



PetroChina



Exploration Go
Deeper Target

*Basement
Characterization*

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(Exploration Department)

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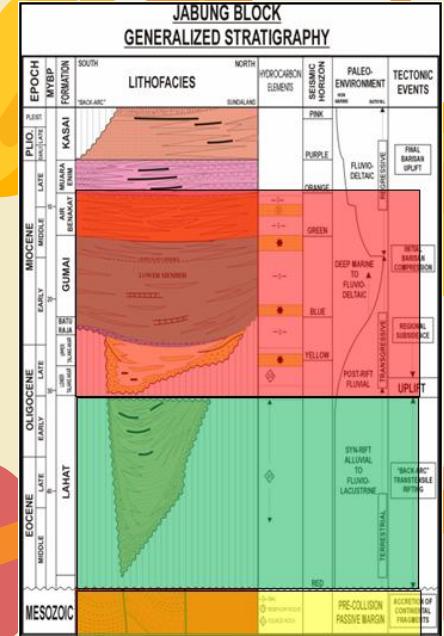
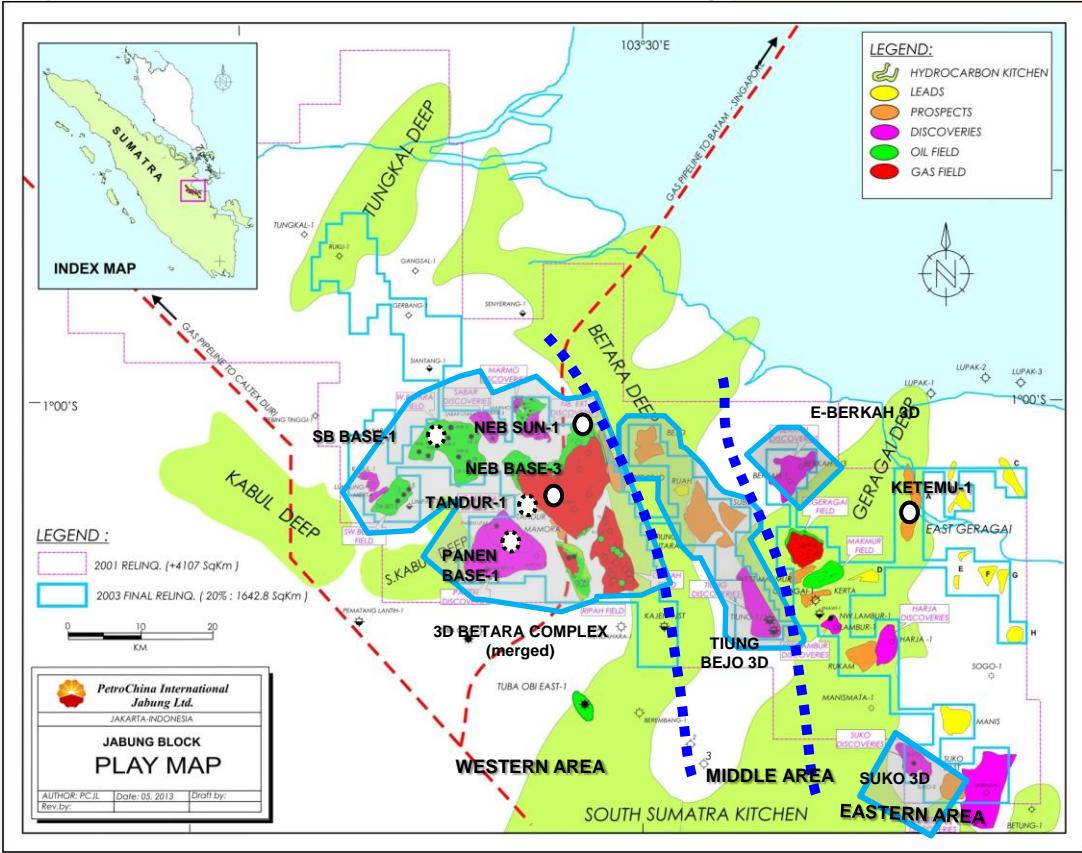
1. Jabung **Overview**
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3. **Fault – Fracture** Hunting
4. Summary



