

# 3D Modeling for CO<sub>2</sub> Storage of the Unayzah Formation in Saudi Arabia

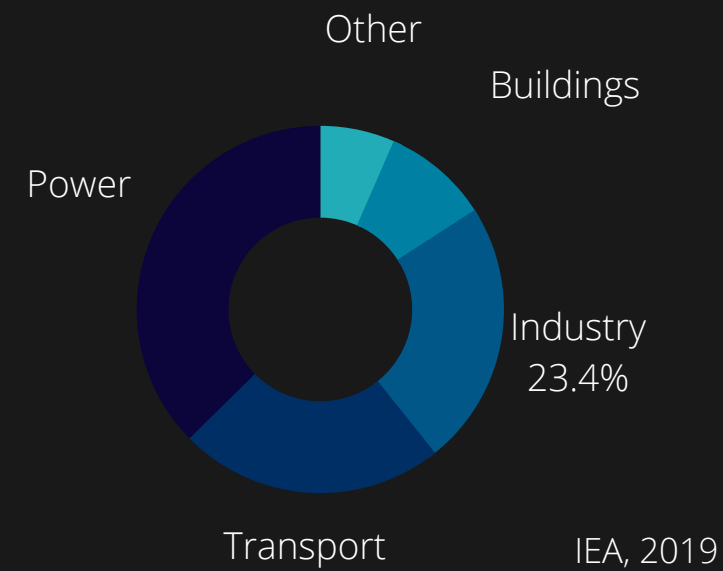
SOFIA MANTILLA SALAS

Visiting Research Student\*

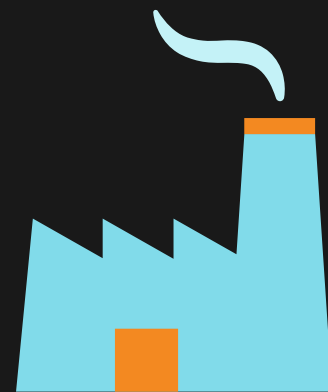
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Professor Hussein Hoteit\*  
Professor Abdulkader Alafifi\*

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King Abdullah University of Science and Technology

