

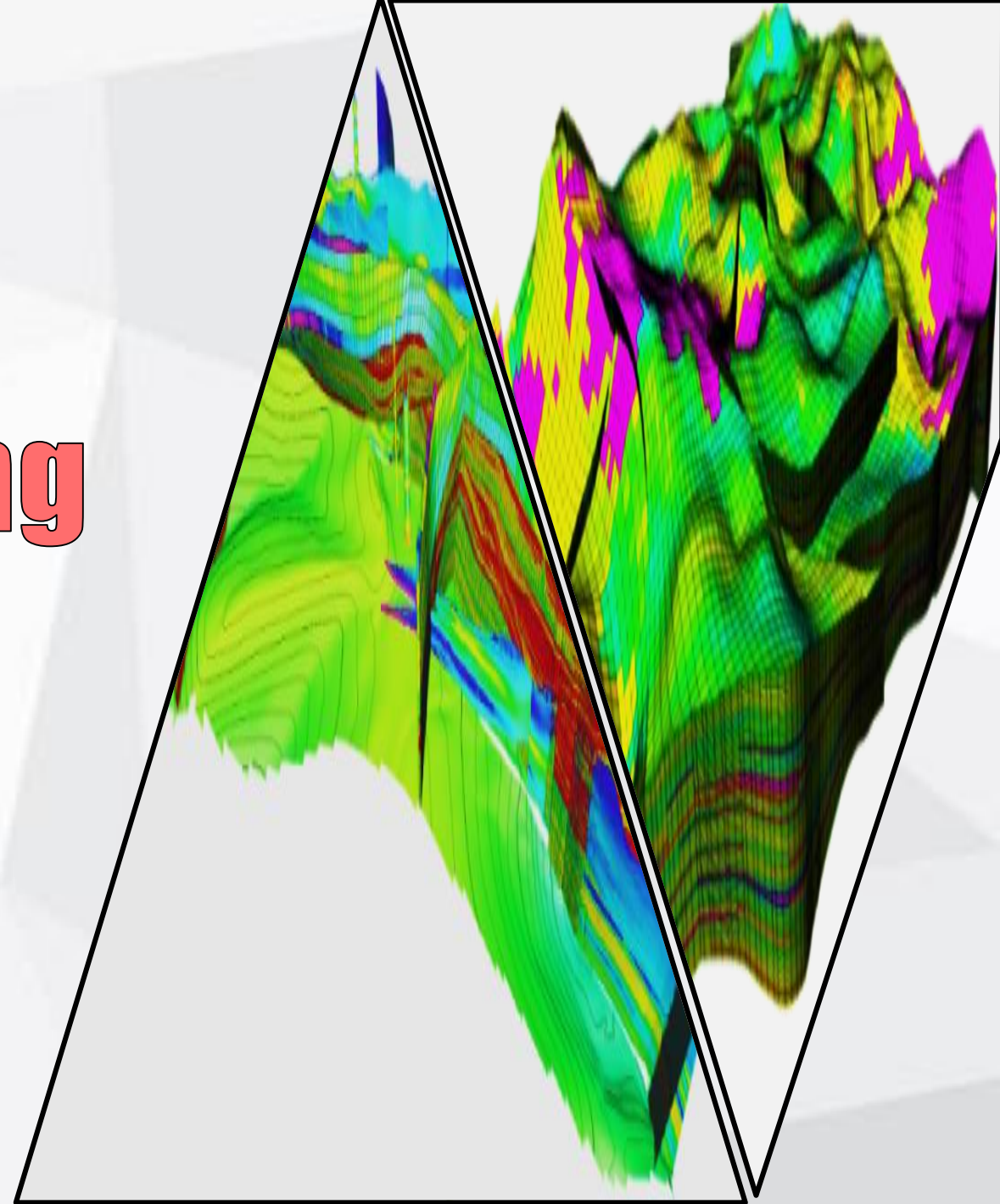


# Reservoir Modelling

## Data in Reservoir Modelling

Petroleum & Mining Engineering Collage/ Forth Year

Dr. Maha Muneeb



# Input Data

- Oil and gas reservoir modelling involves two broad classes of data:

**1 Static**  
core, well logs, and seismic interpretation

**2 Dynamic**  
pressure and fluid production observed at wells

Integration of dynamic data together with static data:

**1**

Enhances the quality of the reservoir models generated

**2**

Provides the reservoir engineers with a better basis for reservoir simulation and management

