruction
- An appreciation of environmental geometries and heterogeneities refines reservoir models

DIAGENETIC ANALYSIS



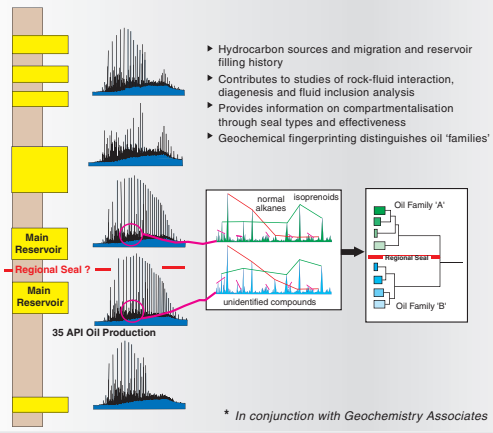
- Understanding diagenetic history for input to rock-typing scheme
- Calculate fluid compositions and model potential flow paths

ROCK TYPING



- Identifies rock units with similar petrophysical properties from petrographic and core analysis data sets
- Applied to openhole logs to aid reservoir quality prediction in uncored intervals
- Used to predict reservoir permeability architecture
- Upscaled for input into 3D reservoir models

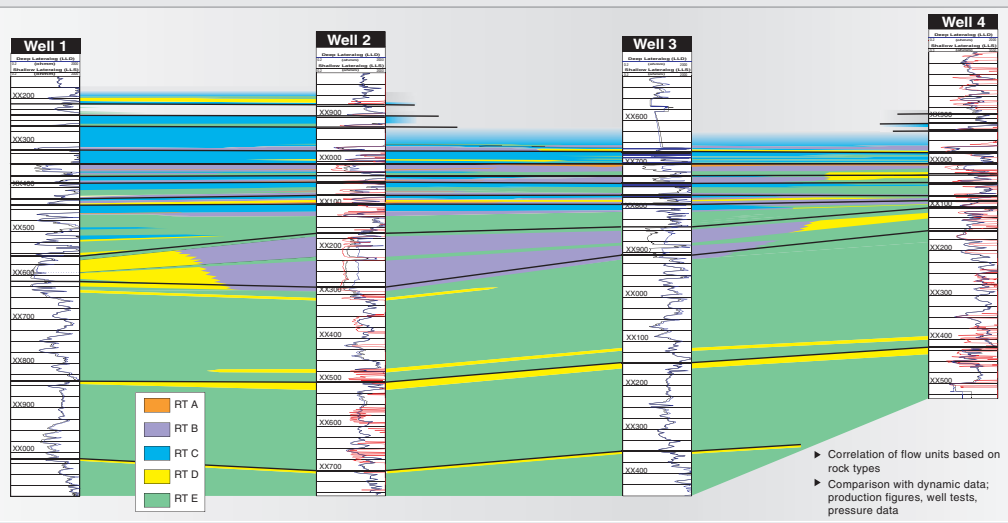
FLUID CHARACTERISATION*



- Hydrocarbon sources and migration and reservoir filling history
- Contributes to studies of rock-fluid interaction, diagenesis and fluid inclusion analysis
- Provides information on compartmentalisation through seal types and effectiveness
- Geochemical fingerprinting distinguishes oil 'families'

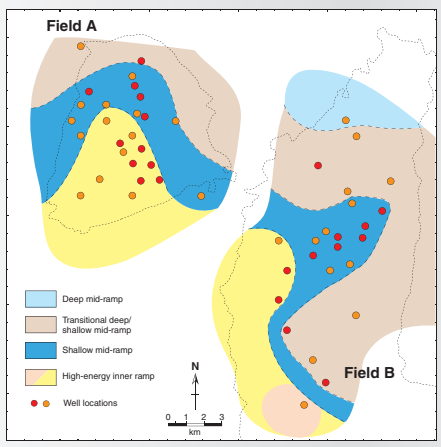
* *In conjunction with Geochemistry Associates*

RESERVOIR LAYERING



- Correlation of flow units based on rock types
- Comparison with dynamic data; production figures, well tests, pressure data

RESERVOIR MAPPING



- Structural, isopach, fluid contacts, saturations, volumetrics
- Reservoir properties: net-to-gross, porosity, permeability

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geo>graphics< Designed this product.

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