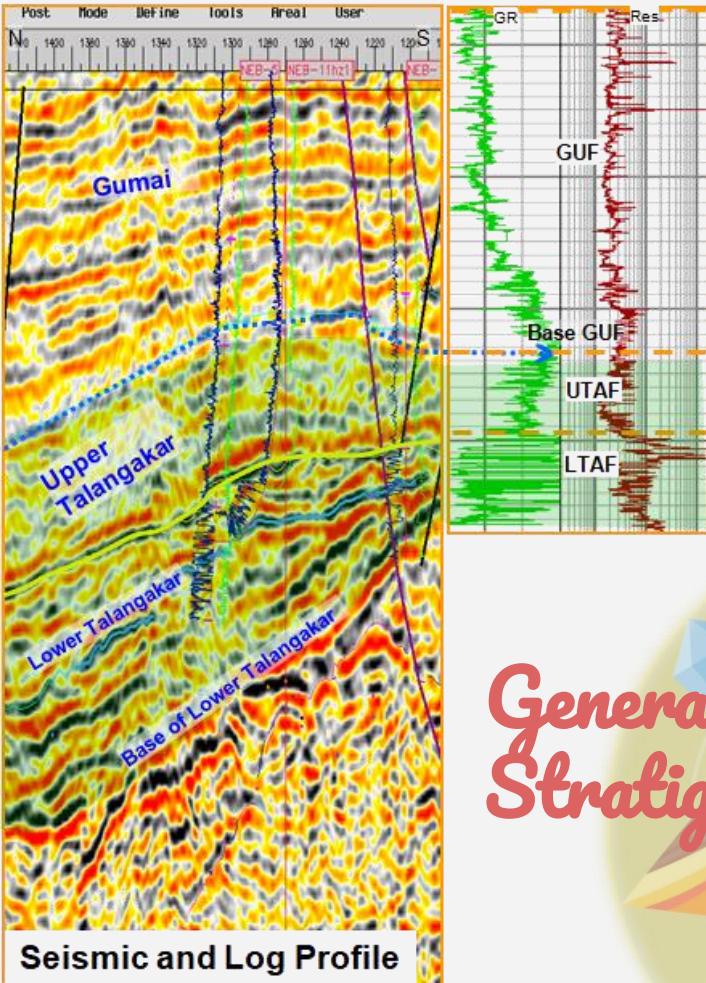
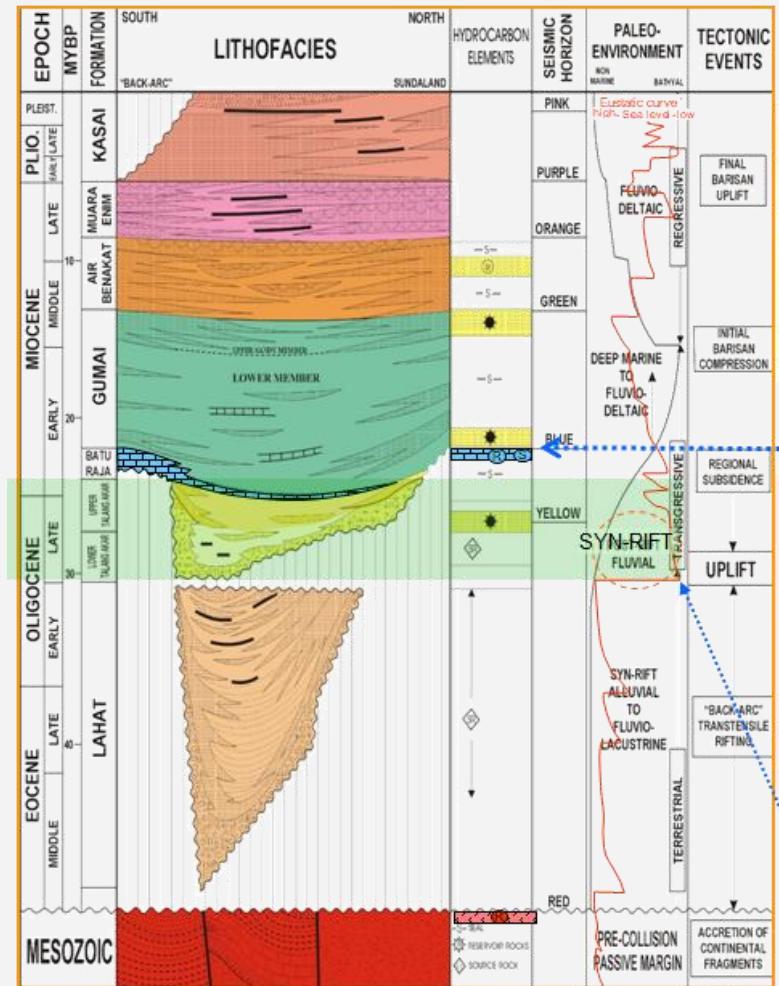
•01• *Jabung Overview*



