SUBSURFACE CLARITY

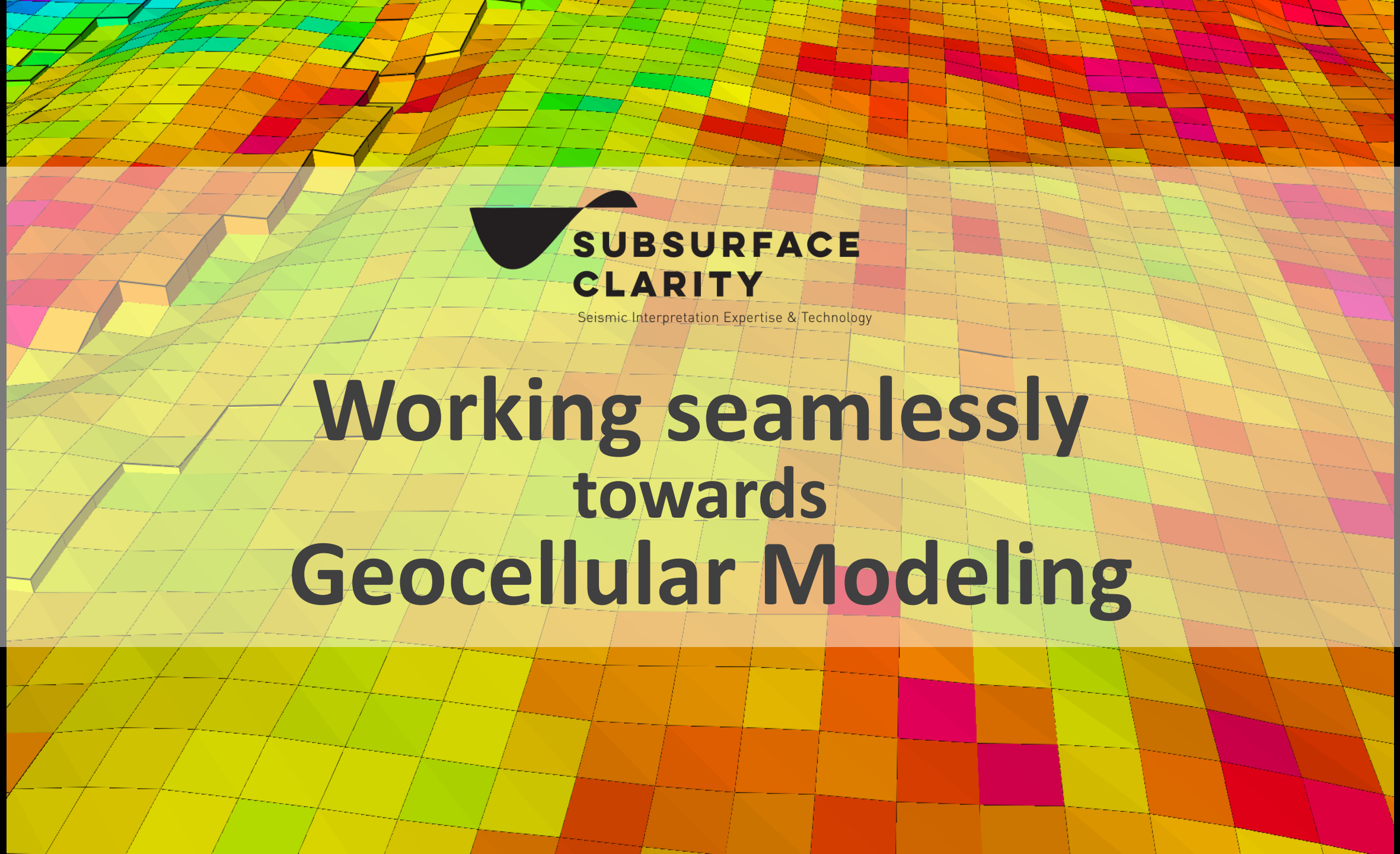
Seismic Interpretation Expertise & Technology

PaleoScan Technical Forum

a presentation by

Ken Abdulah and Clemence Prazuck

September 12th, 2019



SUBSURFACE CLARITY

Seismic Interpretation Expertise & Technology

Working seamlessly towards Geocellular Modeling

SUBSURFACE CLARITY

Technology

In this study, we attempt to illustrate the application of some very innovative software tools available to us in PaleoScan. The PaleoScan suite, together with tools available in GeoTeric, allow us to move traditional data sets seamlessly through:

PRE-CONDITIONING
STRATIGRAPHIC INTERPRETATION
WELL ANALYSIS
SEQUENCE ANALYSIS
STRUCTURAL INTERPRETATION
FACIES INTERPRETATION
3D PROPERTY MODELING
GEOCELLULAR MODELING

PaleoScan

geoteric

Well-log based 3D Property Models, guided by seismic data volumes and supported by cross-plot analysis, open up a spectrum of integrated workflows to the interpretation team.

Shear Impedance data remains a critical requirement to more advanced classifications. In this study we had very limited shear data, but have attempted none-the-less to walk the viewer through what we think are valuable workflows.

Geology

Outcrops, Cores
Surface geology
Well-logs
Structure & tectonics
Sedimentology
Stratigraphy
Subsidence history
Depositional models
Source rock analysis
Reservoir parameters
Production data
Horizons, Faults
Seismic attributes
Seismic facies
Geostatistics
Neural Networks

Geophysics

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AVO/AVA
Rock physics
Rock mechanics
Post-stack inversion
Pre-stack inversion
Vp, Vs, ρ, λ, μ
Bulk modulus, K
Young's modulus, E
Poisson's ration, σ
PI, SI, EEI, ψ

Petrophysics

Mineral models
Lithofacies
Rock physics
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Vp, Vs
λ, μ, rho
Bulk modulus, K
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TOC, Pressure, Temp
Fracture gradients
Sw, Sw(irr), Øt, Øeff, κ, η

Basin models

Static Reservoir Models

Dynamic Reservoir Models

Introduction

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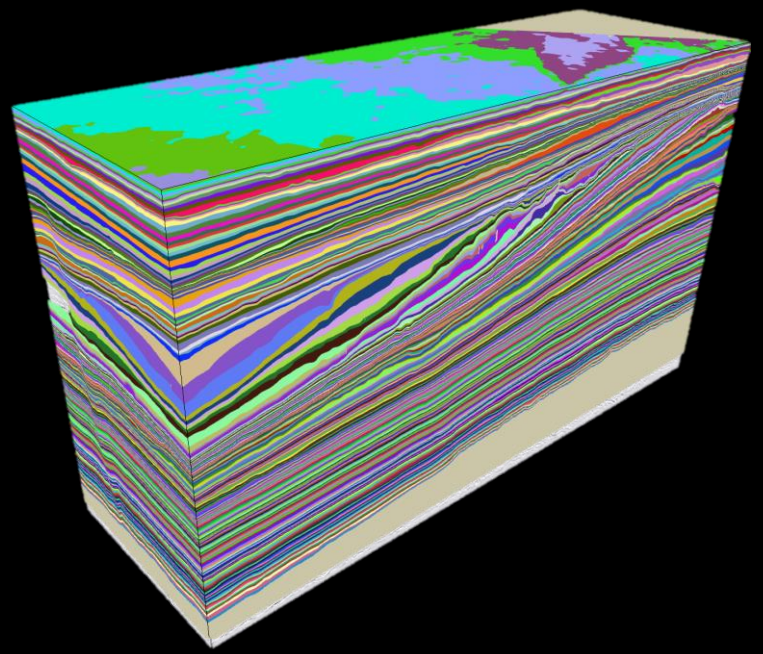
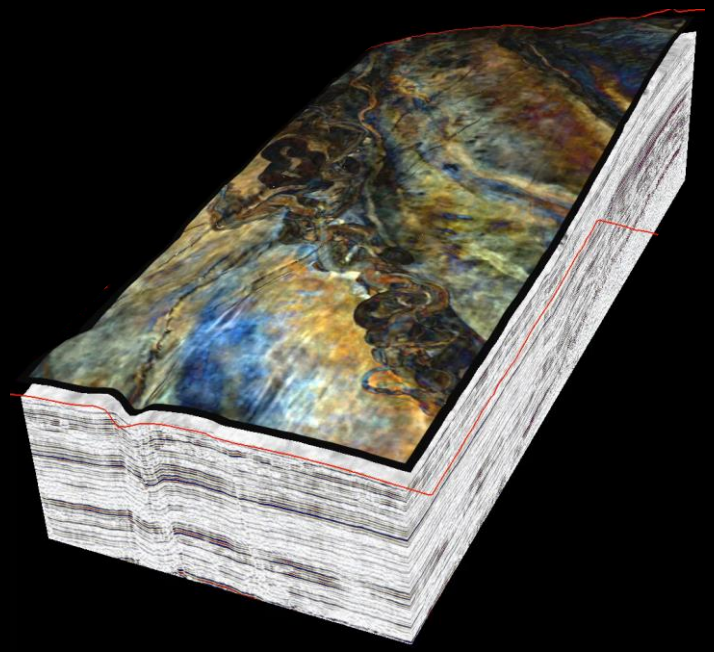
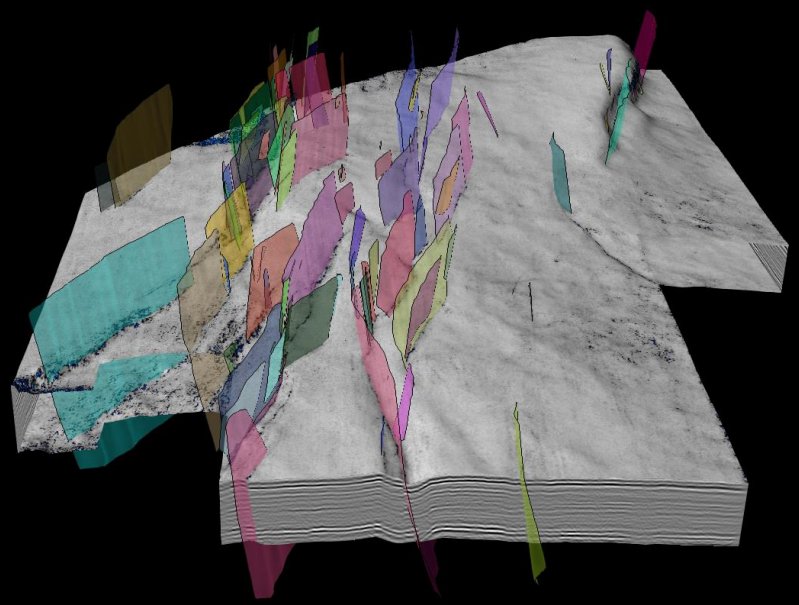
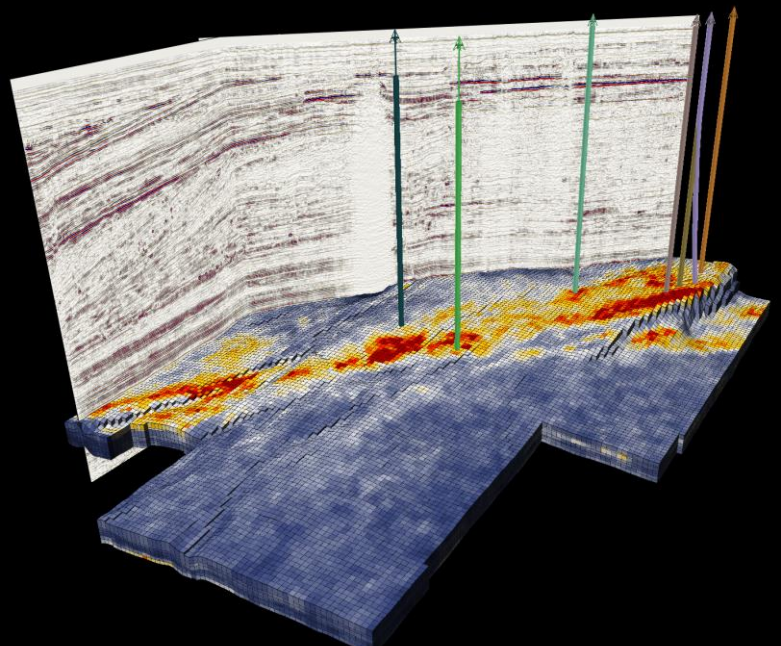
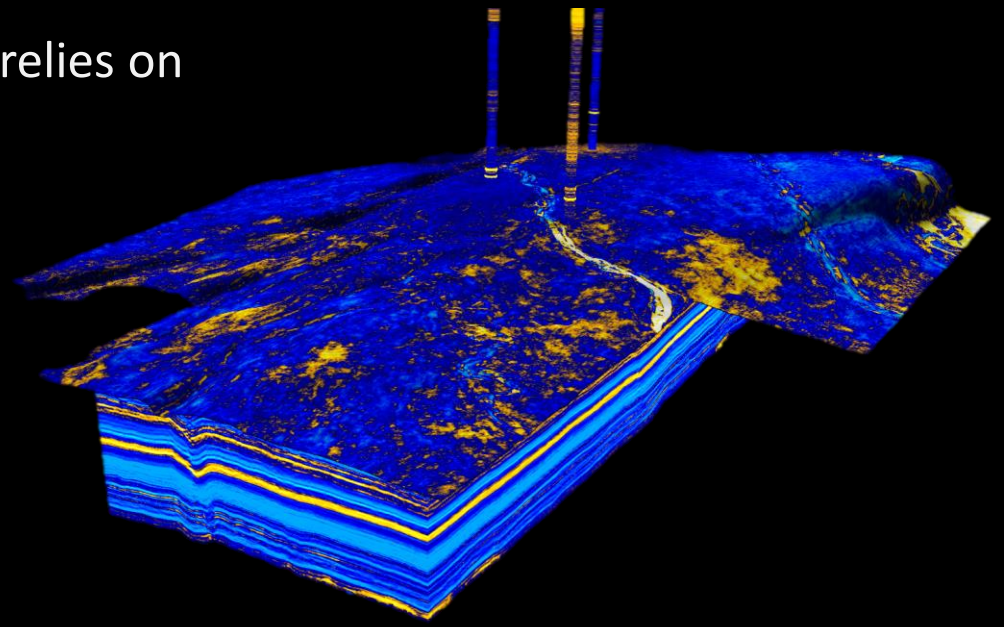