**STATIC**



**DYNAMIC**

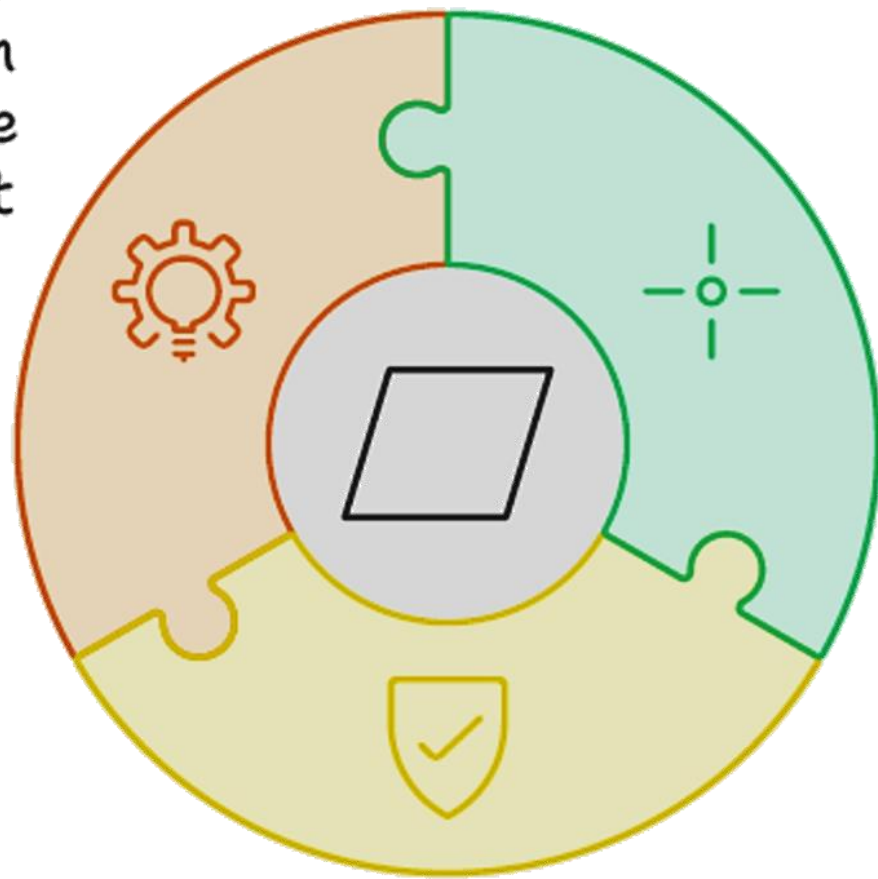


**VS**

## Benefits of Data Integration in Reservoir Modelling

Better Decision-Making in Resource Management

Improved Accuracy in Predictions



Enhanced Risk Assessment

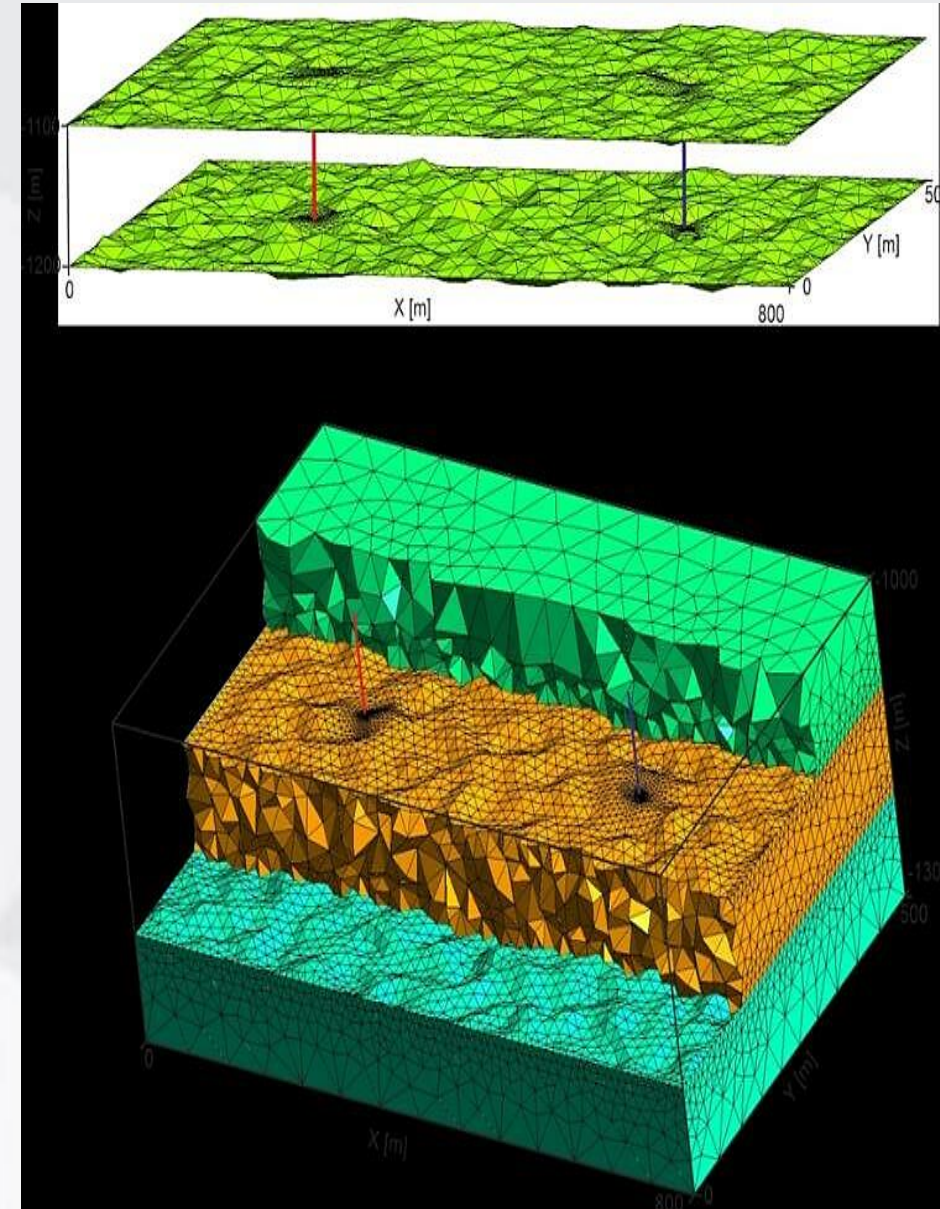


# Data Required to Define the Geometry of A Reservoir Model

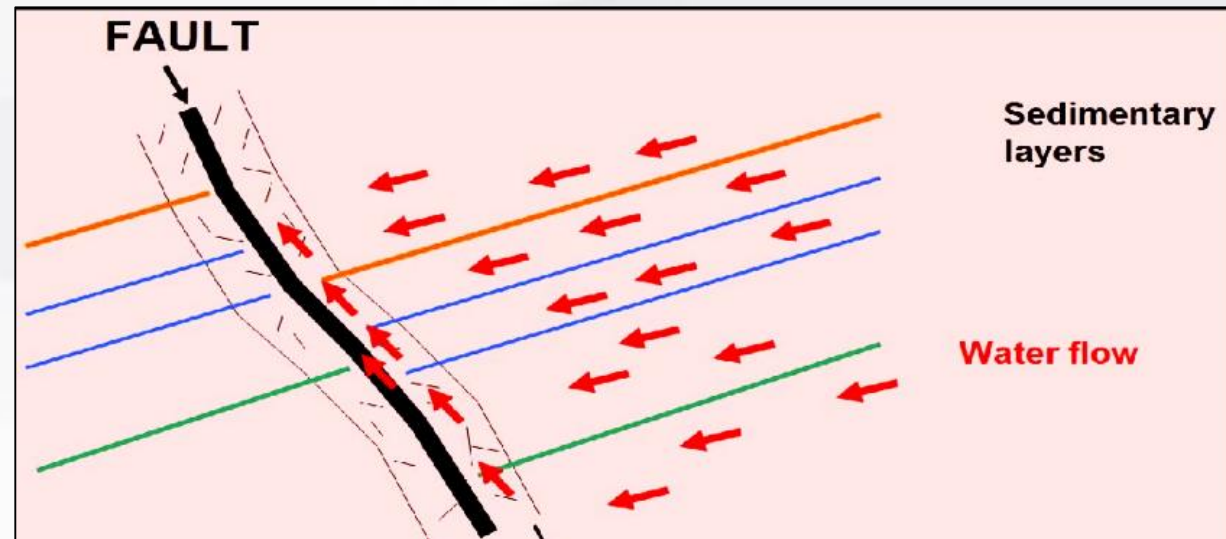
- a polygon that delineates the **lateral extension of the model**
- the **top and base surfaces of the reservoir**, which define the vertical positions and thickness of the model.
- **intermediate surfaces** may be required to define the internal stratigraphic architecture of the model

## Note

The bounding and intermediate surfaces can be from seismic interpretations and/or mapped from the formation markers at wells, typically derived from stratigraphic correlations.