Jabung Block Location Map



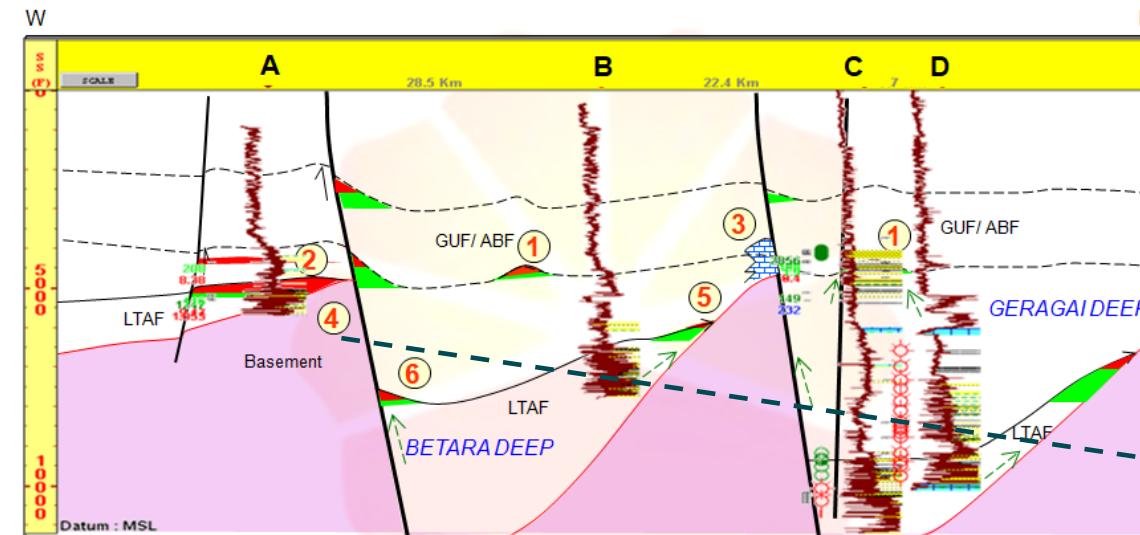
- Existing 3D seismic
- Firm Wells with Mature Analysis
- Firm Wells with ongoing thorough Analysis



Generalized stratigraphic summary of the Jabung block, South Sumatra basin and its correlation to seismic and well log profiles.

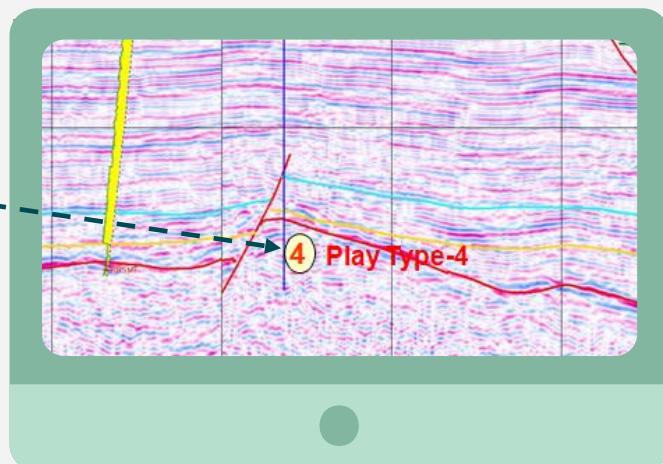
Generalized Stratigraphy

Exploration Play Type



Play Type - 4

- a. **Basement High**
- b. **Fractured Basement**
- c. **Potentially in horst area**



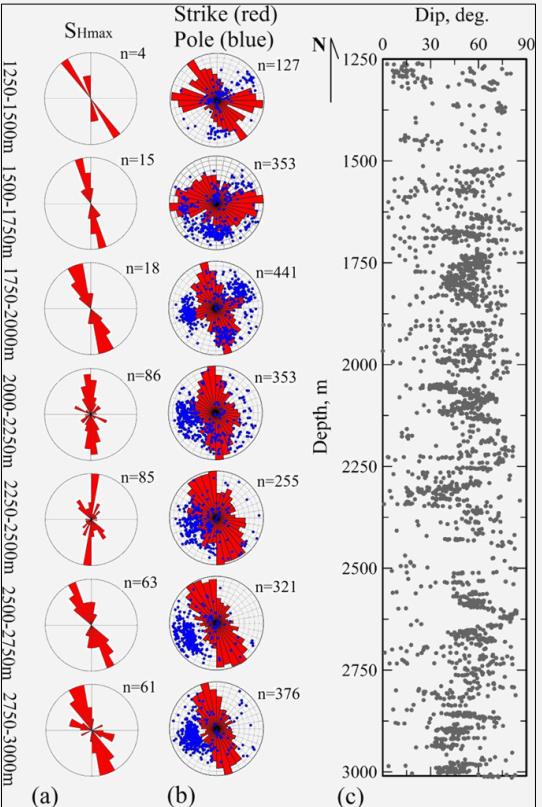
- LTAF ONLAPPING BASEMENT
- HC MIGRATION DIRECTLY FROM THE CENTRAL OF SOURCE ACTIVE PODS



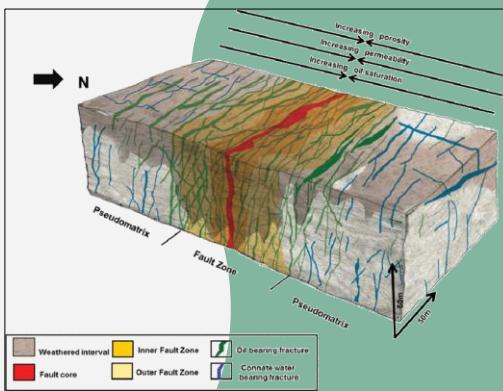
.02.