Efficient subsurface analysis relies on integrated workflows



SUBSURFACE CLARITY

Volume Interpretation Workflows

PRE-CONDITIONING

STRATIGRAPHIC INTERPRETATION

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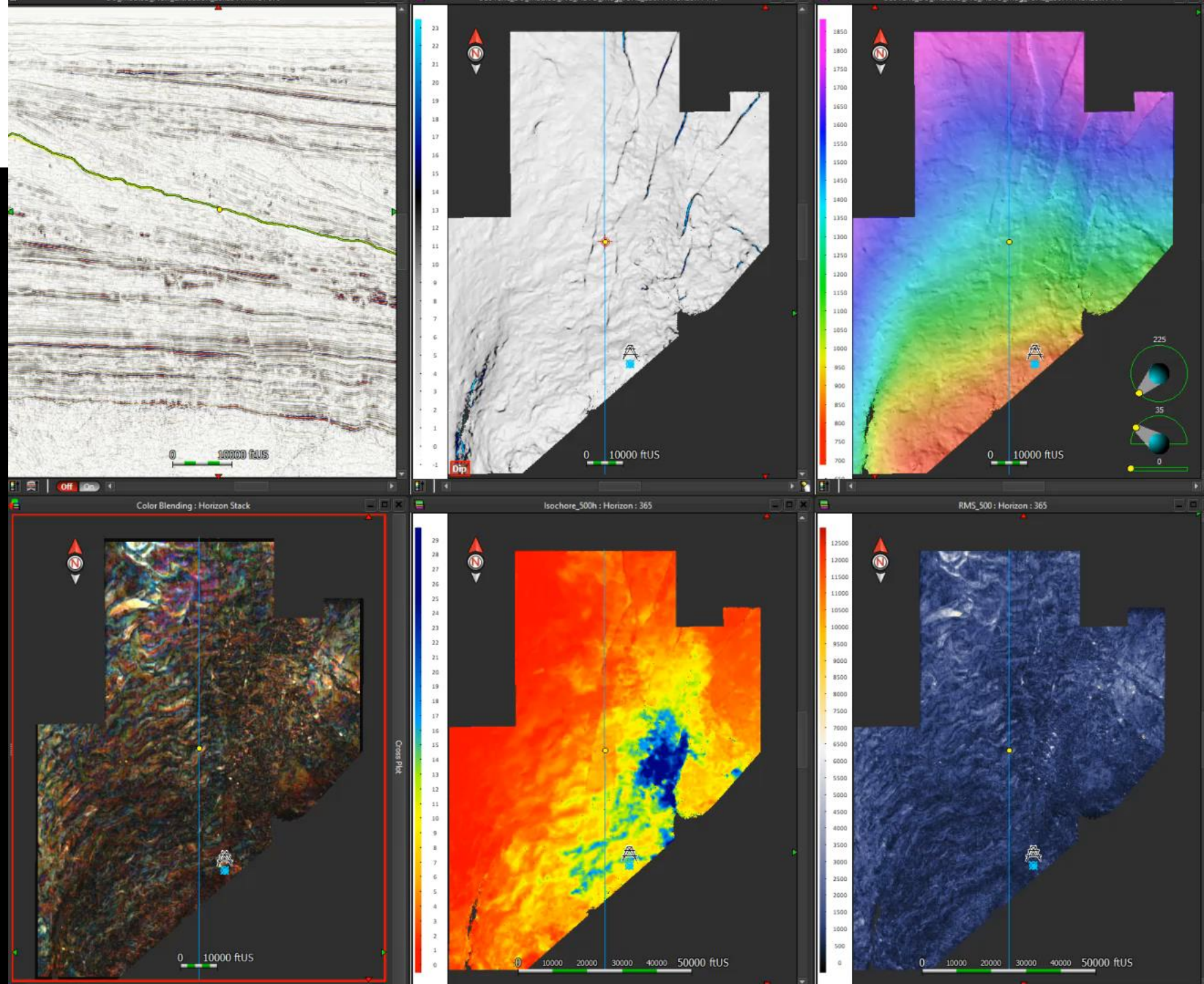
3D PROPERTY MODELING

GEOCELLULAR MODELING



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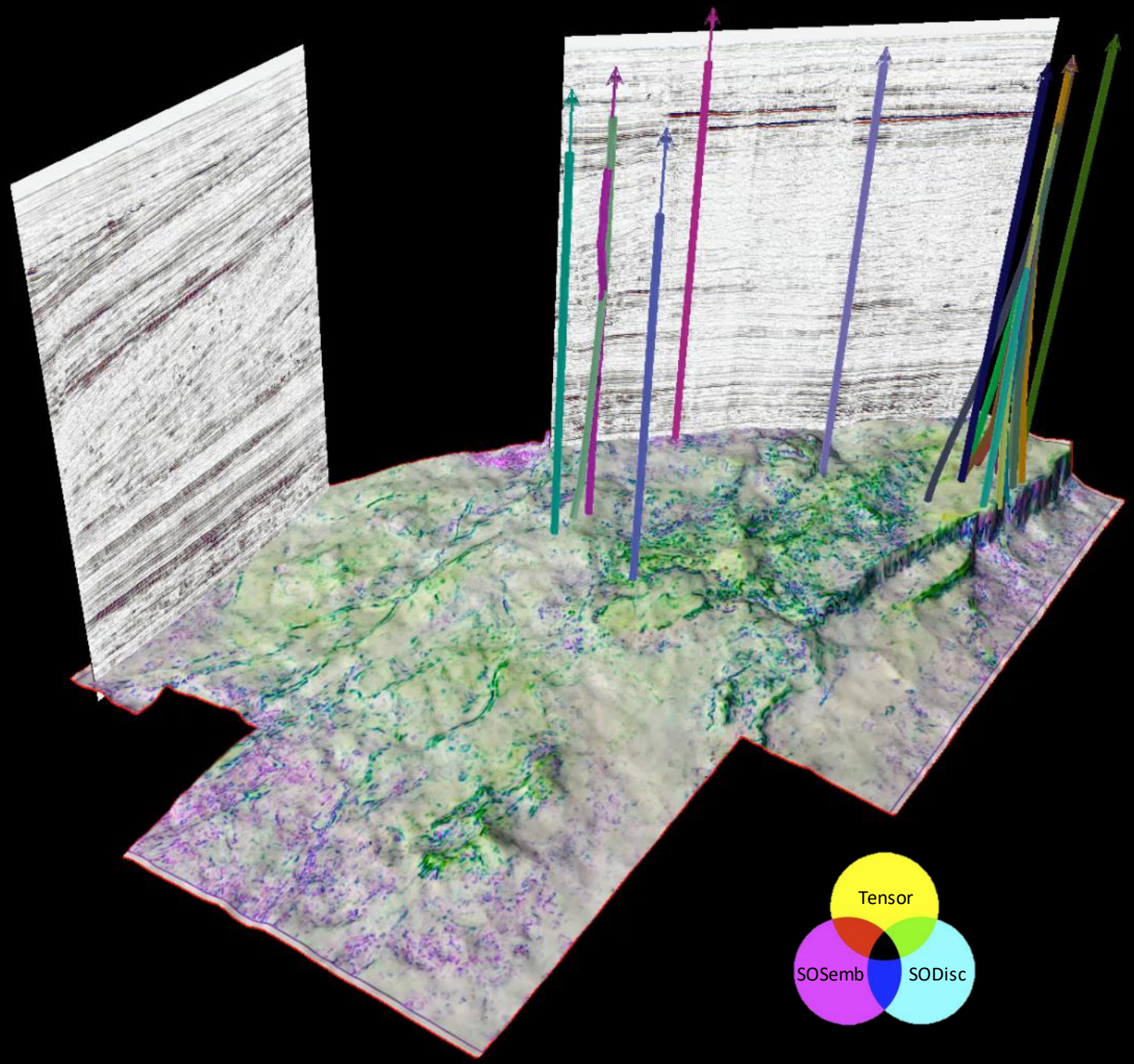