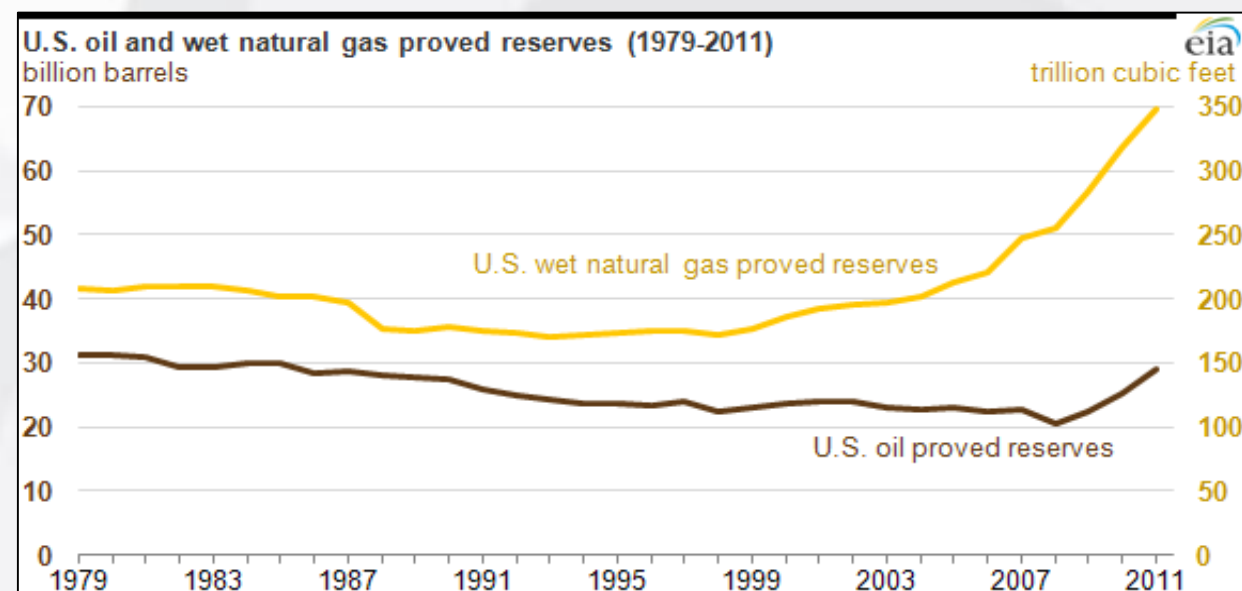


- **Faults** are usually obtained from the interpretation of **seismic data**.



- **Petrophysical properties** model data, are generally obtained from petrophysical analysis of **well logs and cores**

- **Dynamic data** include production data measured at wells, **such as pressures and liquid and gas production rates**.

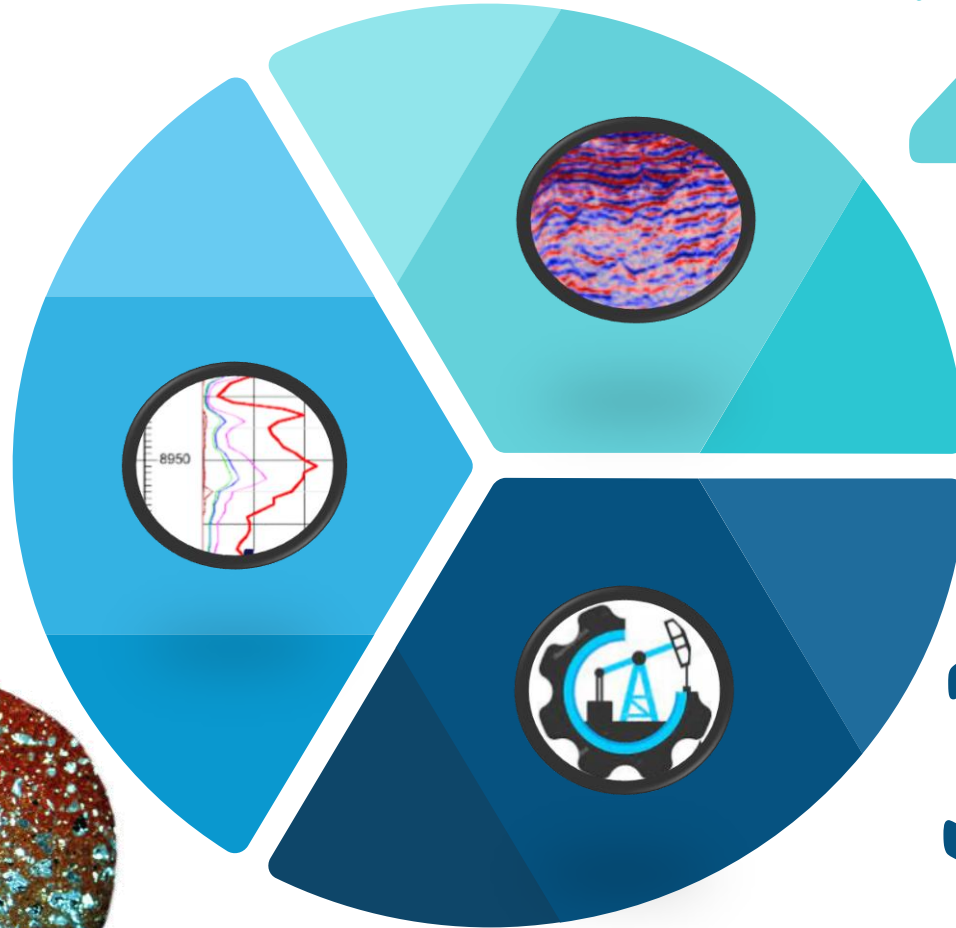
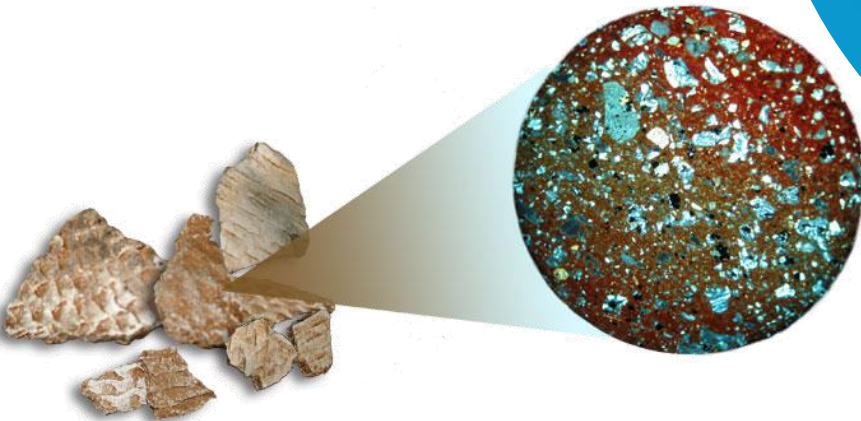


# Data Collection and Management

## 1 Well Data

Cores, Well Logs, Cuttings

- log data at 15 cm
- and petrographic data  $<1\ \mu$



## 2 Seismic Data

provide valuable information on large-scale reservoir geometry.

