Volumetric inversion method with integration of advanced log measurements

(NMR, Dielectric, Spectroscopy)

Mounir Belouahchia

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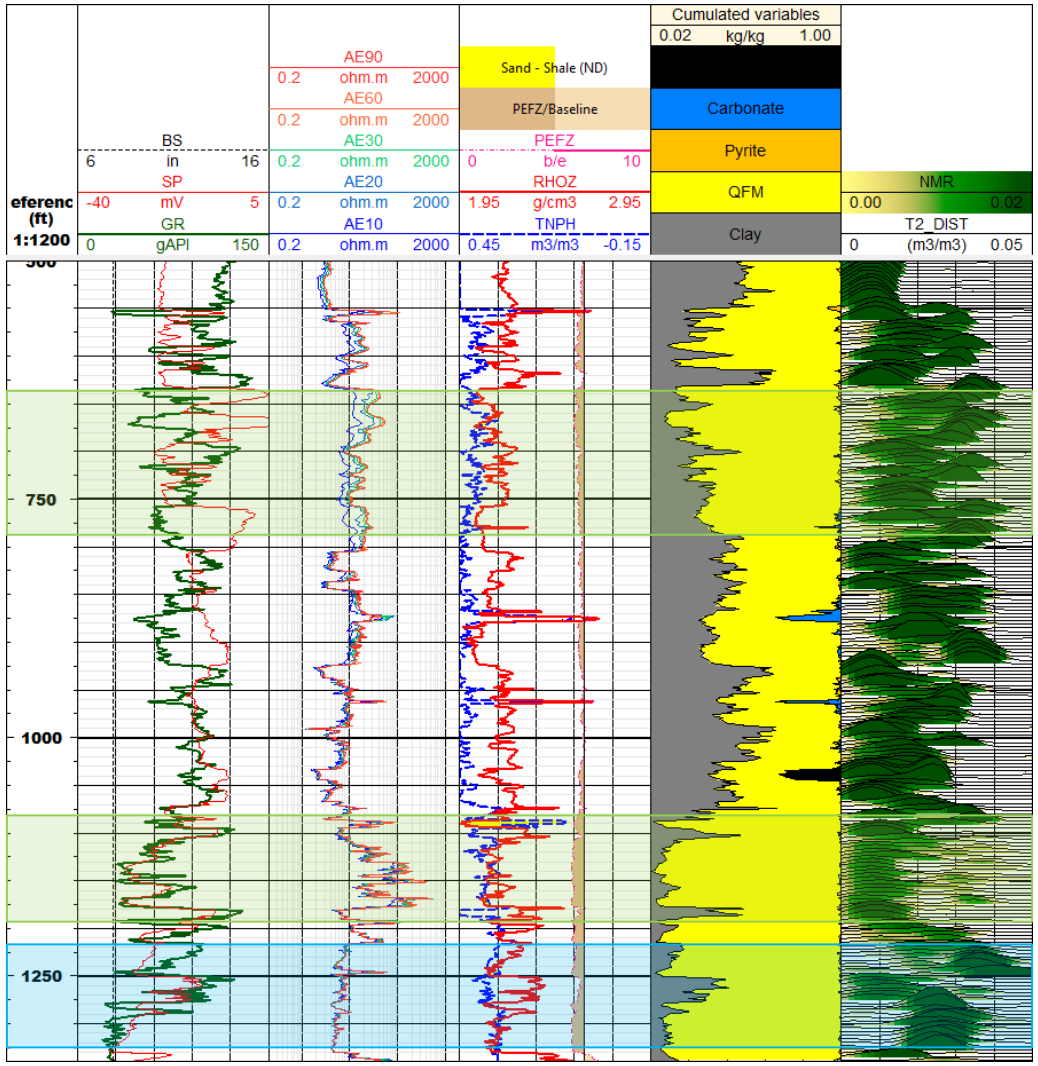
Well Overview



- ❑ Triple Combo
- ❑ Induction Resistivity
- ❑ NMR
- ❑ Spectroscopy
- ❑ Dielectric