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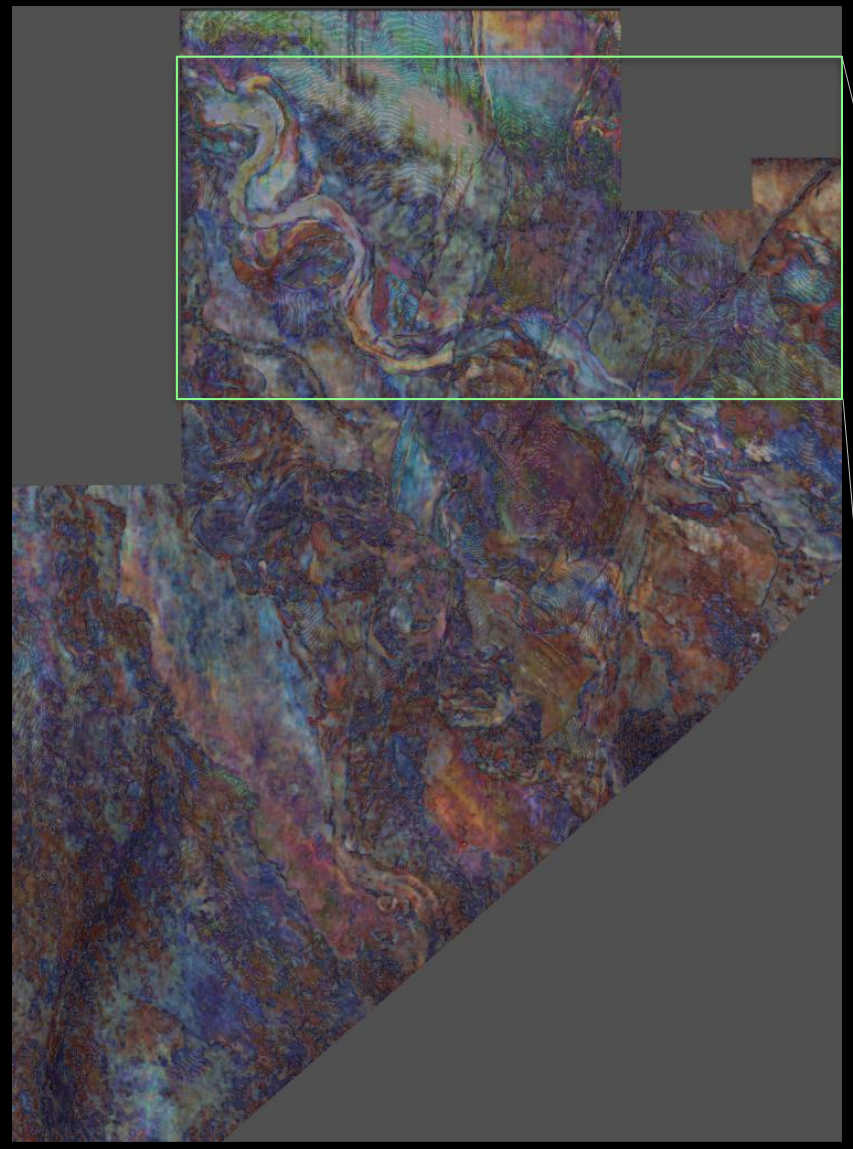

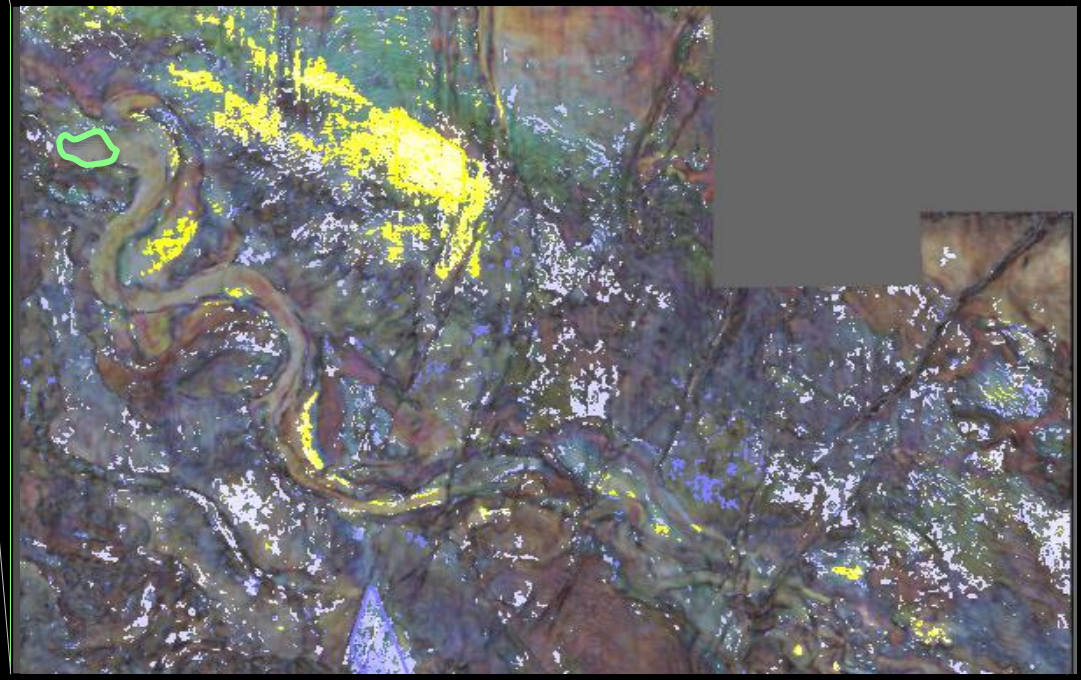

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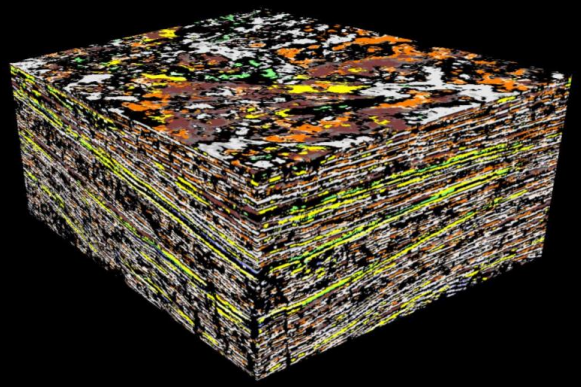

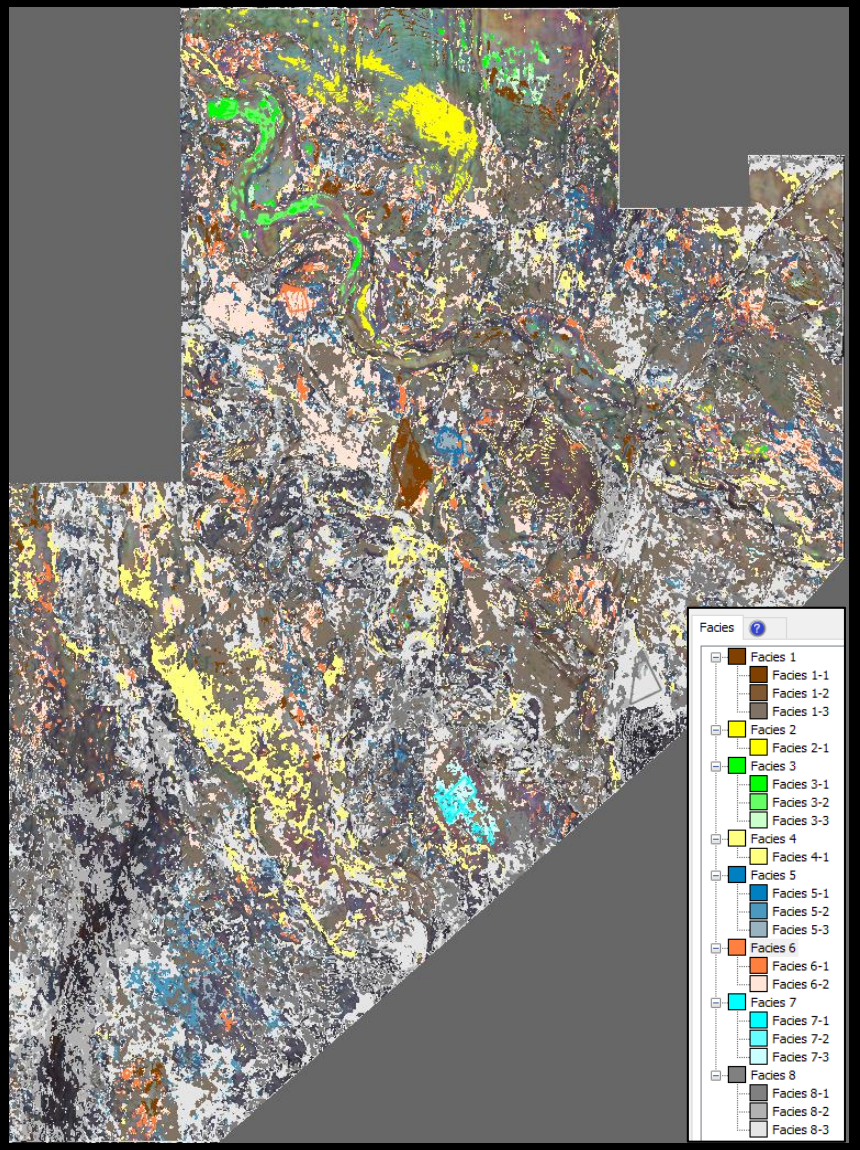

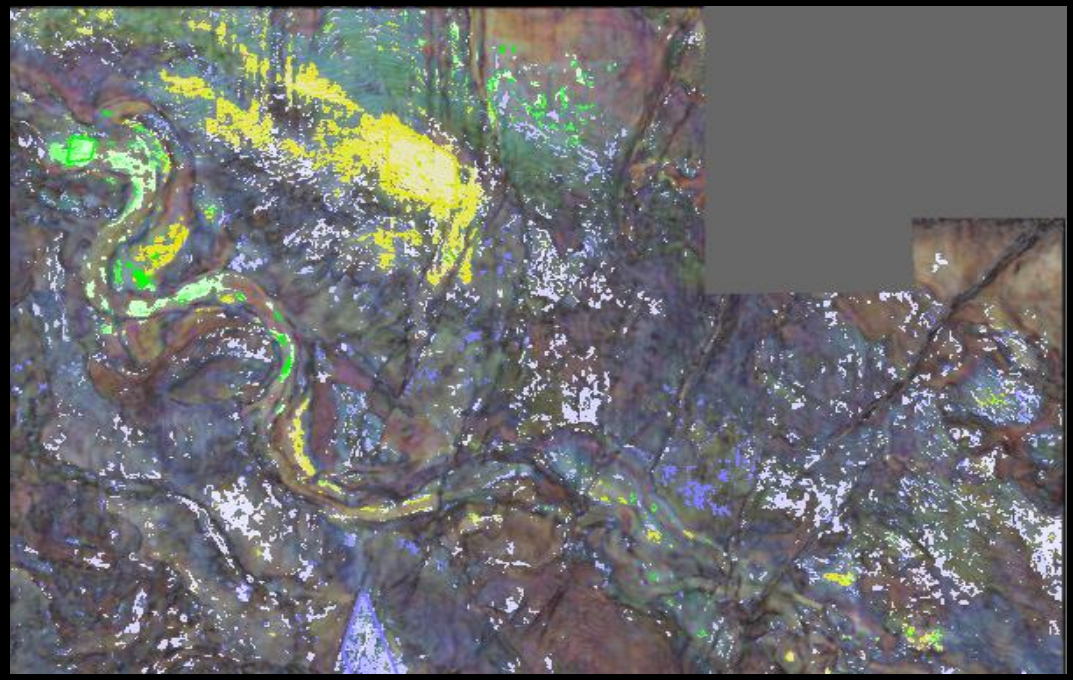

Interpolation options: inverse distance, kriging and co-kriging

Cokriging with seismic facies volume

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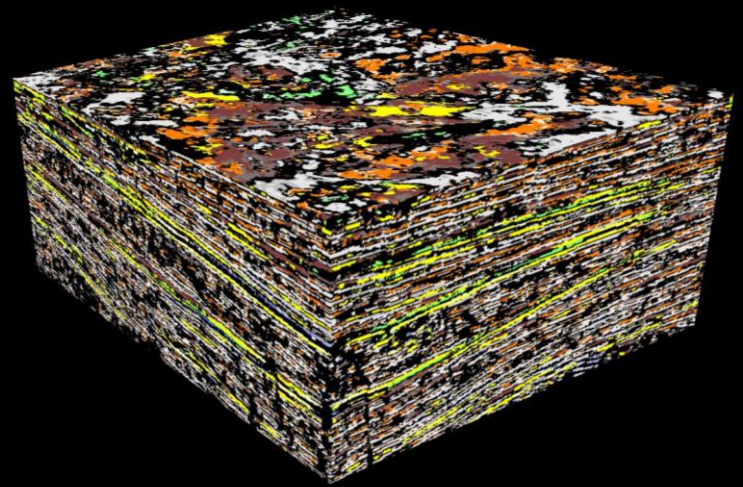
Inverse distance