Resolution between 10 and 50 m depending on

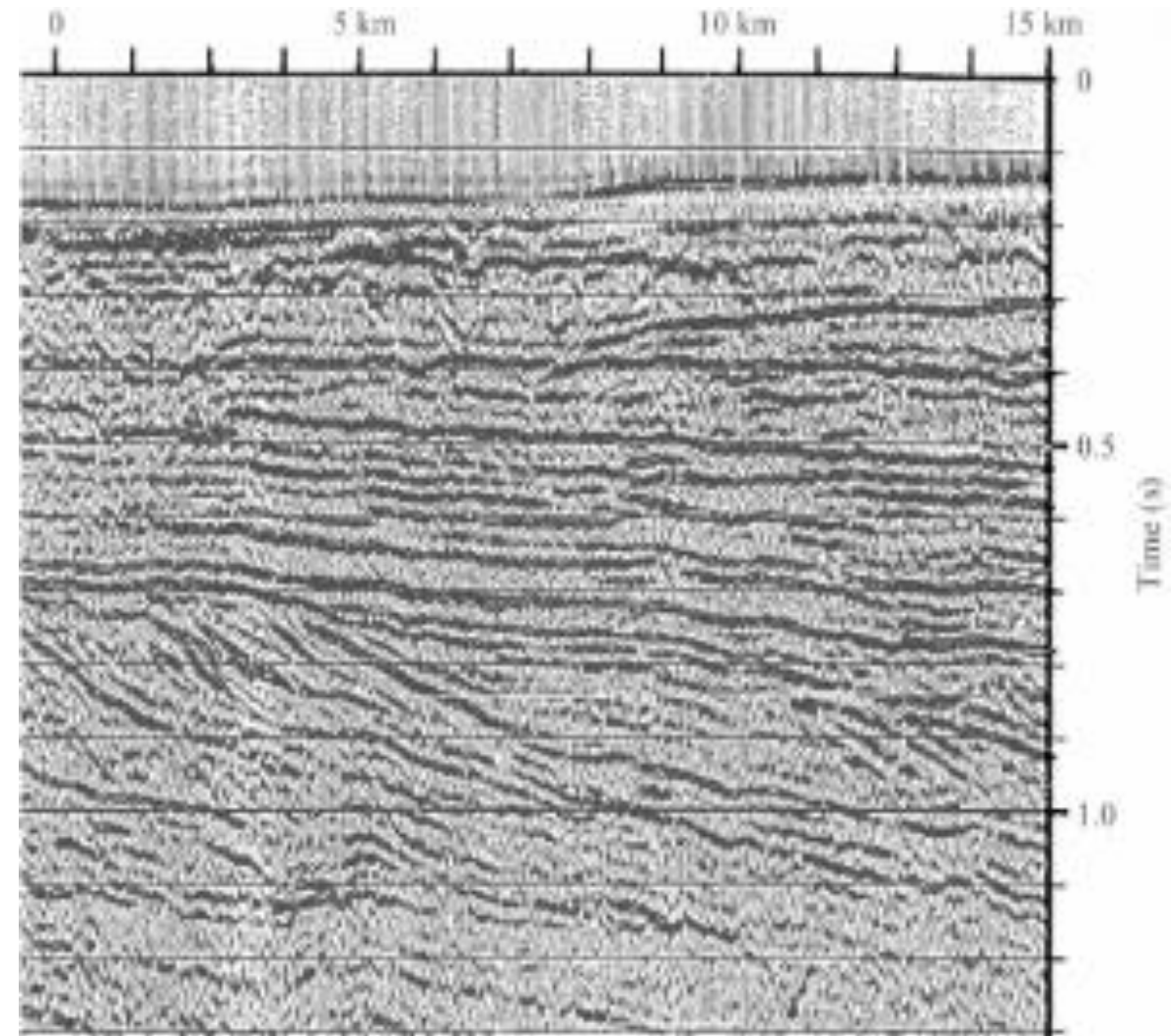
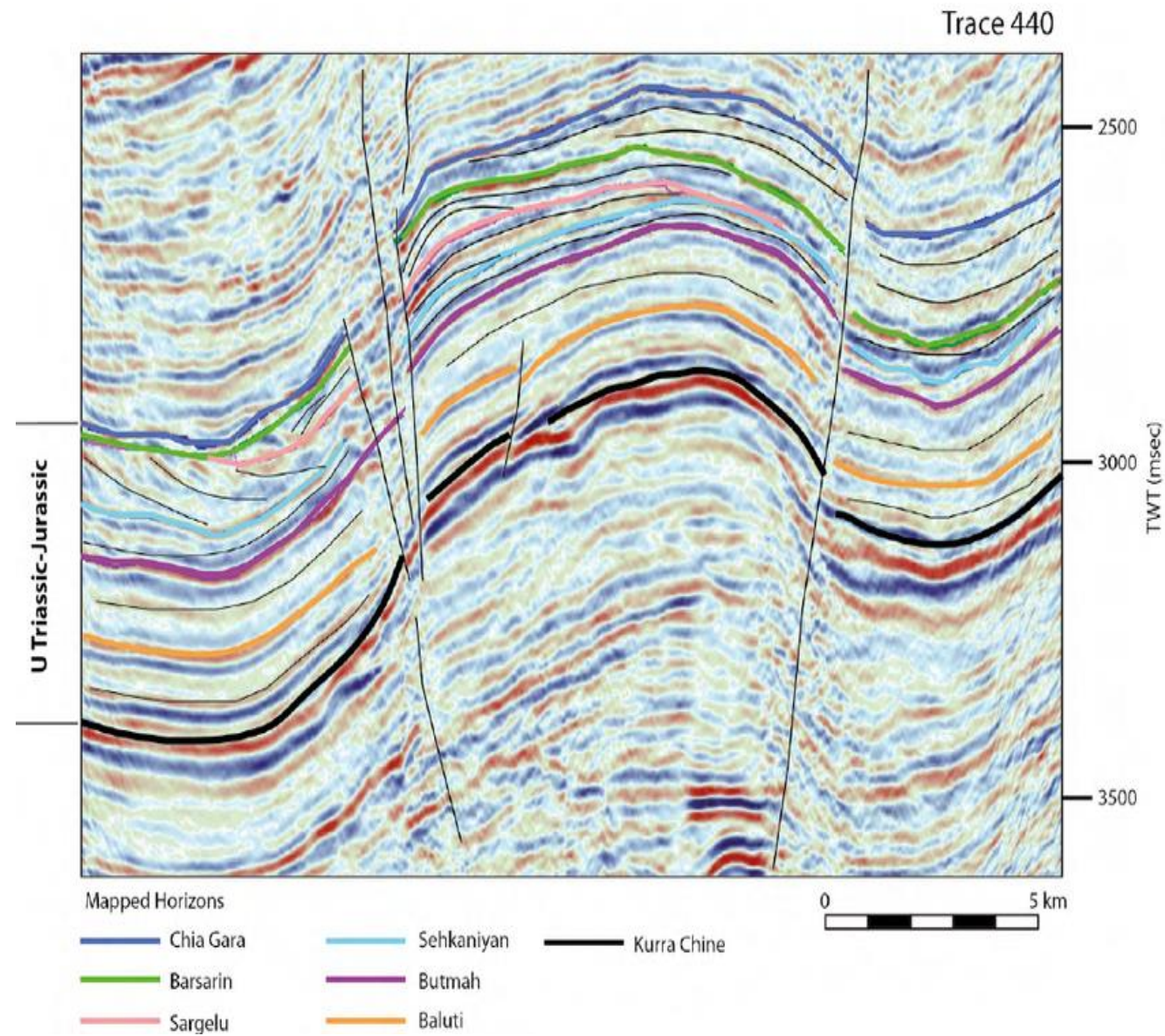
- the quality of the data
- the complexity of the overburden