Basement Characterization

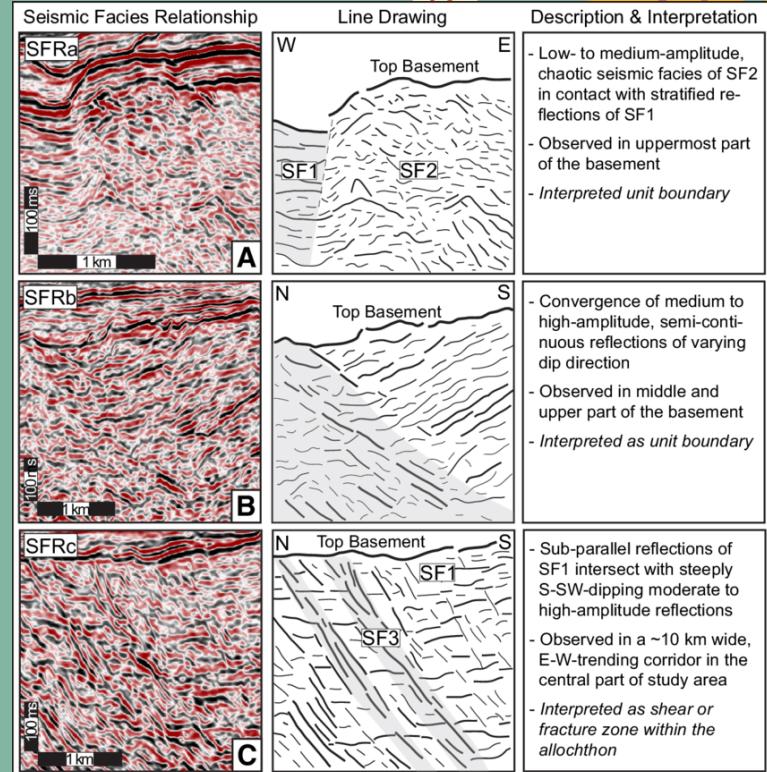
Basement Theories



Conceptual model of basement reservoir within structural closure. The formation is divided into three facies: (1) an Inner Fault Zone; (2) an Outer Fault Zone (both of which combine to make up a Fault Zone); and (3) Pseudomatrix. Fault Zones are associated with a specific GRV related to mapped seismic-scale faults and the Pseudomatrix represents the remaining GRV which consists of subseismic-scale faults and protolith.



Plot showing (a) SHmax orientation, (b) fractures strike azimuth and fracture poles for 250 m intervals in the granitic basement, and (c) depth profile of dip amount of the fractures in the same borehole section. SHmax orientation is determined from DITFs and wellbore breakouts whereas strike, pole, and dip information of the fractures are obtained from analysis of borehole images.