Seismic facies volume



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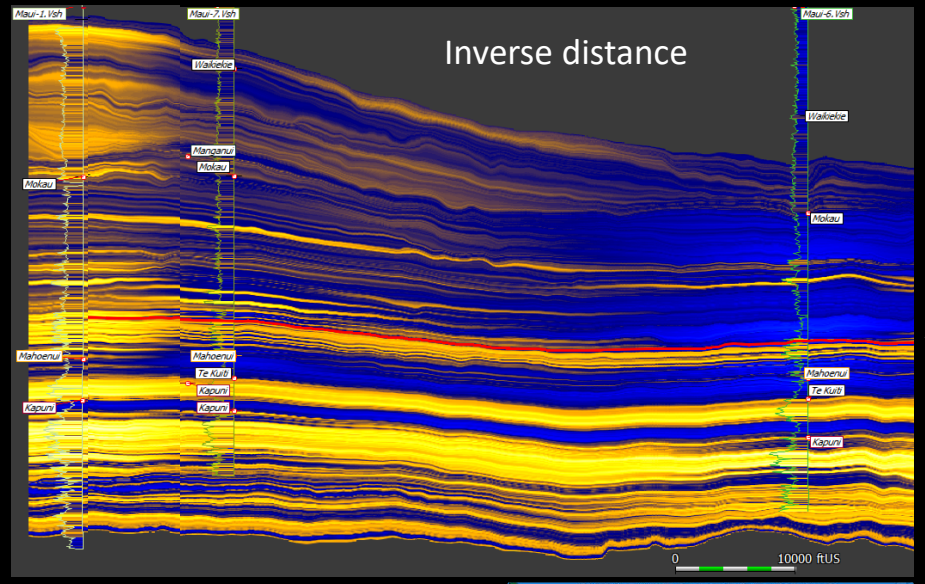
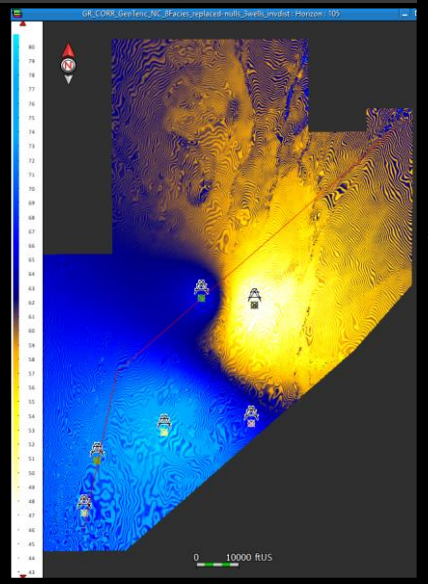
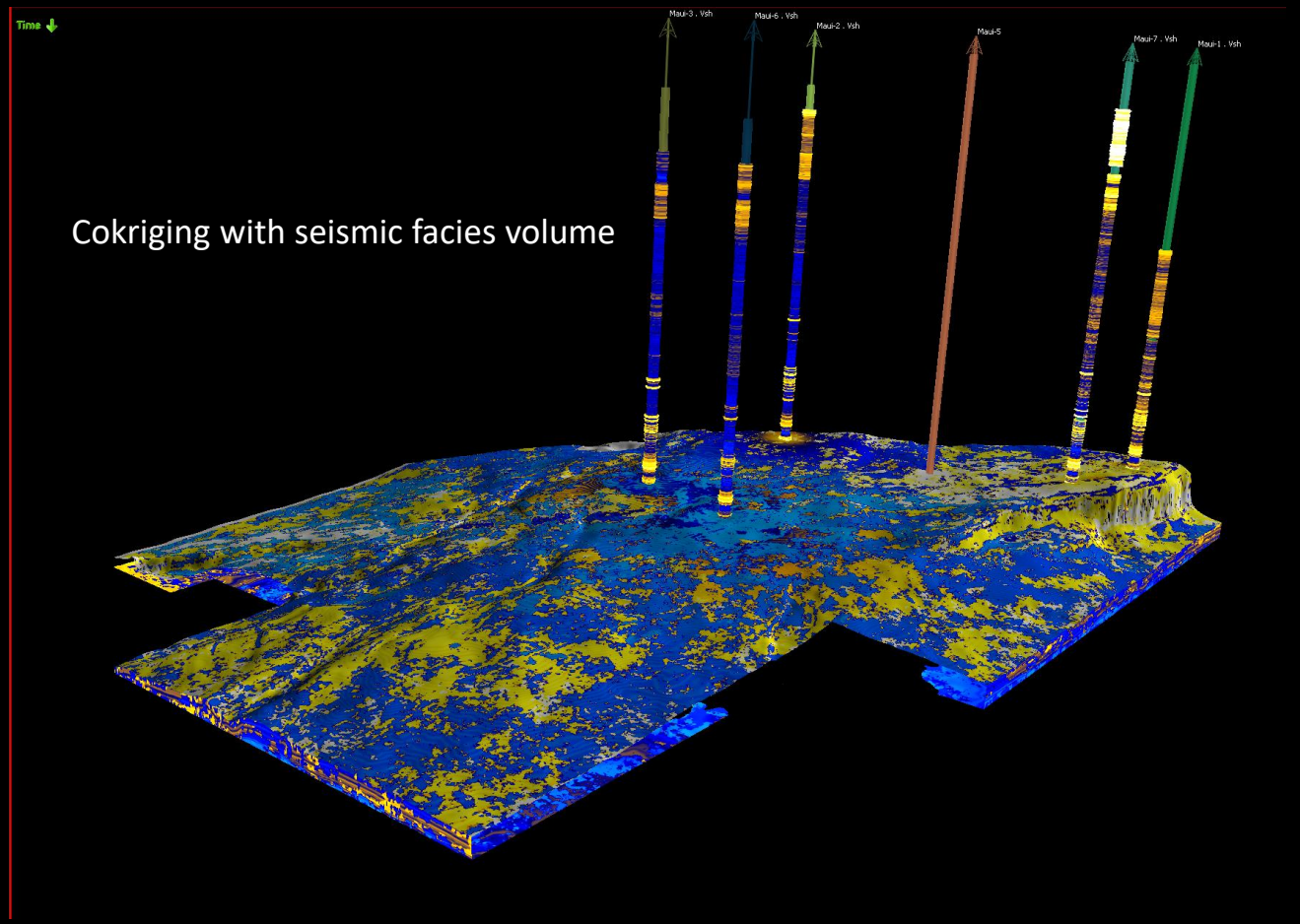
Interpolation: inverse distance versus co-kriging



Inverse distance



Inverse distance map view



Cokriging with seismic facies volume

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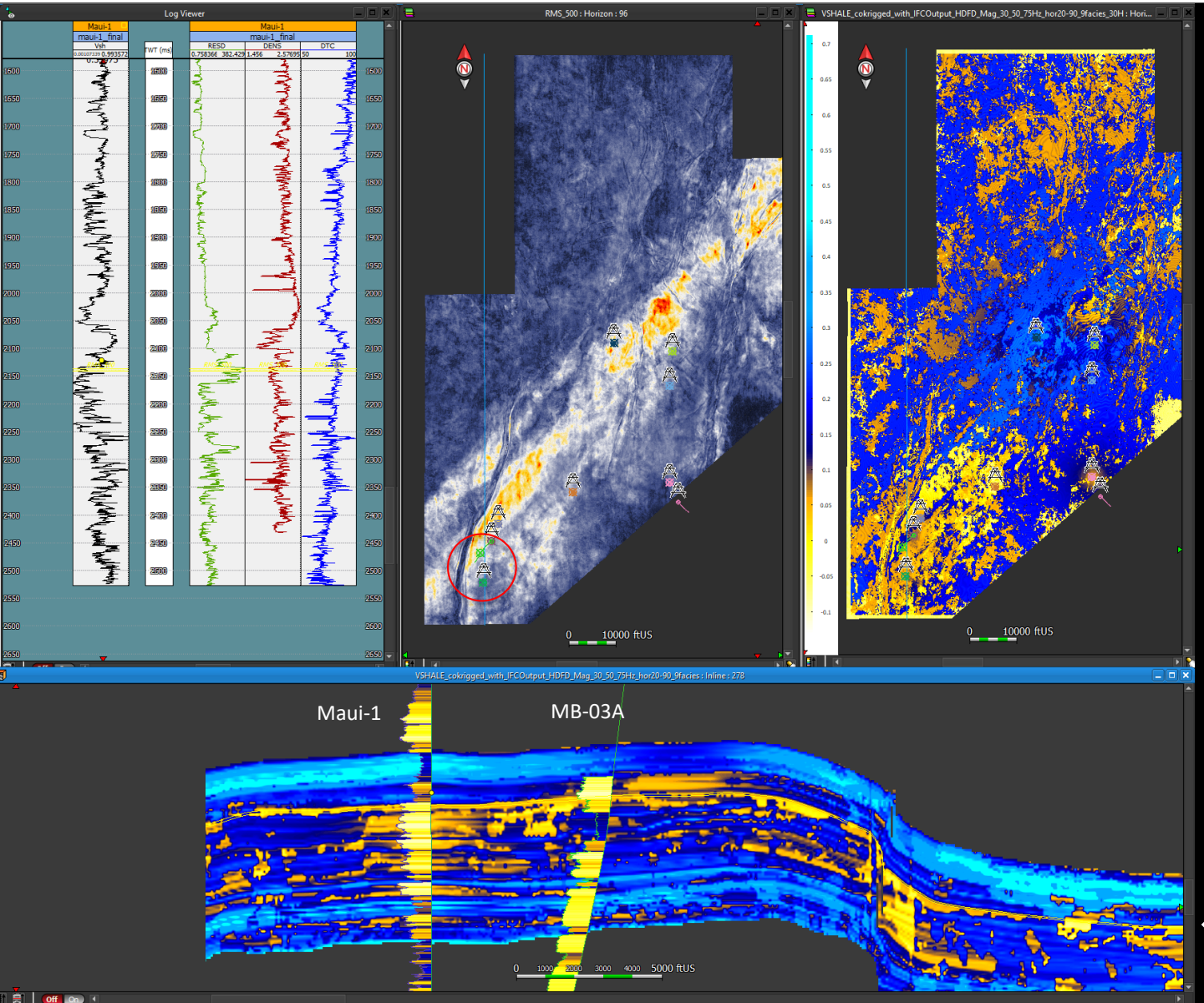
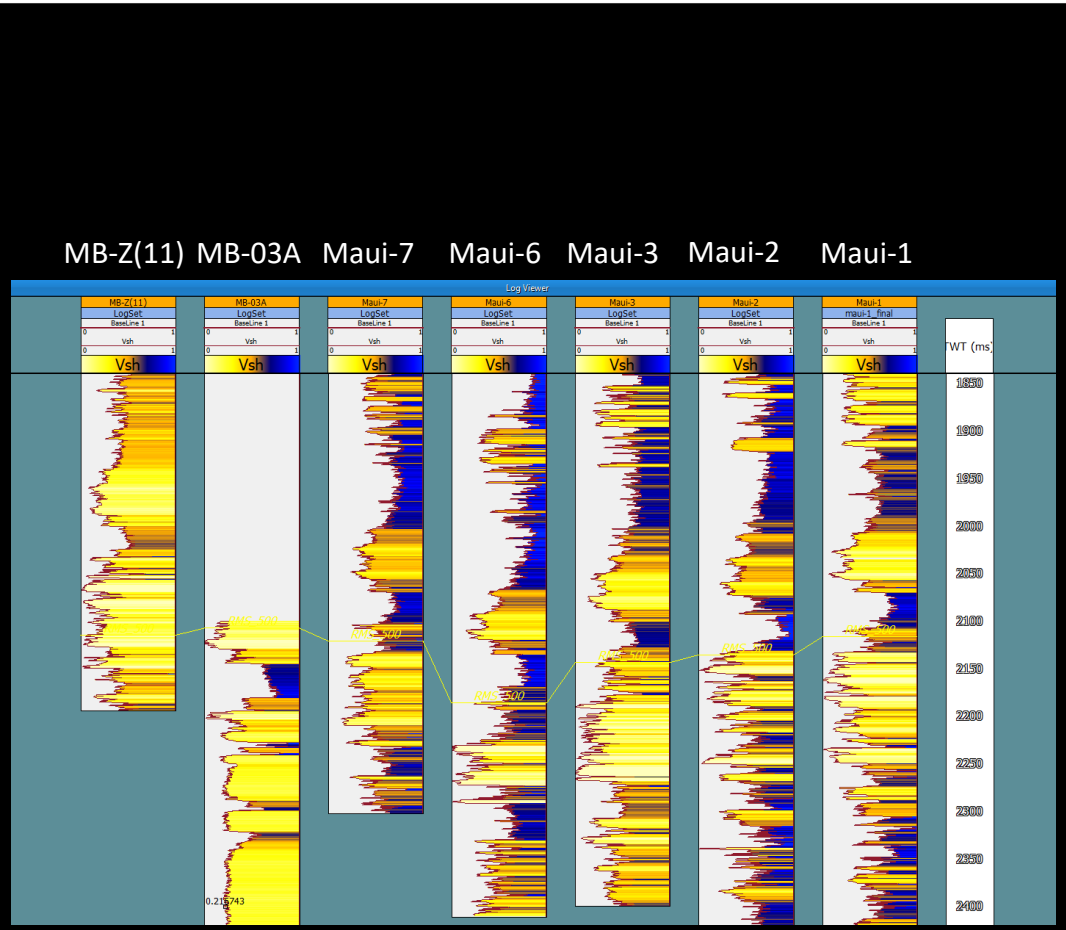
There is a strong dependence on well control and data quality