## 3 Dynamic Data

well tests, historical production



# Seismic Section



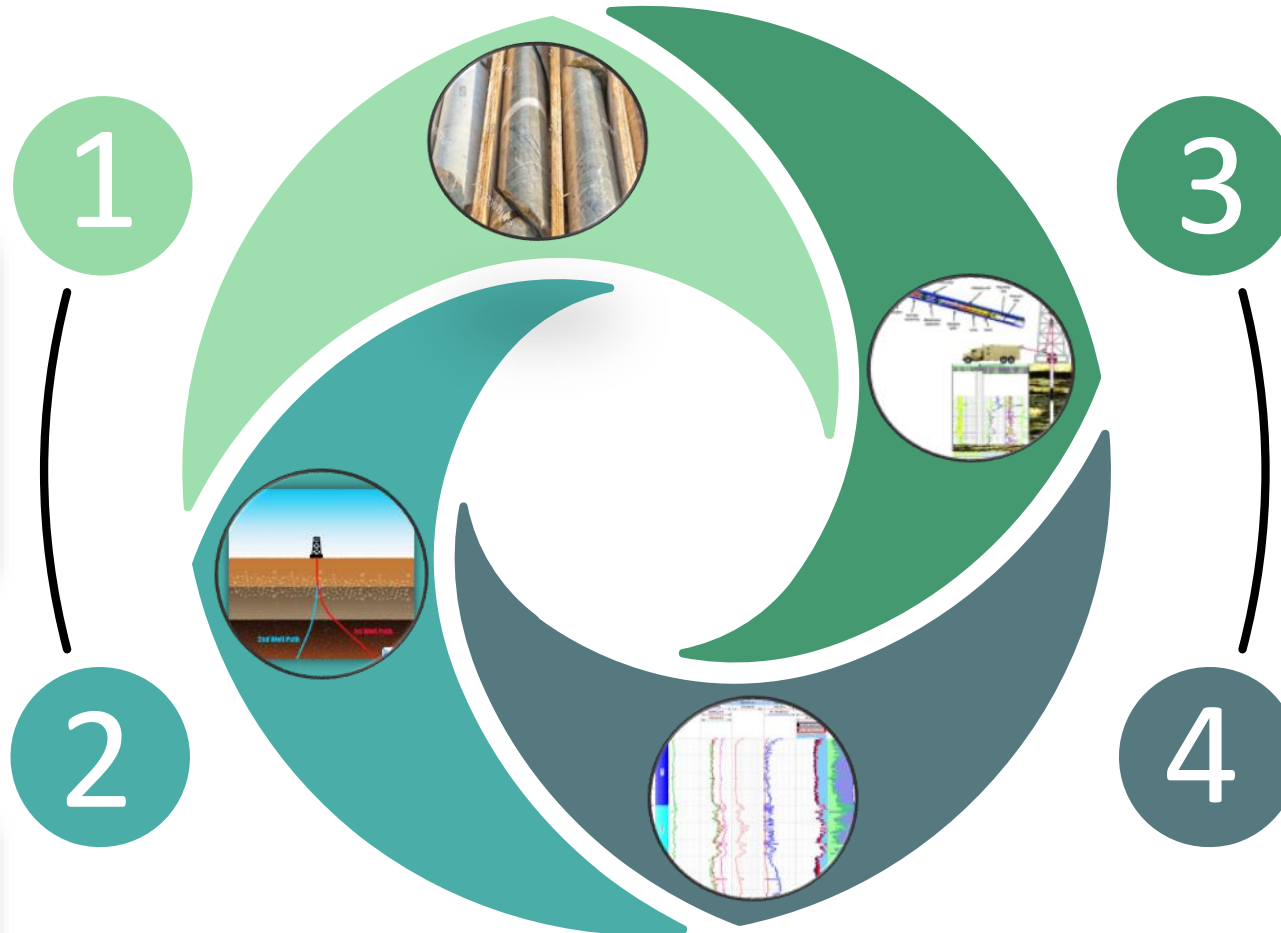
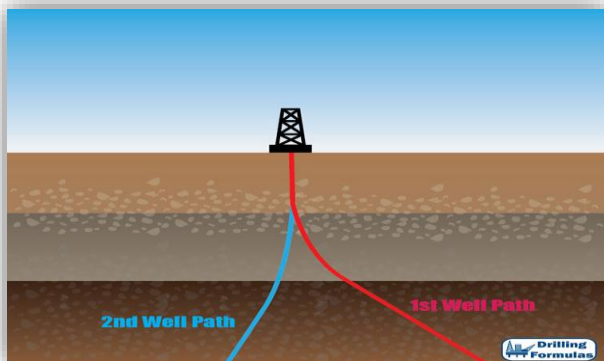