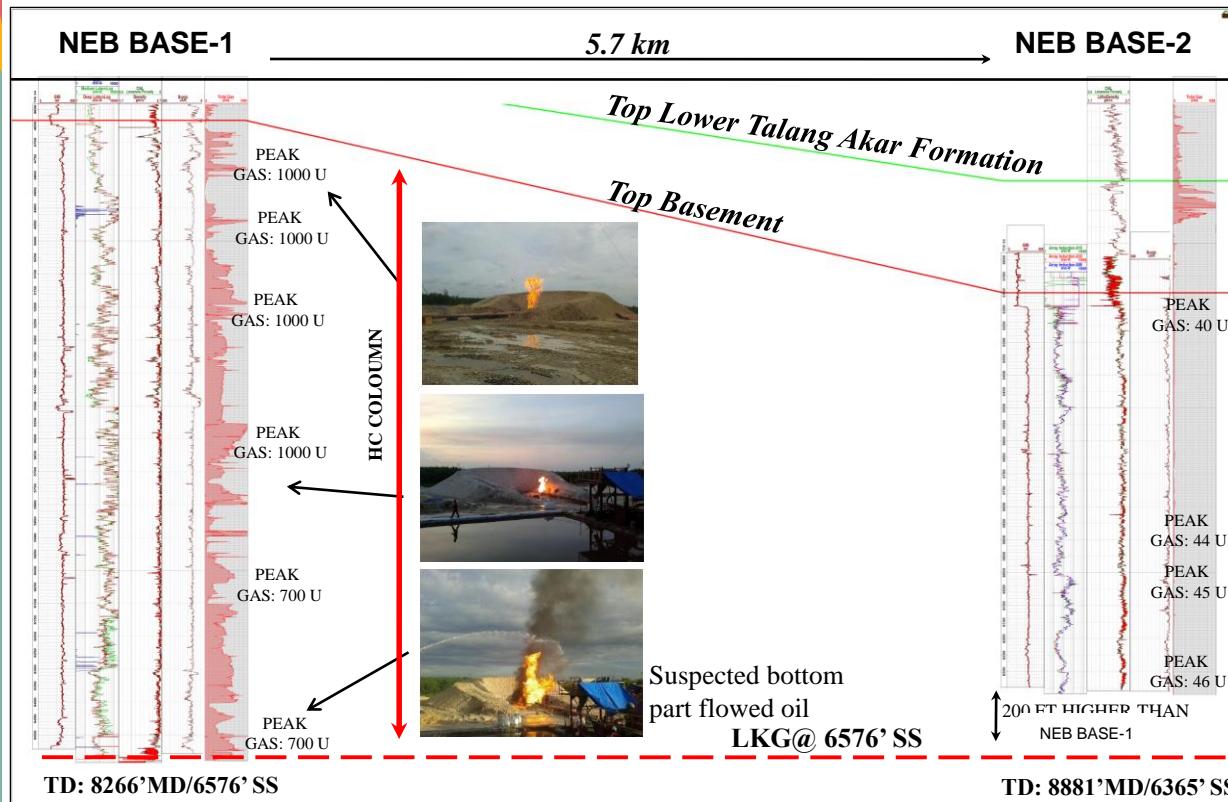


Seismic character, line drawing, and interpretation of geometrical relationships between different seismic facies relationships.

Jabung Basement Well Corelation

SE

NW



NEB BASE-1	NEB BASE-2
Drilled in 2013 penetrated granite basement	Drilled in 2014 penetrated granite basement
Peak Gas : 1000U at basement	Peak Gas : 46U at basement
Open-hole Test at basement: 3.3 MMSCFD + 149 BCPD	Open-hole Test at basement: NO FLOW; 5% oil (from Lab analysis)





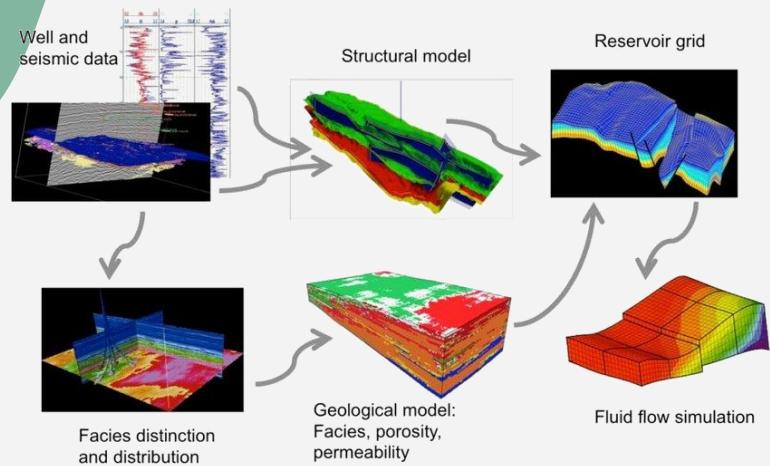
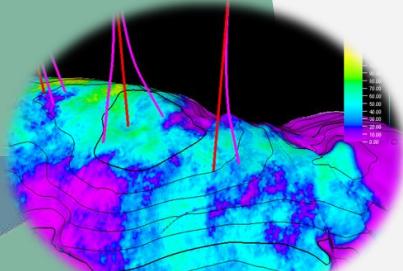
.03. *Fault & Fracture Hunting*