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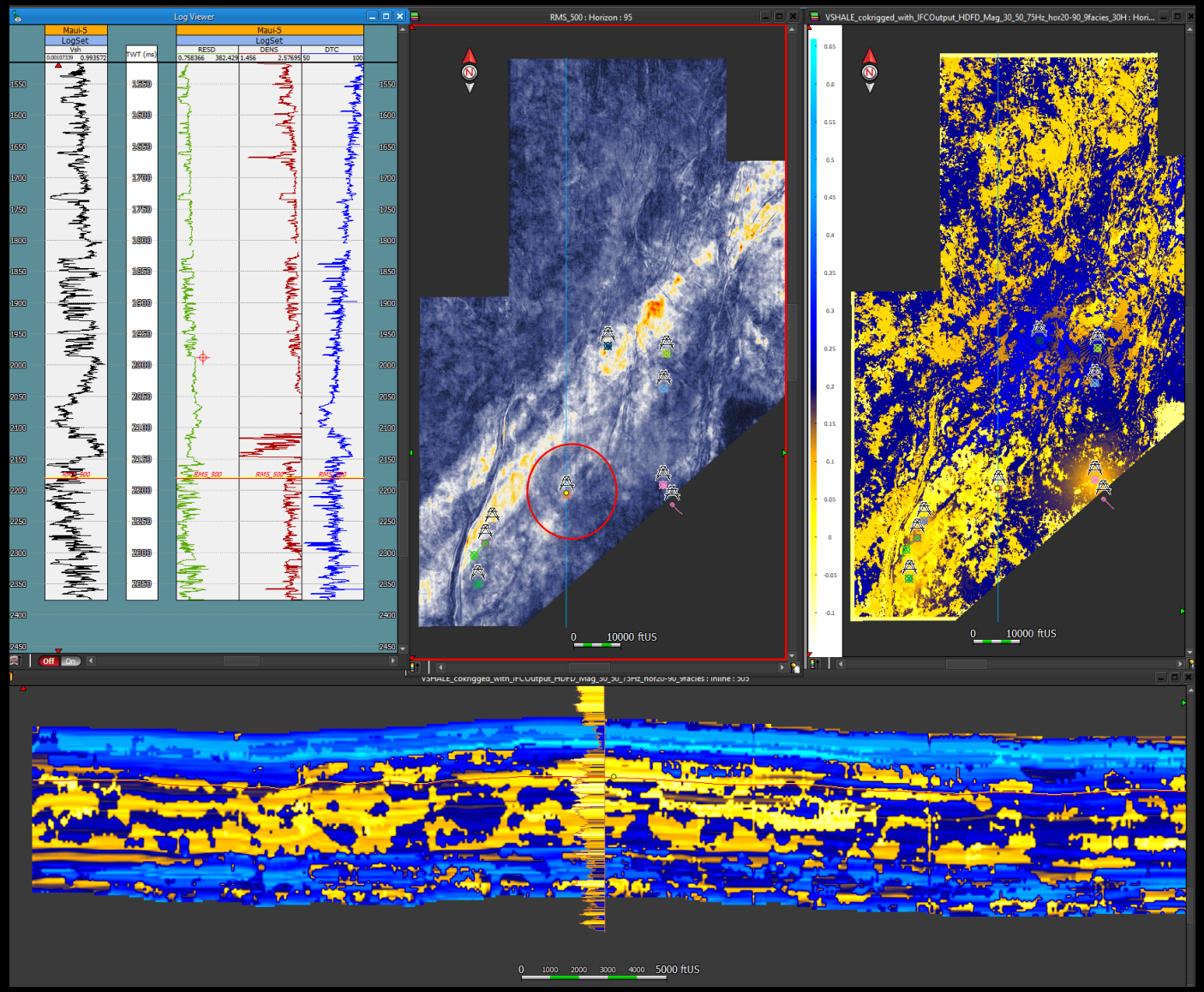
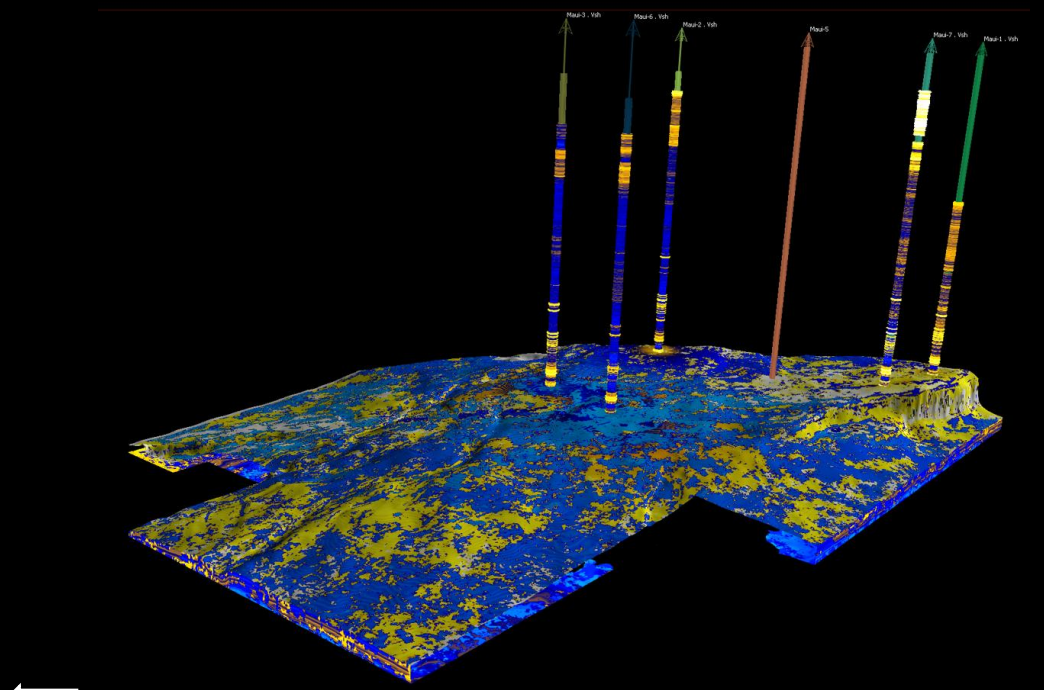
Maui 5 blind test





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Lithofacies are defined based on well-log cross plots of Vp/Vs and AI using the wells MB-03A and MB-Z(11)