# Motivation



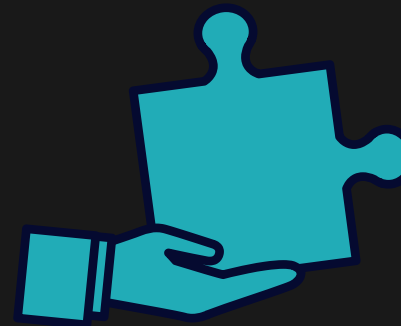
Global Warming  
Emissions



Best option to  
decarbonize



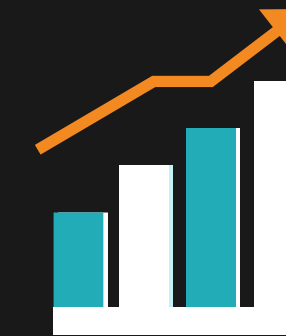
Energy - Development  
Relationship



Traditional Energy  
Skillset



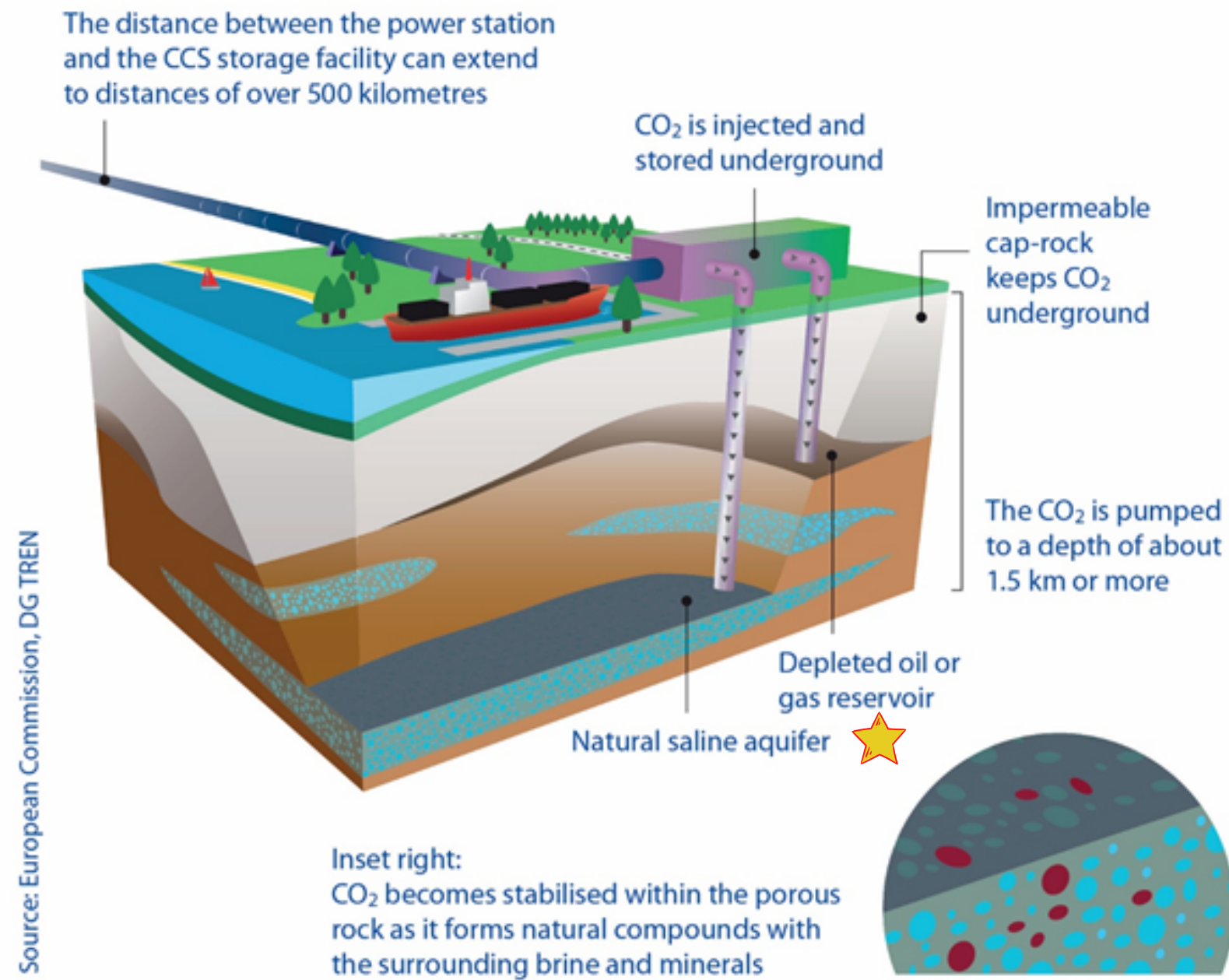
Climate Targets



Scale - Up

# Objective

## Carbon Capture and Storage (CCS)



## 3D Geological High-resolution Model of the Unayzah Formation as a Carbon Storage Reservoir



Reservoir architecture and heterogeneity  
Reservoir properties  
Key uncertainties and risks involved



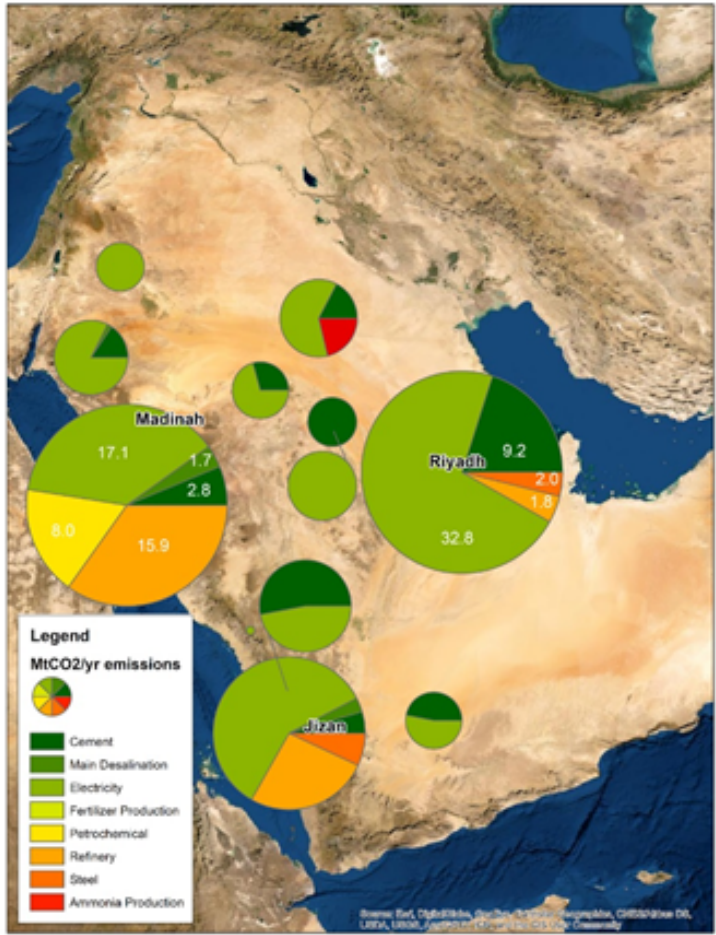
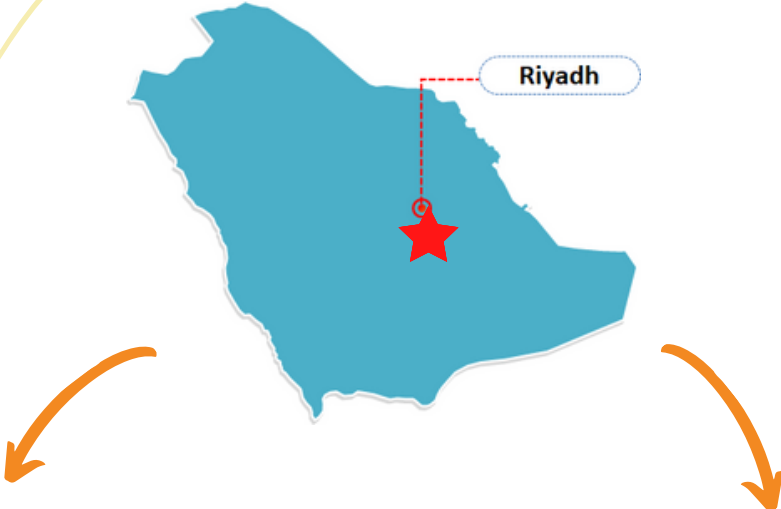
Accurate site selection  
Proper characterization