Geology – Geophysical Analysis

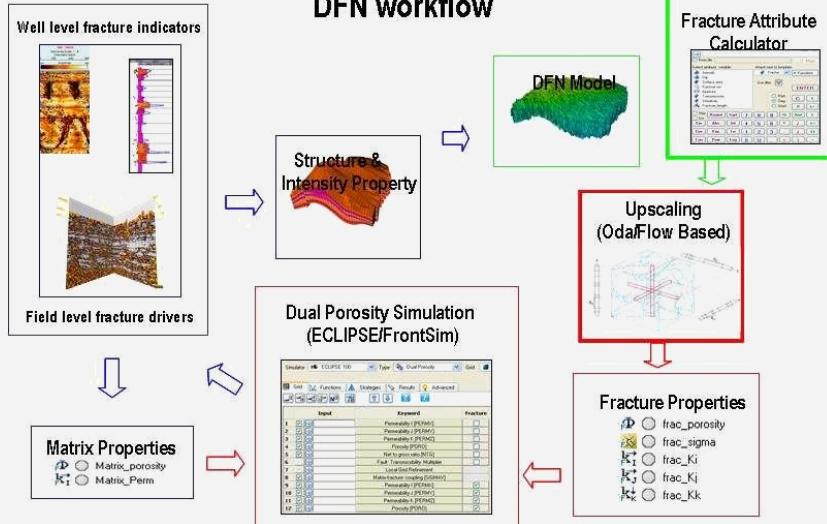
Geophysical Geological Model Workflow



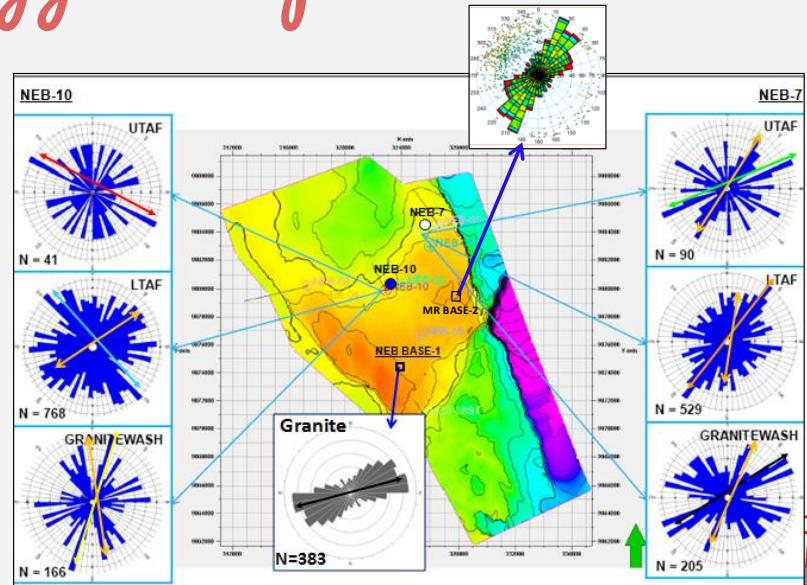
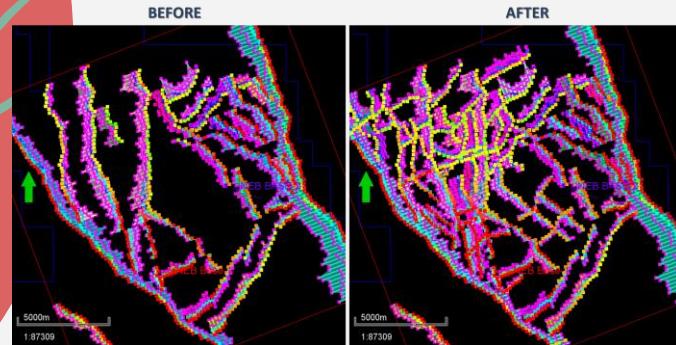
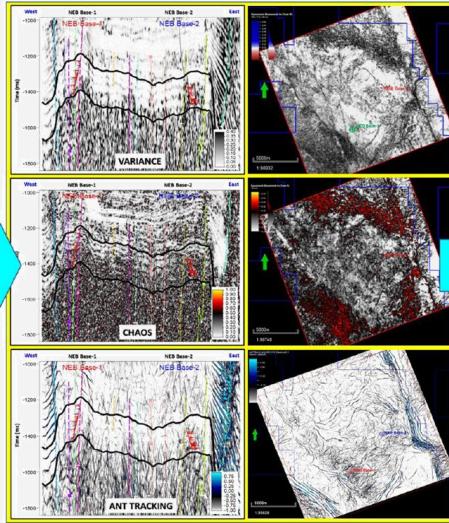
To locate the exploration wells especially in Basement target to be drilled accurately



DFN workflow



Geophysical – Geology Interpretation



The three seismic attributes are generated from the original seismic. Through the vertical and slice section (surface and time slices) sections in detail. The results of this fault interpretation were then validated vertically and in the slice section combined with the geological theory of the formation.

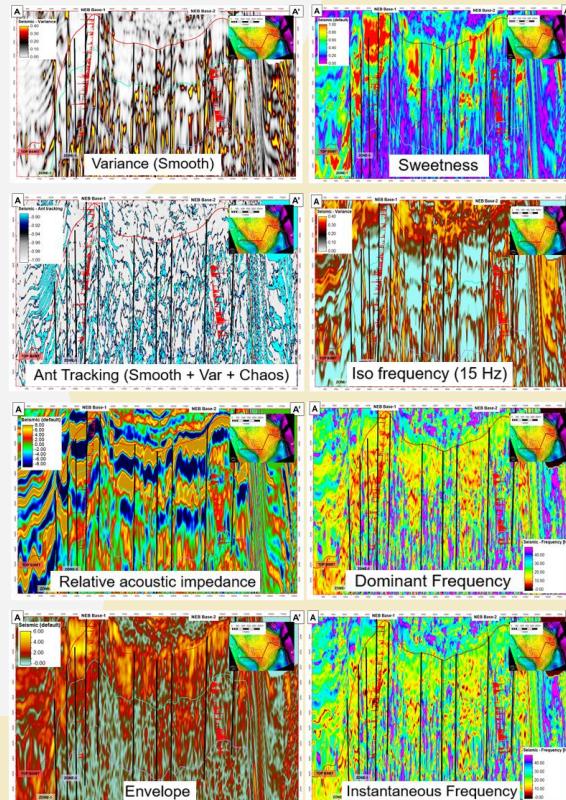


Seismic Attribute

ATTRIBUTE GENERATION

1. Structural Smooth
2. Variance (Smooth)
3. Chaos
4. Ant Tracking (Smooth + Var + Chaos)
5. Curvature
6. Instantaneous Phase
7. Instantaneous Frequency
8. Envelope
9. Sweetness
10. Relative acoustic impedance
11. Dominant Frequency
12. Iso frequency (15 Hz)
13. t^* attenuation
14. Dip