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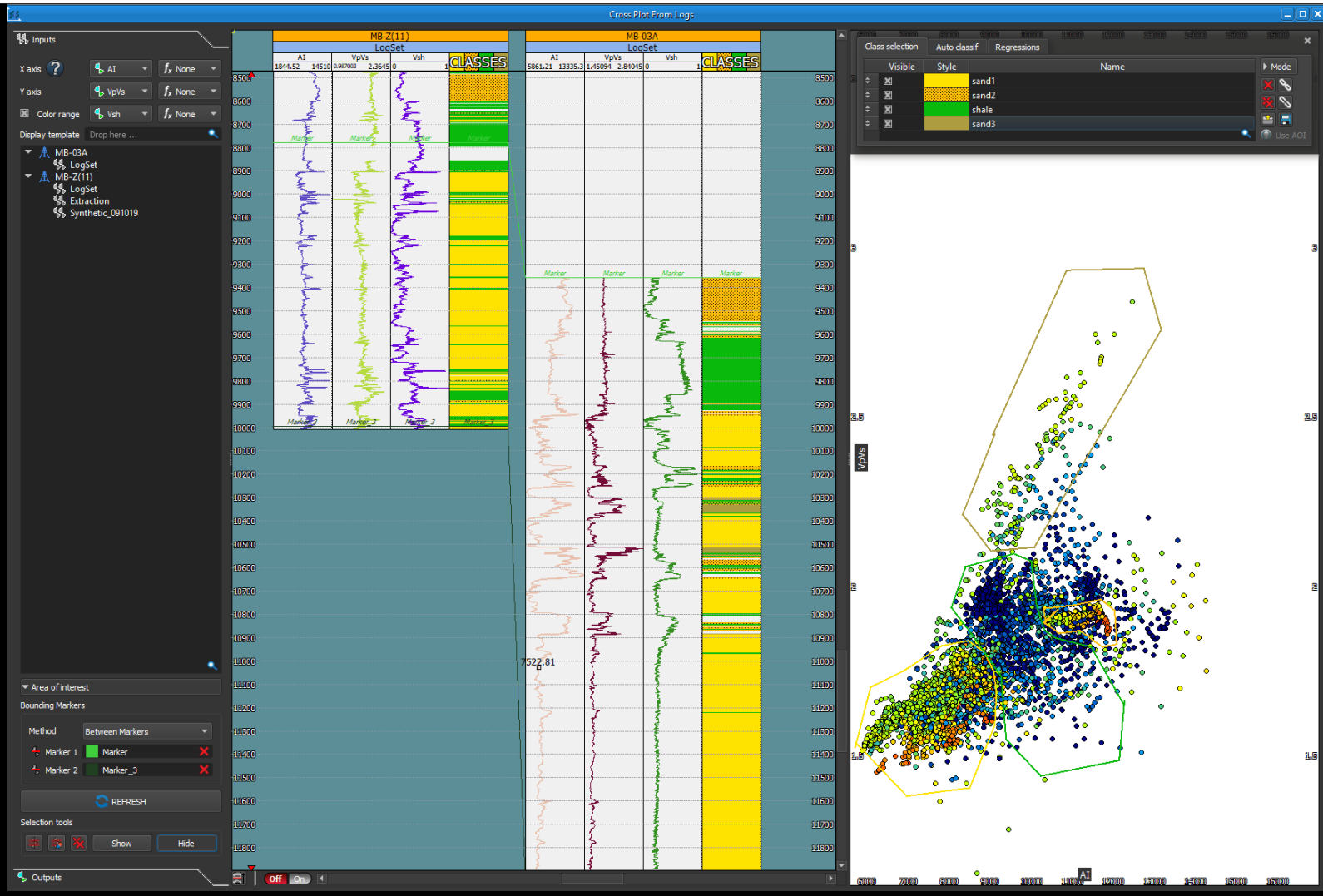
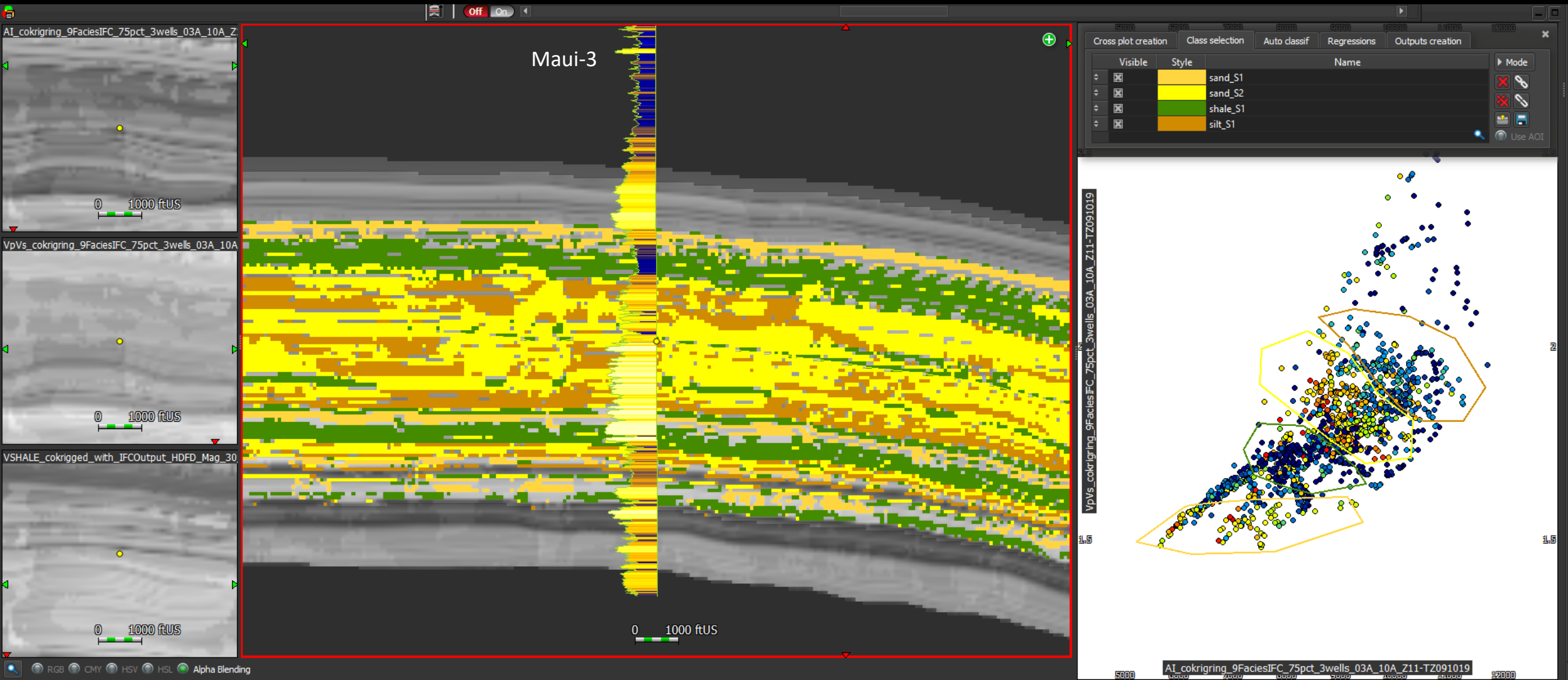


Note: having only 2 wells with Vp, Vs logs creates a major limitation. However, we will still examine workflows keeping in mind the danger of circular reasoning.

SUBSURFACE CLARITY

Lithofacies volumes can also be classified based on volume cross plots

Note: we have created Vp/Vs and AI volumes by co-kriging the well-log properties, and recognize the risk of very limited data, and potential circular reasoning..!



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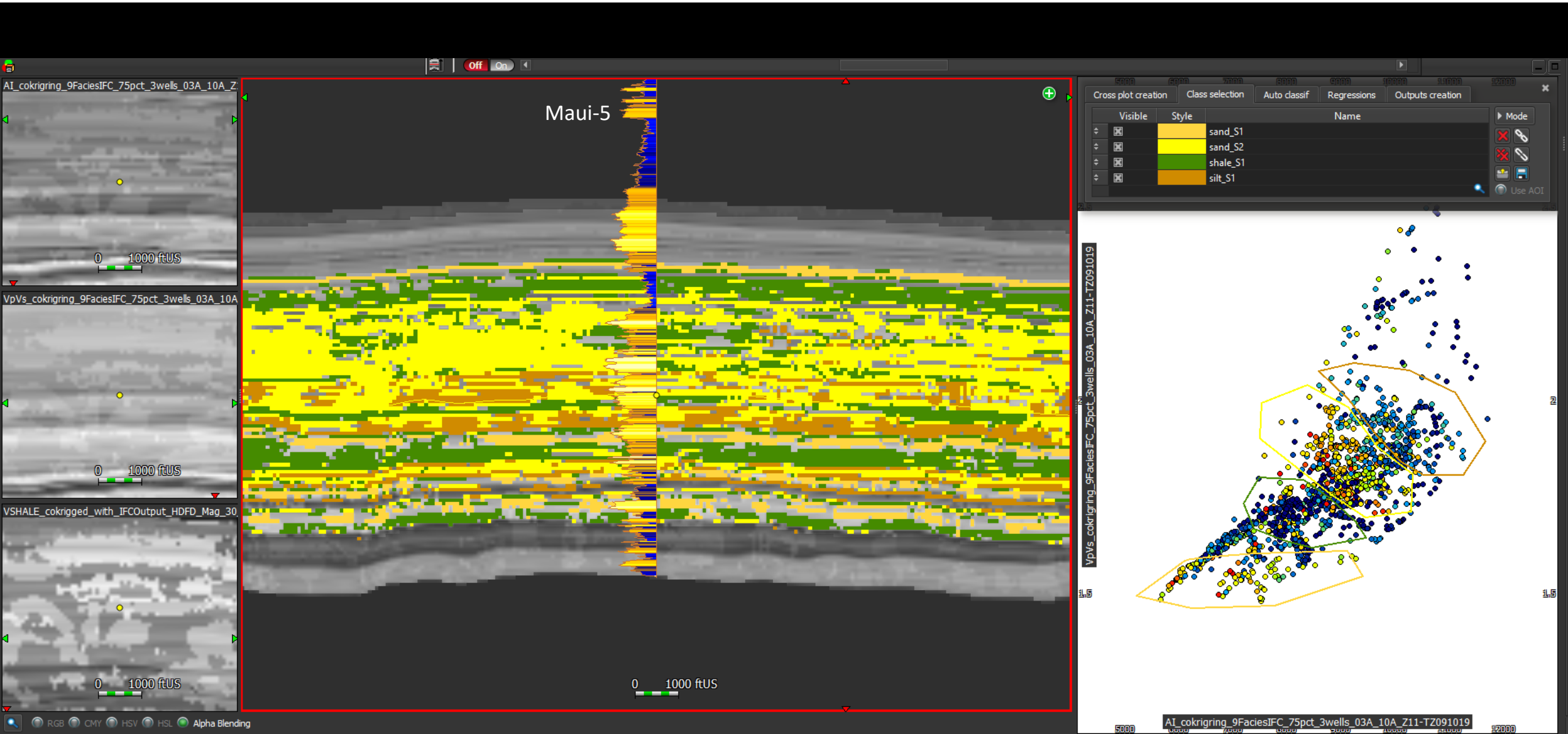