# Well Data

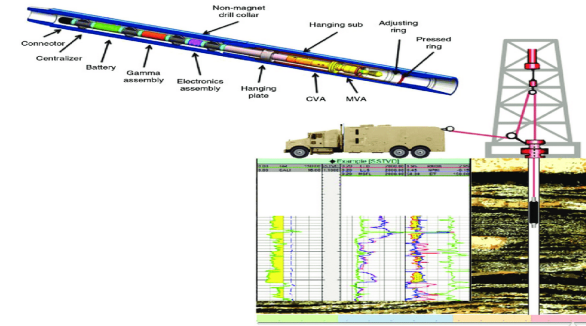
Core Data



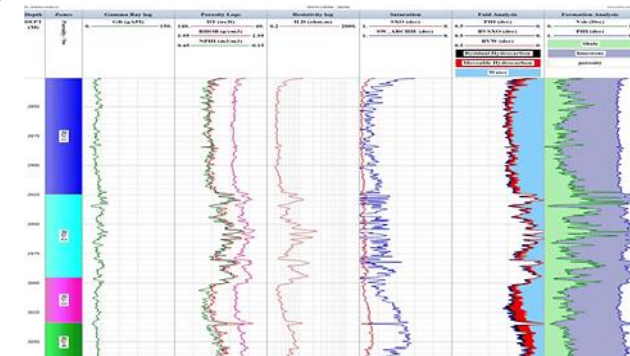
Wellbore Path



Wireline and MWD/MWD



CPI logs



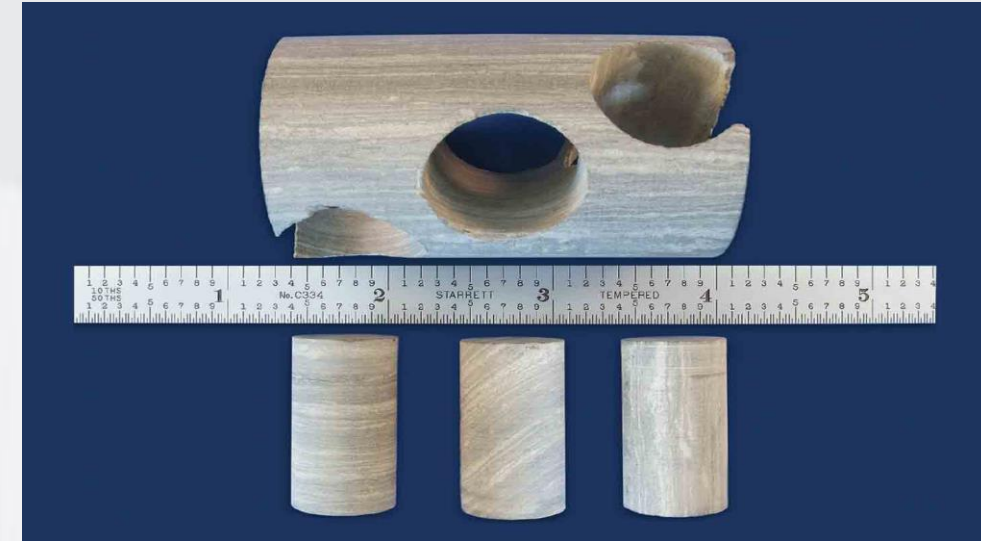


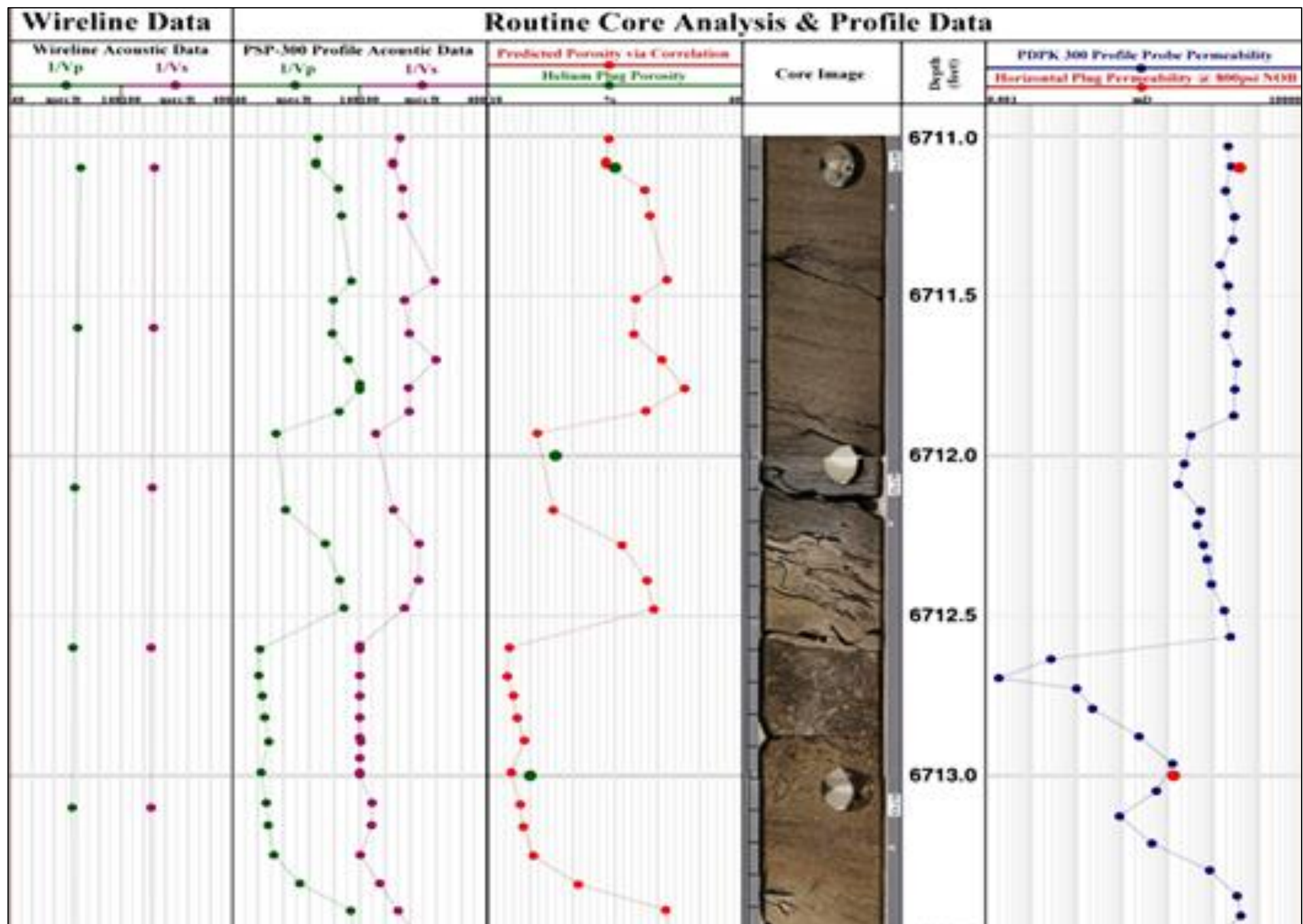
# Core Data

- ▶ core plugs
- ▶ entire sections of core

Core derived data give us information detailed about

- ▶ **Geological analysis** (Sedimentology, petrography, environment of deposition).
- ▶ **Petrophysical properties** (porosity and permeability, rock density, fluid Show).