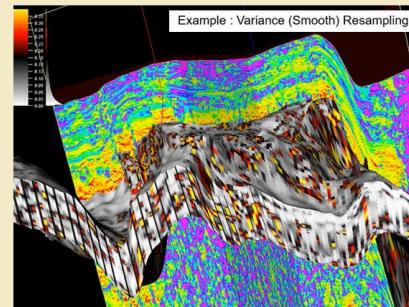
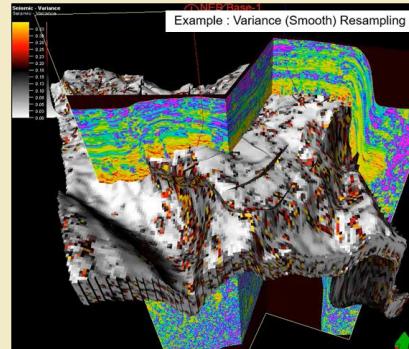
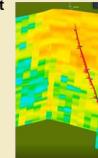
ATTRIBUTE SCREENING & SELECTION



ATTRIBUTE RESAMPLING

Seismic Resampling Quality Method : Exact
20 Layers / Zone
(Total Interval Zone : 6)

Exact: As intersecting, but volume correction is performed. This method will take a very long time, but will produce the most accurate results in all cases. Use 'most of' or 'median' averaging for discrete value volumes.



Fracture Network Model

Method : Stochastic Fracture Modeling

This approach models fracture sets for the entire 3D grid, per region or within zones. A fracture model requires these three basic inputs : Fracture Distribution, Fracture Geometry and Fracture Orientation. A Stochastic fracture model typically can be used for fractures where location, size and orientation are not known directly, but can be inferred from statistics.

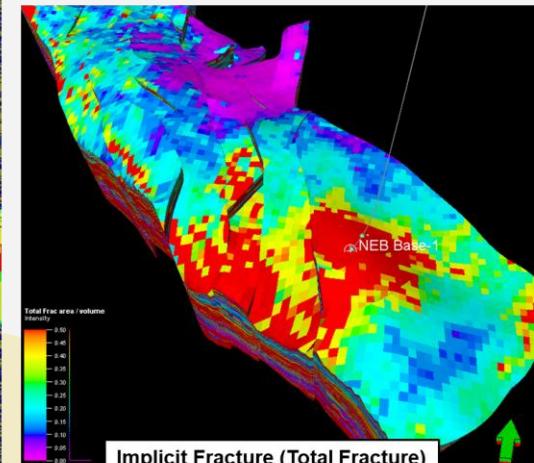
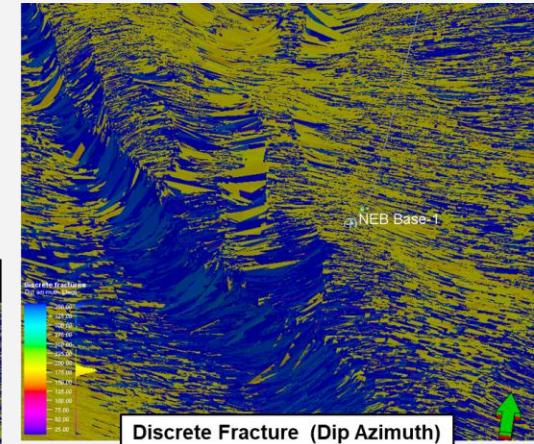
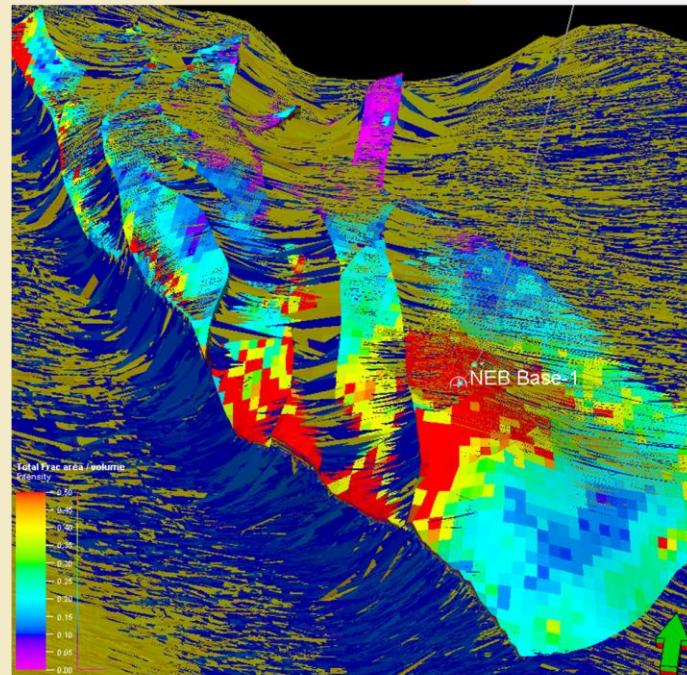
Distribution :
Intensity NN (U)