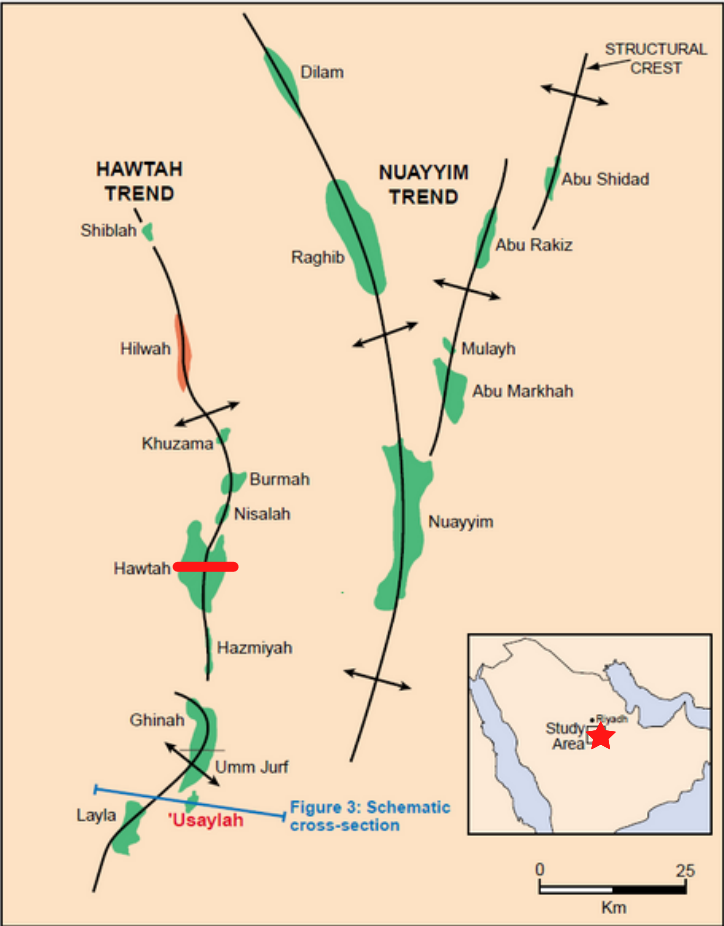
**Safe, efficient, and reliable storage**