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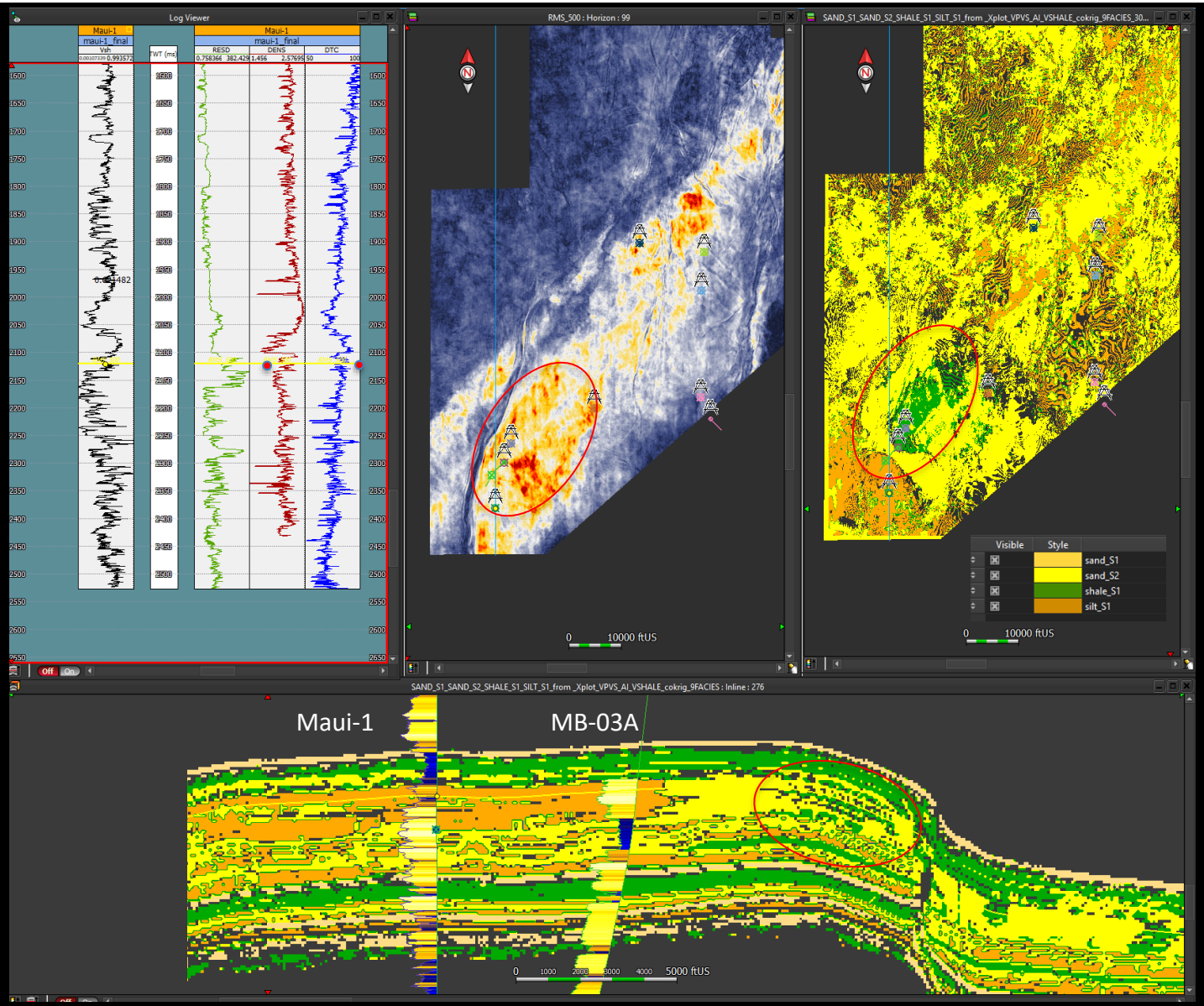
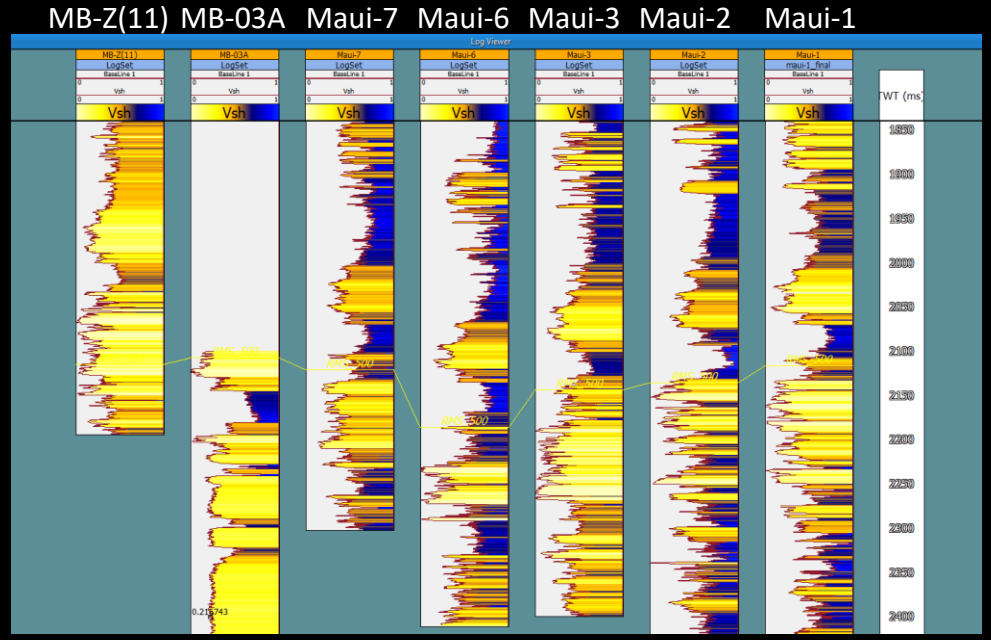
Lithofacies classification – gas sands vs. shales





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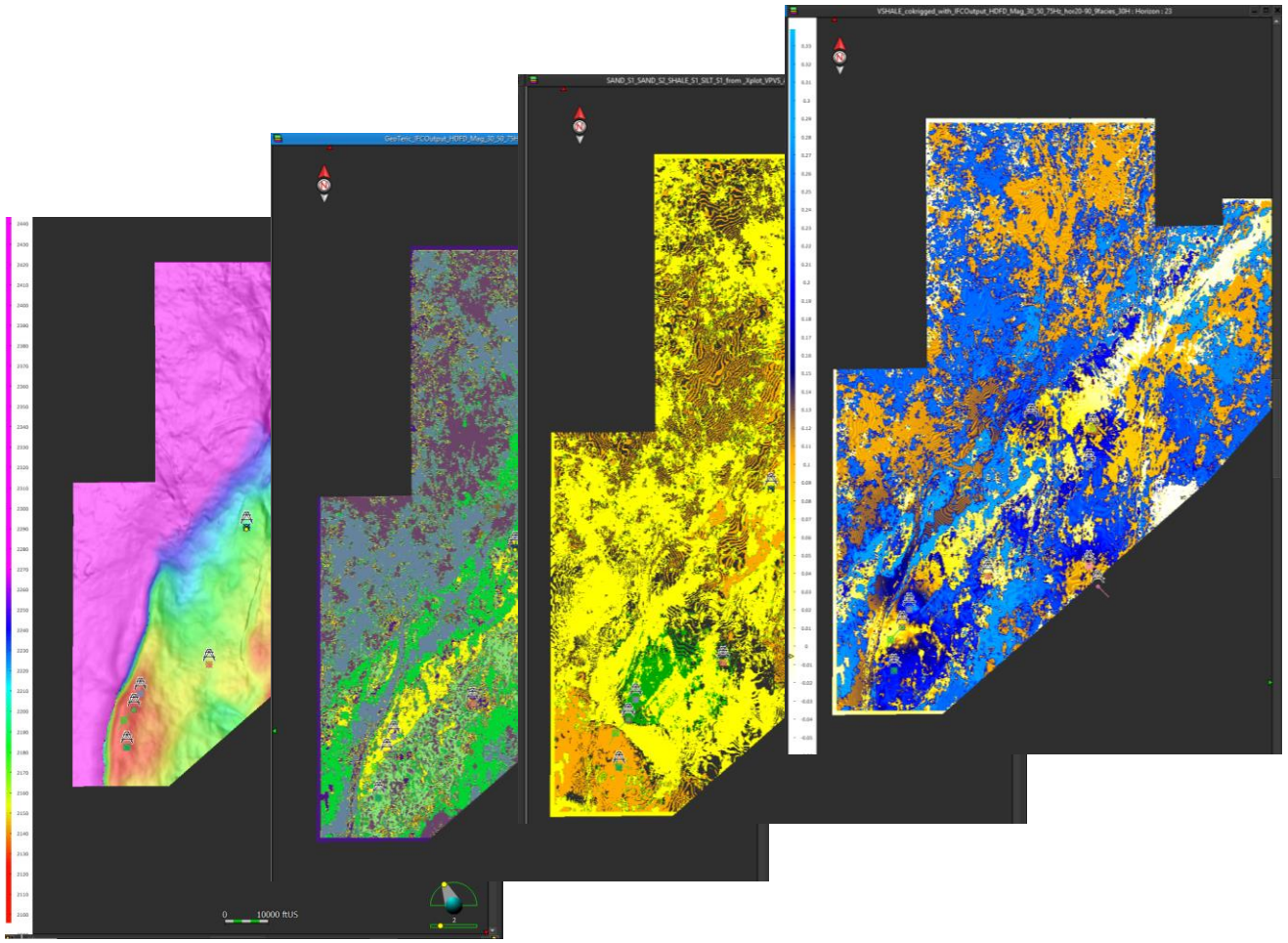
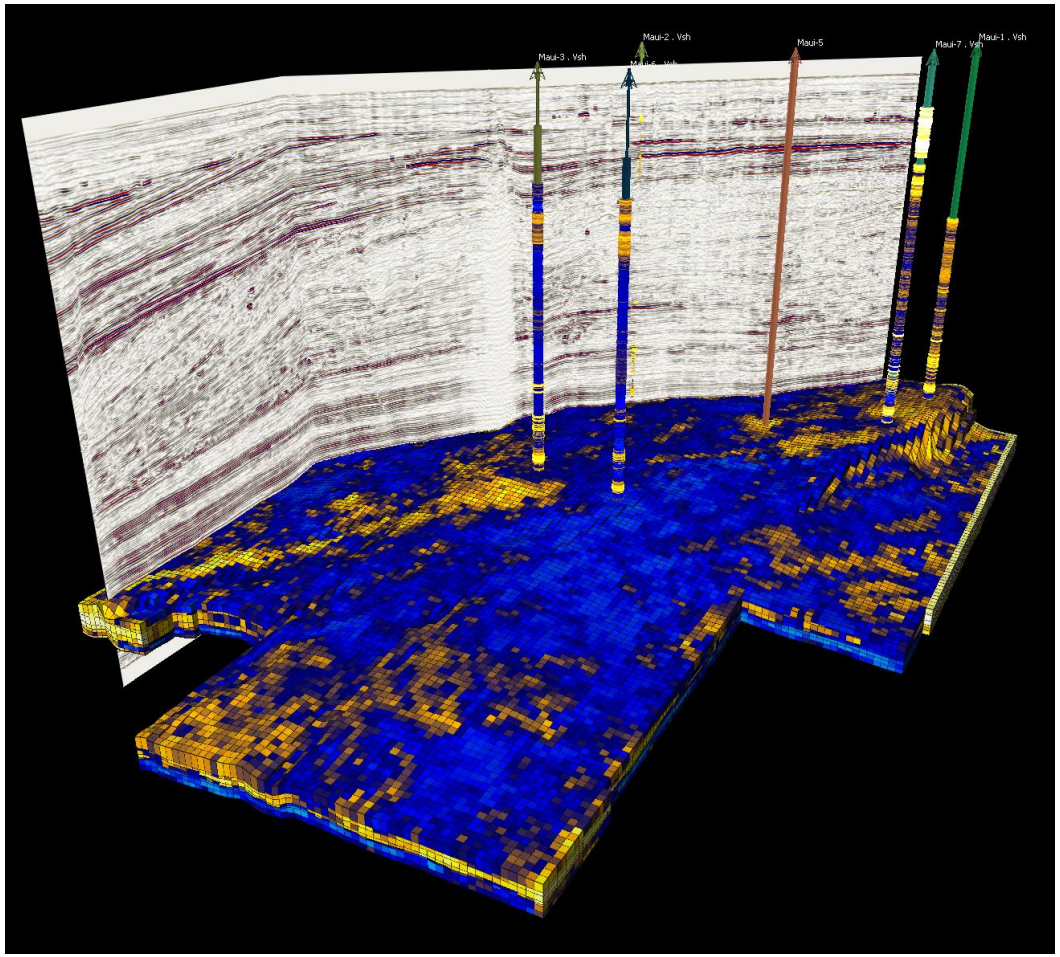
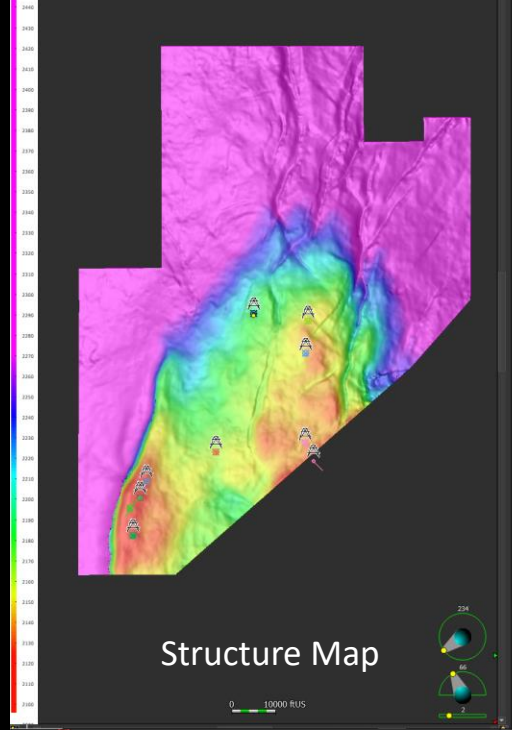
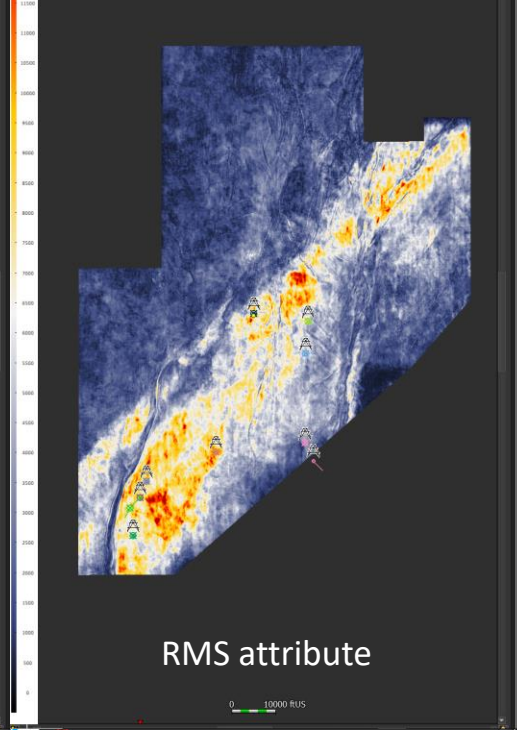
Geocellular models populated by 3D property models