Max. Length :
150 (Power Method)

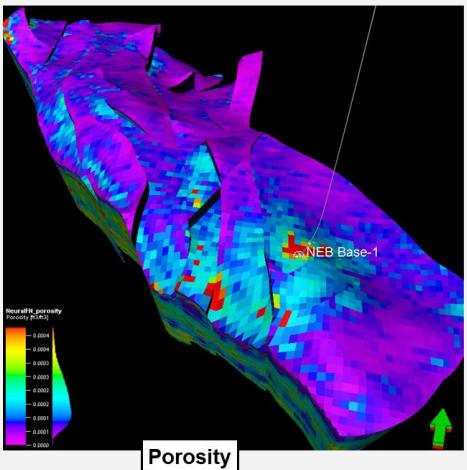
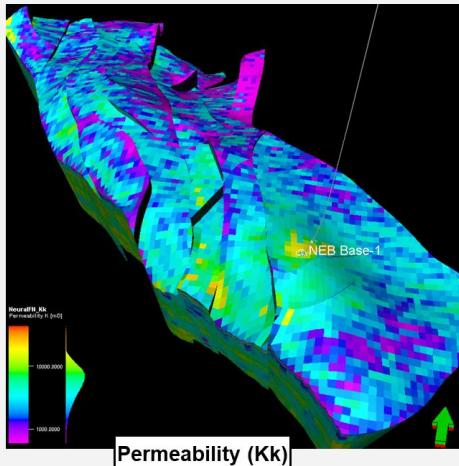
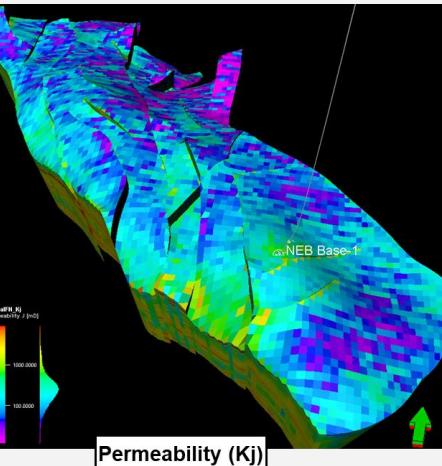
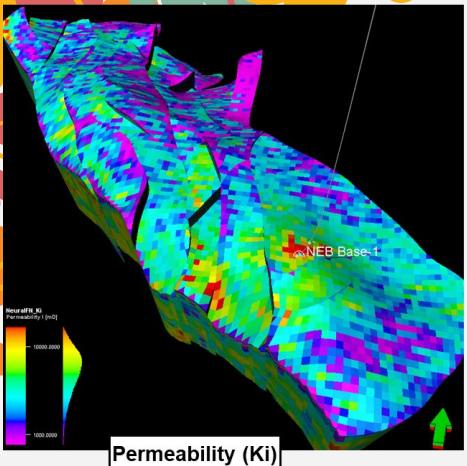
Orientation :
Fisher Model

Mean dip :
90

Concentration :
40



Fracture Basement Properties

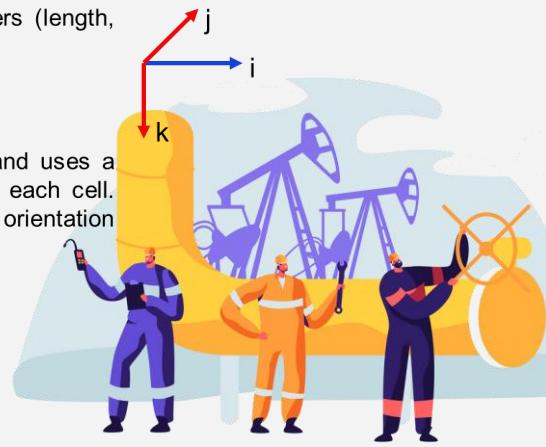


Permeability of the fracture system is a function of fracture parameters (length, aperture, intensity), which are largely unknown.

All Fracture properties have been upscaled using the **Oda Method**.

Oda Method relies on the geometry of the discrete fracture planes and uses a statistical method based on the number and sizes of the fractures in each cell. Meanwhile for implicit fractures, it performs a numerical integration over orientation sectors to build the permeability tensor.

Note : Distribution Property using Intensity NN (U)



Summary!

The analysis results will be used to propose new wells with the main target in the Basement Formation (Fracture).

The fault interpretation process is carried out in more detail to see the possibility of the distribution of fractures close to the formed faults.



Thank You...