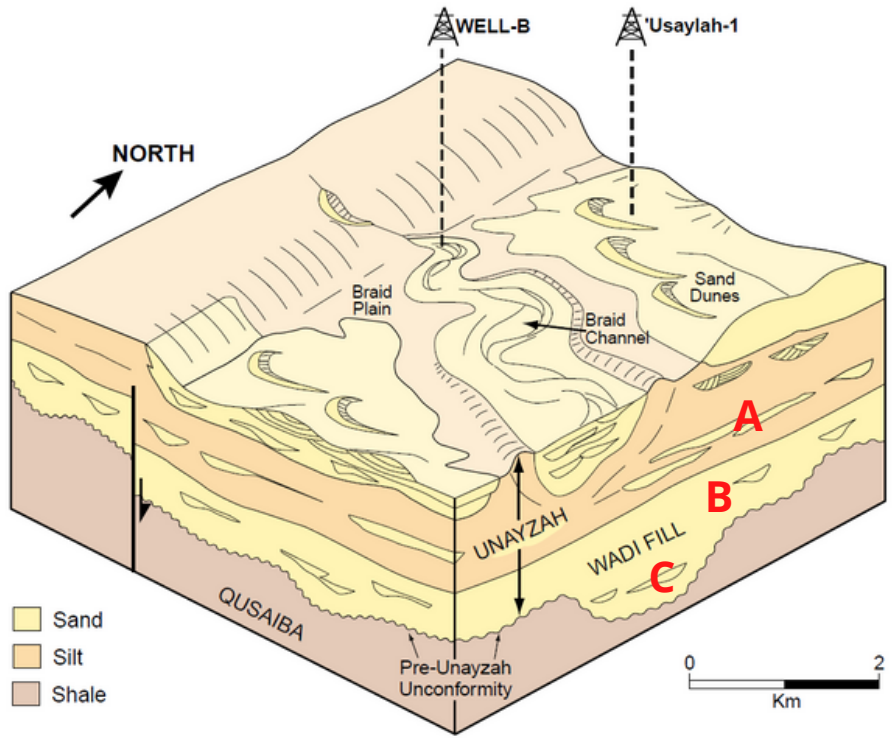
# Location & Geological Framework



ANPERC, 2020



Evans, 1997



## Unayzah Formation

### A Member

Sandstones and Siltstones  
Red Siltstones

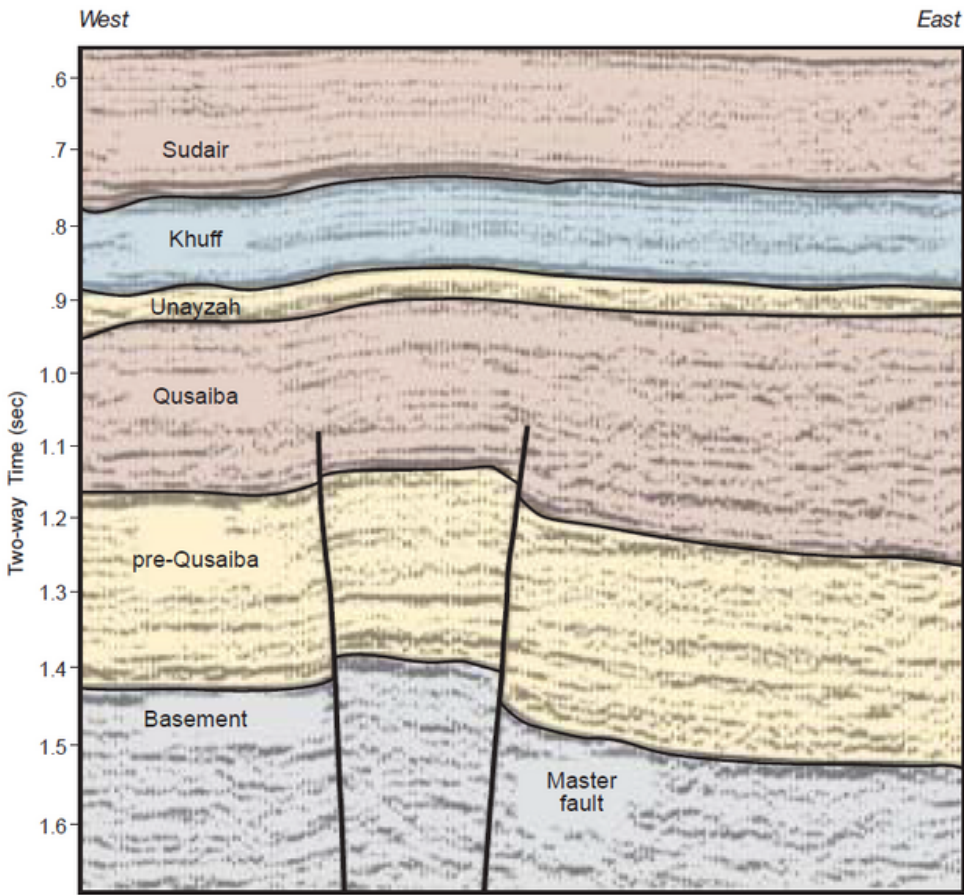
### B Member

Sandstones, diamictites and  
mudstones

### C Member

Sandstones with some  
conglomerates

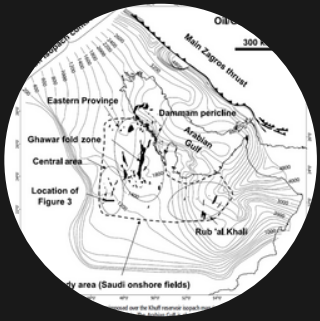
Fault - bounded  
blocks or folds



Al Hussein, 2004

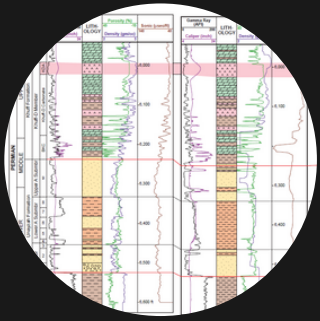


# Data & Methodology



Top / Base Formation  
Maps (digitized)

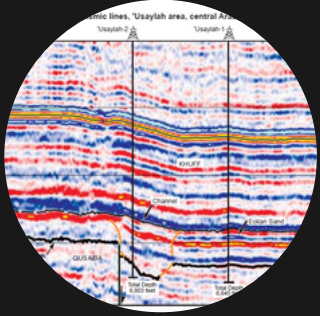
→ Surfaces



6 Well Logs (digitized)

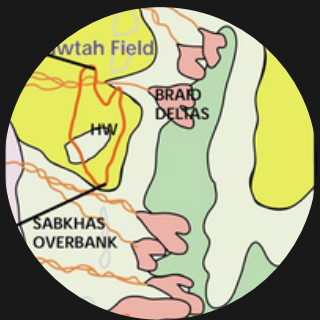
- Hawtah 1- 4 - 6
- NYM -2
- Usaylah- 1
- Jufarah - 1

→ Well tops  
and properties



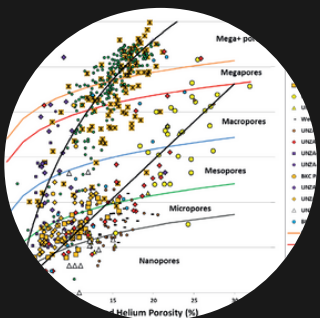
Published Seismic Lines  
and Structural Maps

→ Faults



Unayzah Facies Maps  
(digitized)