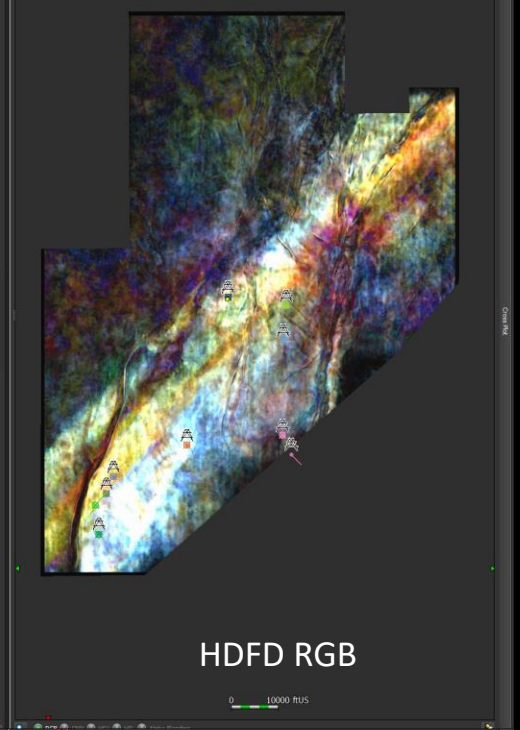




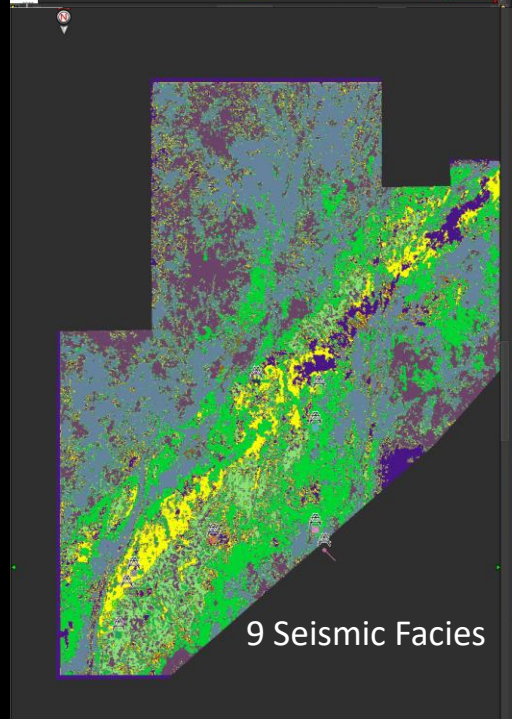
Structure Map



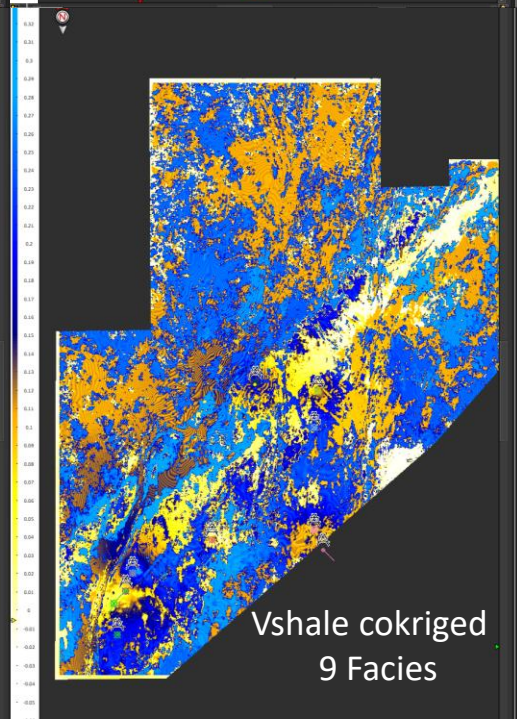
RMS attribute



HDFD RGB



9 Seismic Facies



Vshale cokriged
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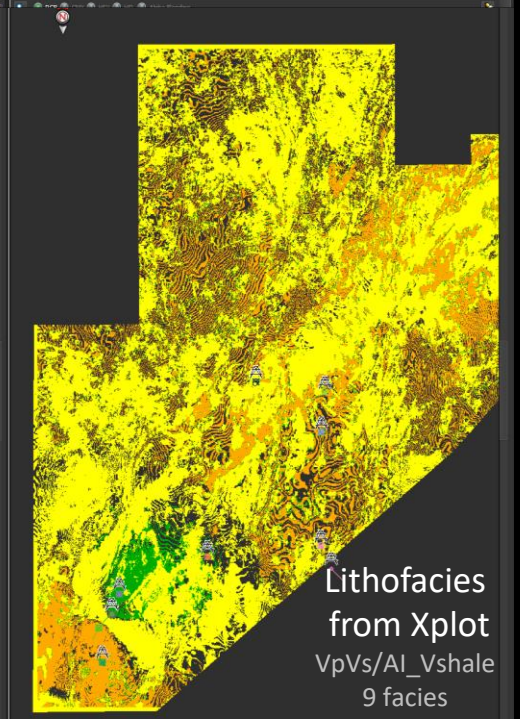

Lithofacies
from Xplot
VpVs/AI_Vshale
9 facies

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Efficient integrated workflows

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Thanks for your kind attention ….!

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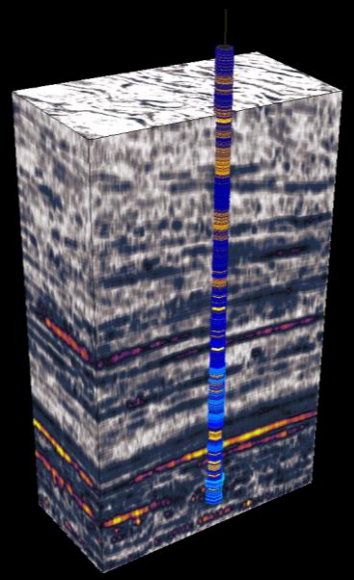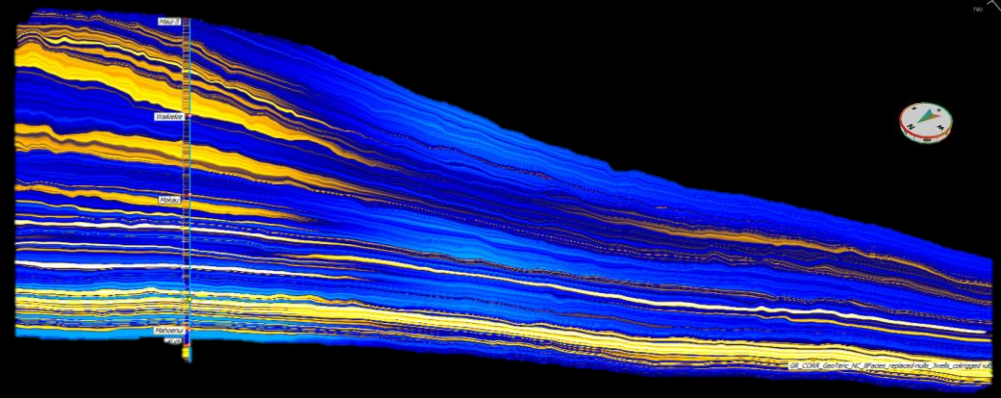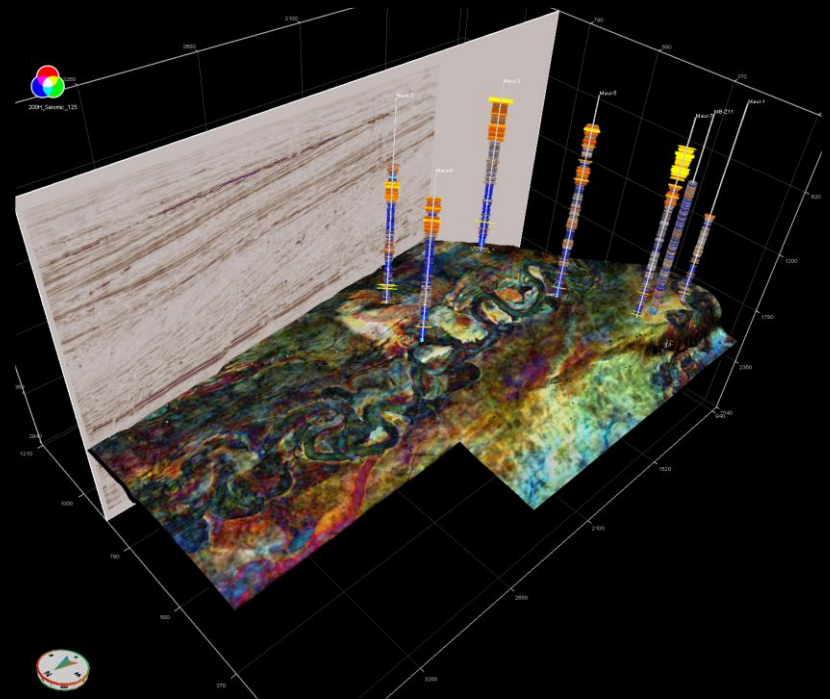
Special thanks to Eliis for their invitation to participate..!