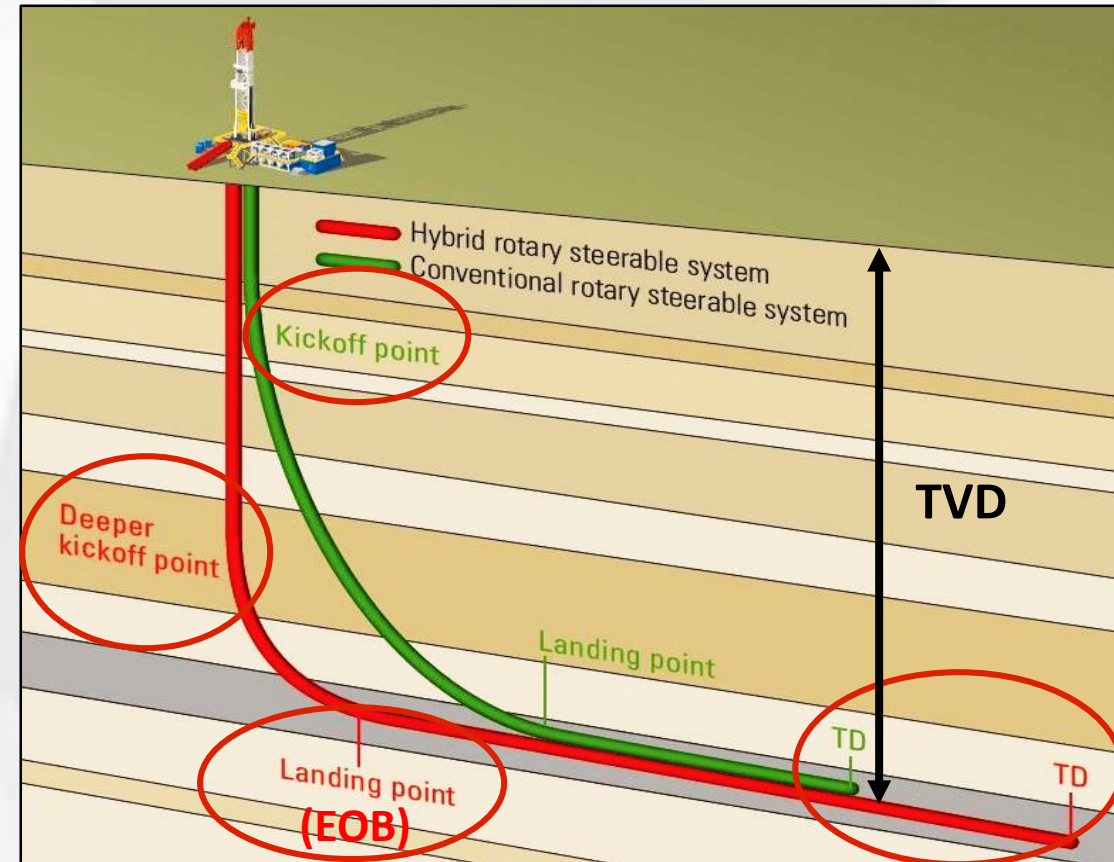
# Wellbore Path:

*Wellbore path* is the trajectory of a directionally drilled well in three dimensions.

(Directional drilling is the methodology for directing a wellbore along a predetermined trajectory to a target.

Vertical wells are usually defined as wells with an inclination within  $5^\circ$ .

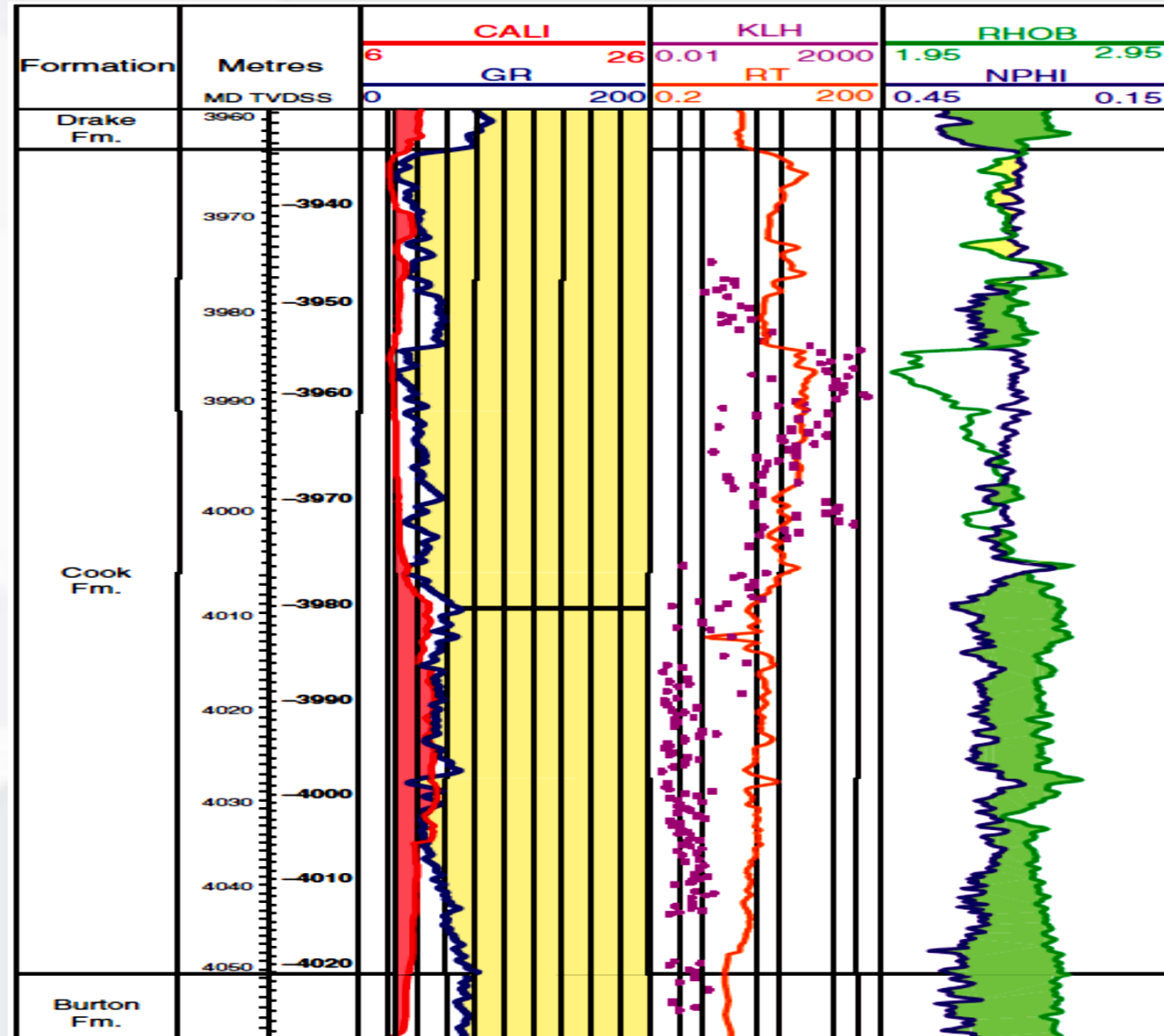
Wells with a section having an inclination greater than  $85^\circ$  for a significant distance are called Horizontal wells