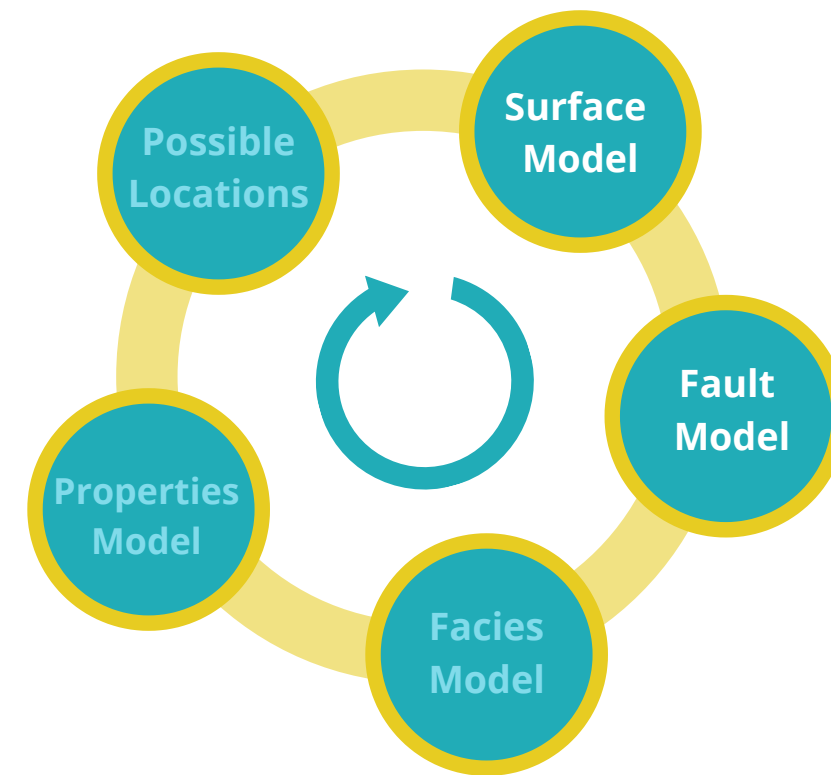
→ Facies Probability  
Trend Maps



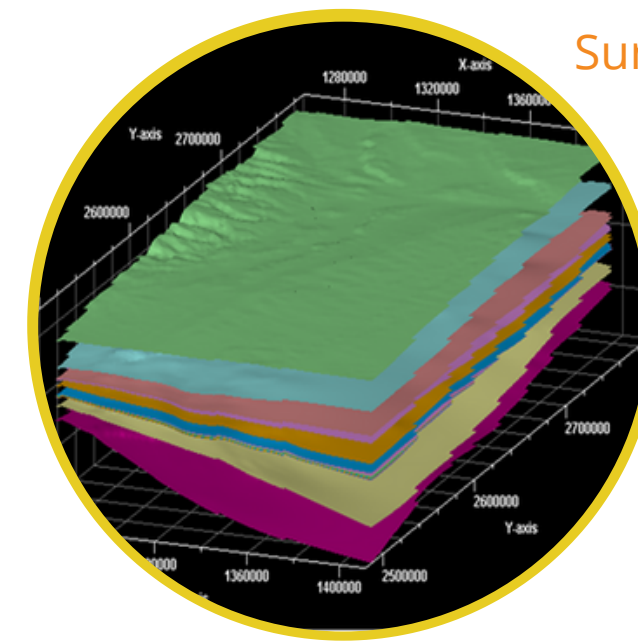
Porosity - Permeability  
Cross plots per Facies  
(digitized)

→ Properties

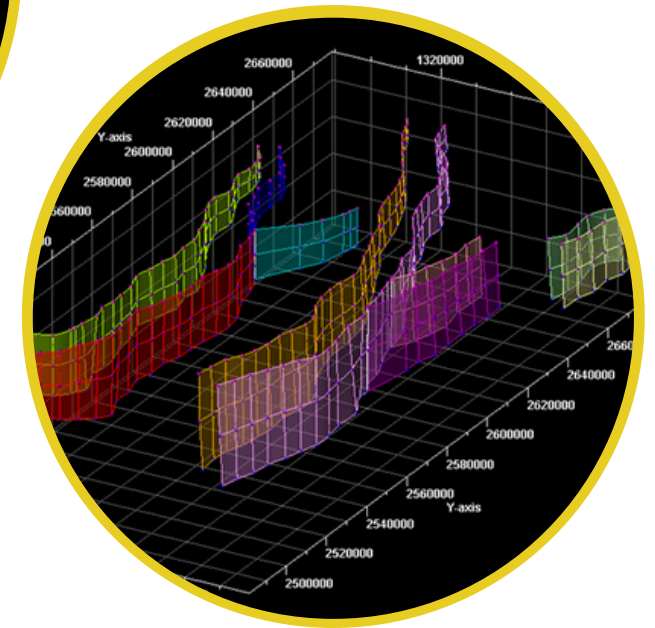
# CONTRIBUTIONS



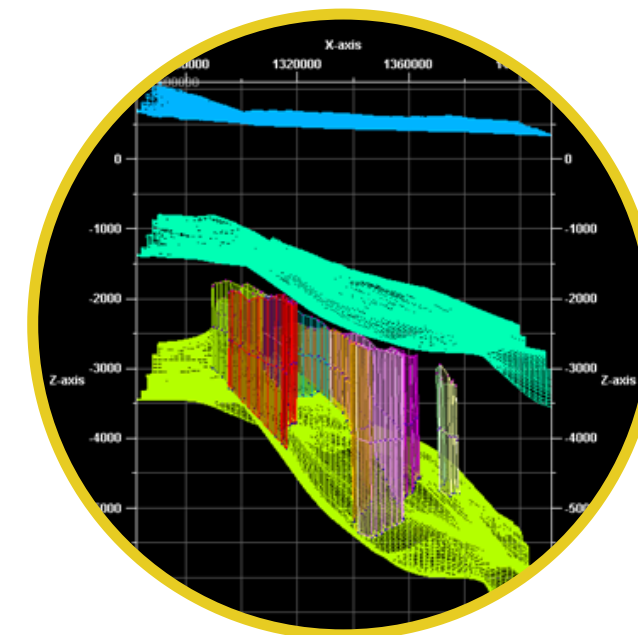
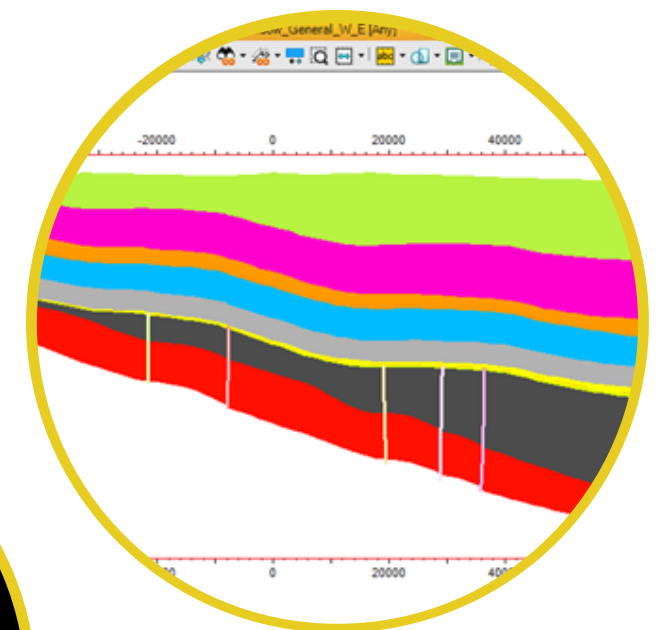
## Structural Model



Surfaces



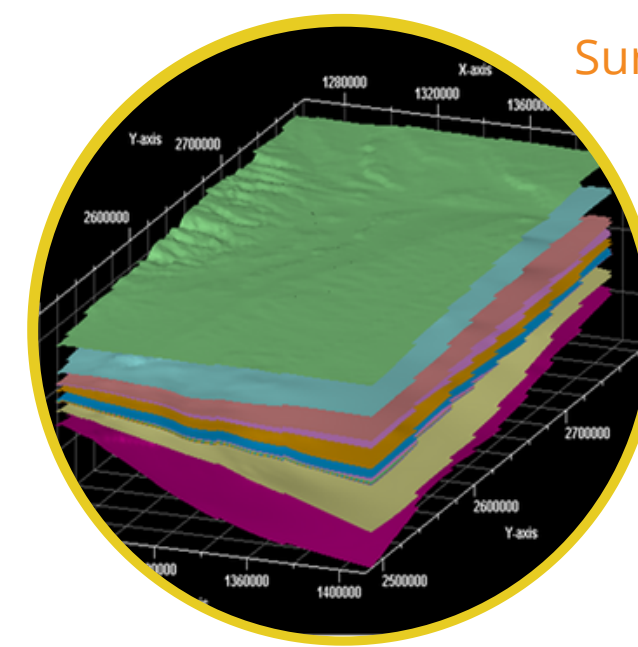
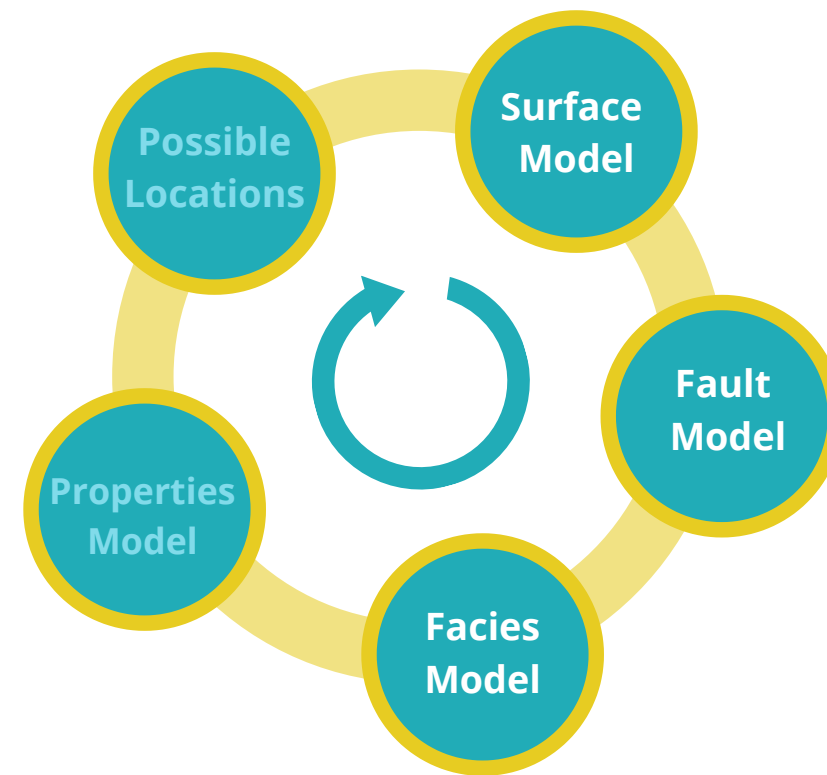
Faults