# Wireline Logs and MWD/LWD Logs

Provide a continuous high-resolution record of accurate information on stratigraphic surfaces, measurements of petrophysical properties such as facies types,  $\phi$ , and, perhaps,  $k$  measurements



LOCATION: Iraq  
SCALE: 1:4000

OPERATOR: I.P.C.

Co-ordinates:  
GRID

1,106,250 N.

1,641,450 E.

KBL: 16m

STATUS: PLUGGED & ABANDONED  
WITH OIL AND GAS SHOWS



Commenced: 30/5/1960

Finished: 9/9/1961

TOTAL DEPTH: 4125m

SUMMARY OF STRATIGRAPHIC BREAKDOWN

S - 91m: AL LUVIUM  
91m - 1205m: UPPER FARS  
1205m - 1645m: LOWER FARS  
1645m - 1676m: GHAR  
1676m - 1712m: BAJAWAN  
1712m - 1779m: BABA  
1779m - 1810m: TARJIL  
1810m - 1834m: PALANI  
1834m - 1961m: DAMMAM  
1961m - 2139m: UMM ER RADHUMA  
2139m - 2370m: AALIJI  
2370m - 2490m: SHIRANISH  
2490m - 2609m: HARTHA  
2609m - 2762m: SA'DI

2762m - 2776m: TANUMA  
2776m - 2839m: KHASIB  
2839m - 3236m: MISHRIF/FAHAD  
3236m - 3248m: AHMADI  
3248m - 3501m: MAUDDUD  
3501m - 3662m: NAHR UMR  
3662m - 3788m: SHUAIBA  
3788m - 4106m: ZUBAIR  
4106m - 4125m: RATAWI

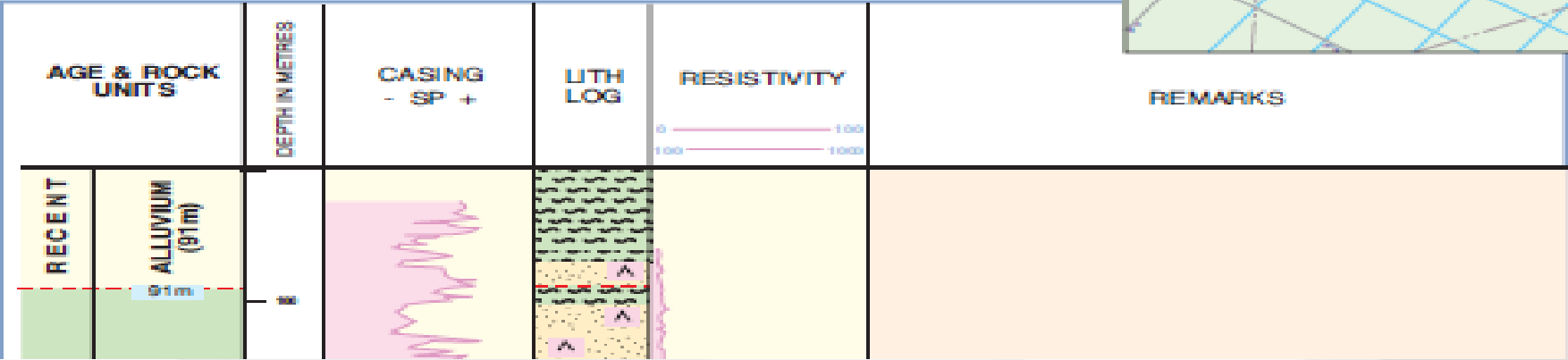
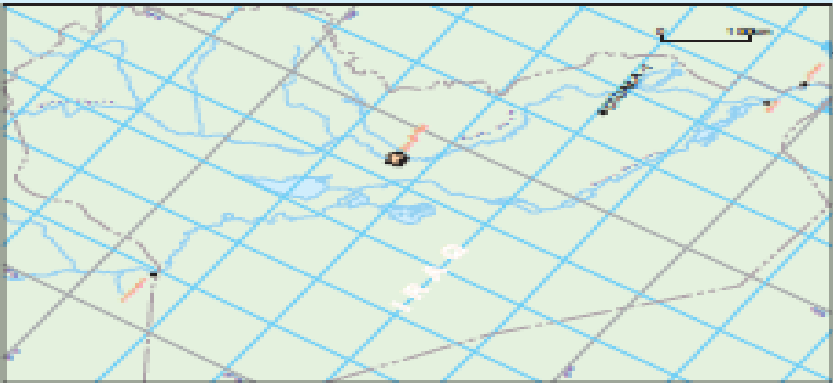
OBJECTIVE: Stood on a weak seismic closure in proximity to a gravity anomaly in a hitherto undrilled district bordering the marshes.

RESULTS: Reached a greater depth (4125m) than any other previous Iraq well. Formations were nevertheless not as deep as expected. Oil indications were noted in the Sa'di, Fahad, Nahr Umr and Zubair; and gas in the Sa'di and Zubair. A test of the Fahad produced emulsion.

PRESENT STATUS: Plugged and abandoned.

LEGEND

Sandstone		Calcareous/thickly limestone		Oolitic		Dolomitic	
Conglomerate		Anhydrite/gypsum		Reefal		Siltified	
Shale/clay		Hallite		Glaucanite		Marly	
Silty shale		Igneous rock		Mica		Cherty	
Sandy shale		Basement		Pyrite		Tested Interval	
Marl		Coal/lignite		Fossils		Perforated Interval	
Siltstone		Pebbly		Carbonaceous		Perforated Interval cemented off	
Limestone		Sandy		Anhydritically siliceous		Unconformity	
Dolomite		Argillaceous		Ferruginous			
Dolomitic limestone		Silty		Calcareous/thickly			



# Computer-Processed Interpretation (CPI) Logs