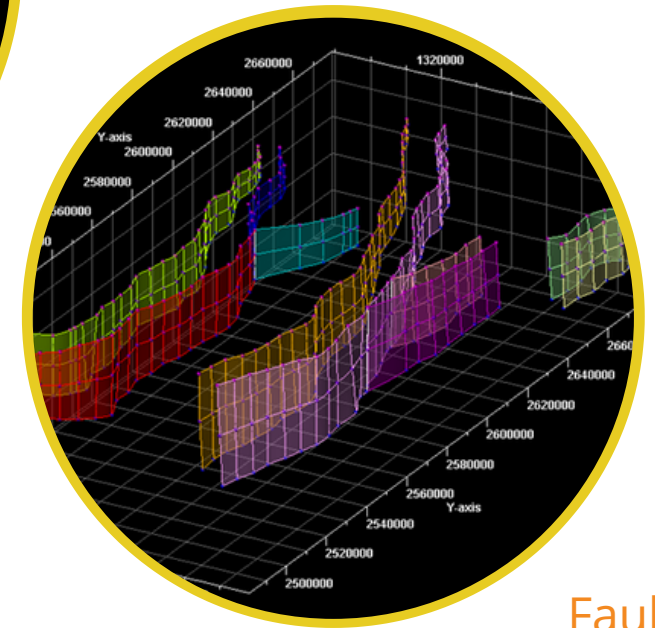
Grid



# CONTRIBUTIONS

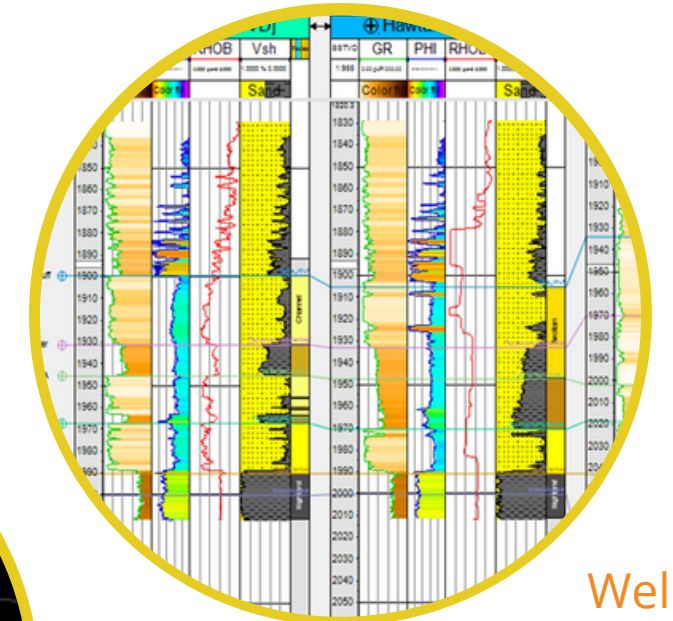


Surfaces

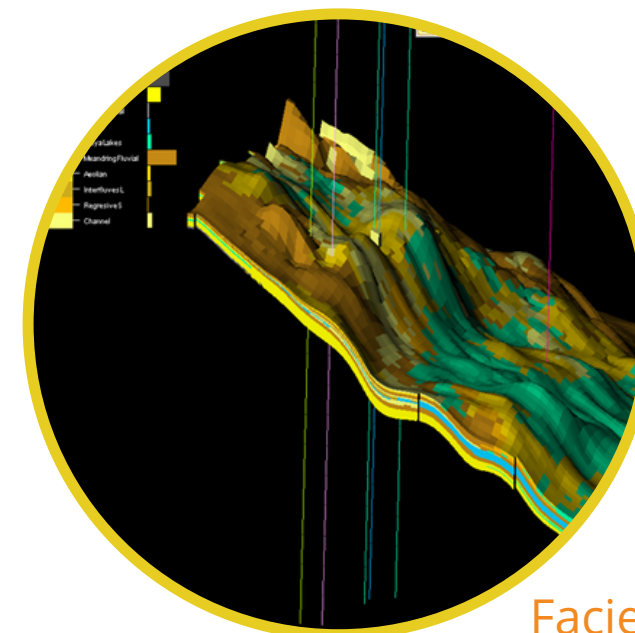


Faults

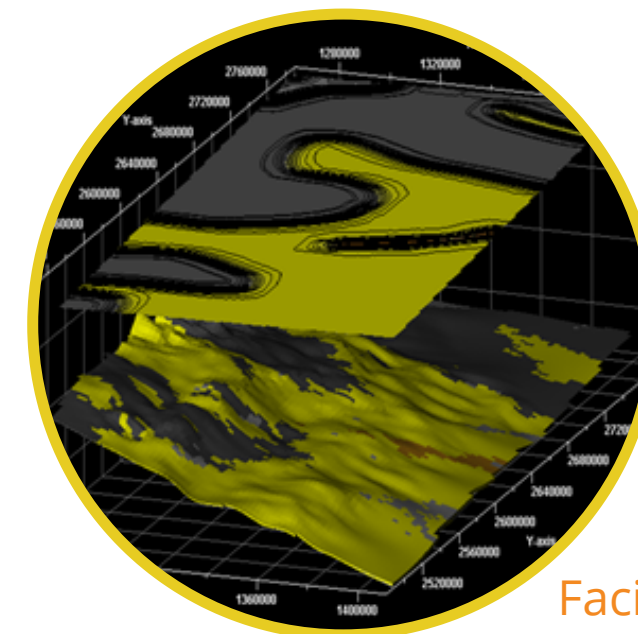
Facies Model



Well Correlation



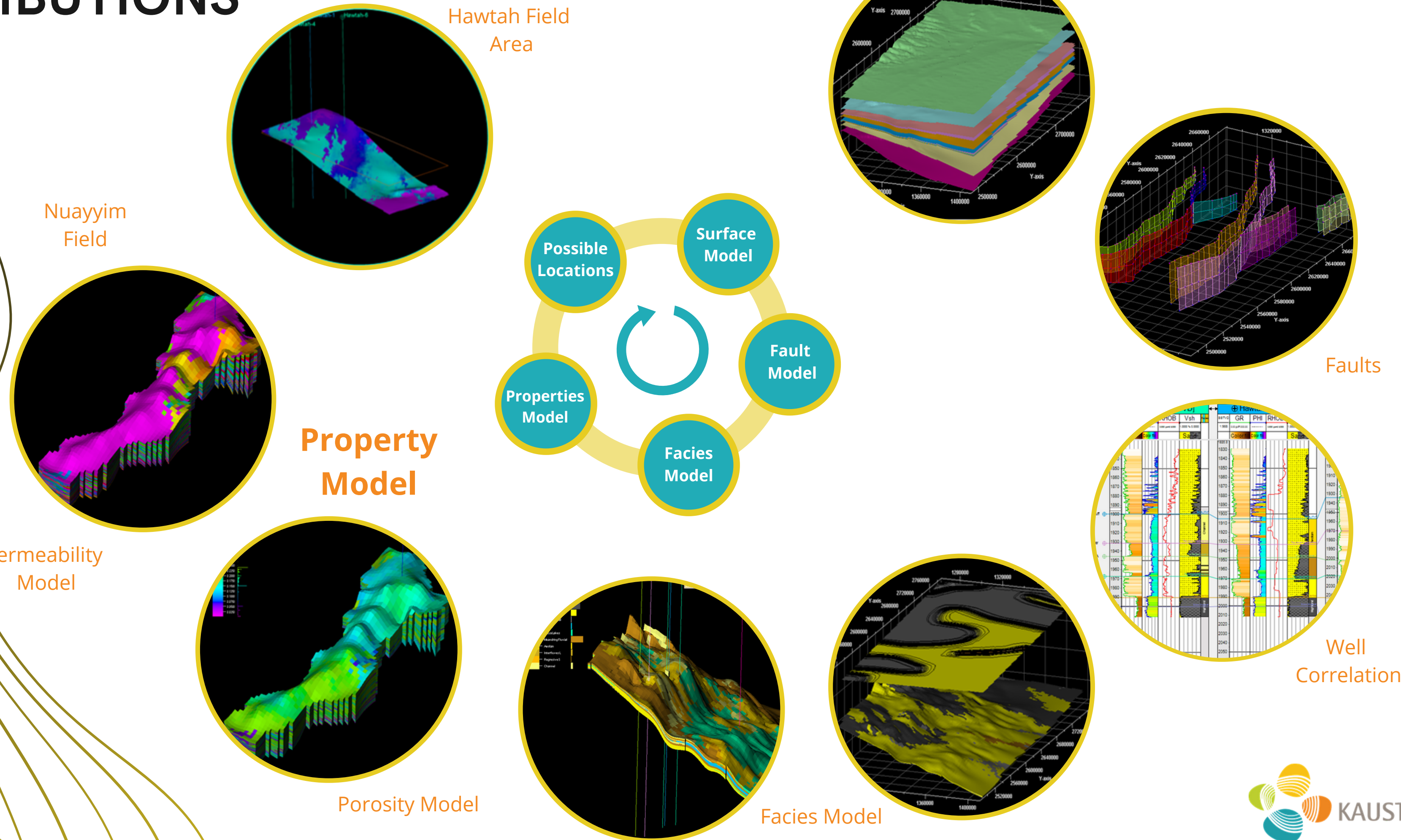
Facies Model



Facies Probability Trend Maps



# CONTRIBUTIONS





# Conclusions

## COMPILED PUBLISHED INFORMATION

## 3D STATIC MODEL

Structure - Facies - Properties

## IDENTIFY POTENTIAL AREAS

Nuayyim Field - Hawtah Field Area

## DYNAMIC SIMULATION MODEL

CO<sub>2</sub> Trapping Mechanisms & Storage

# Thank You



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