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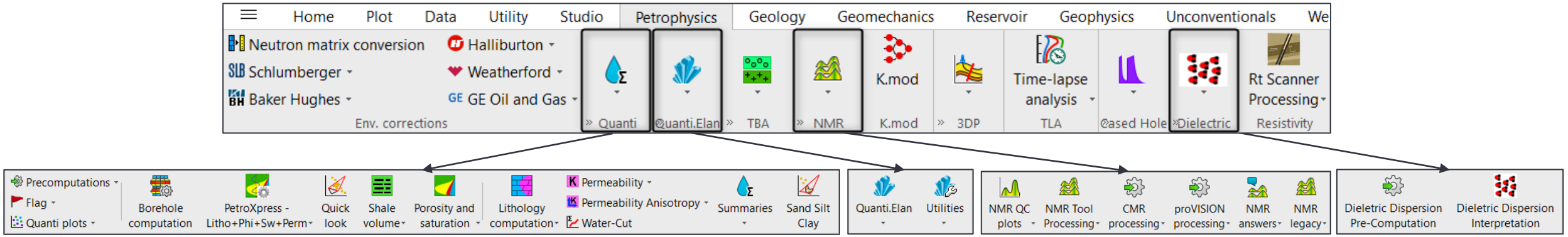
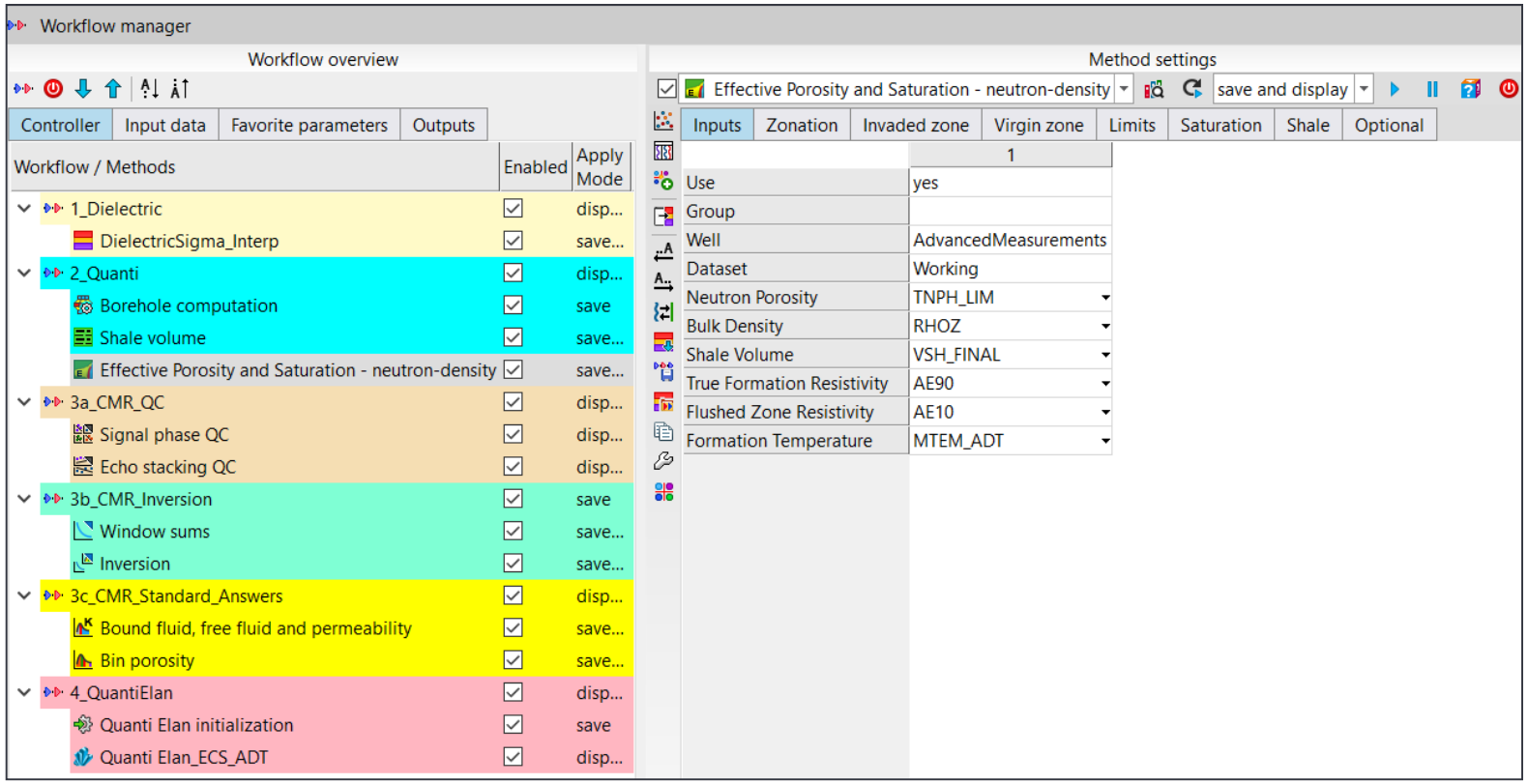


- Quick Look: Quanti
- NMR Processing & interpretation
- Dielectric
- Quanti Elan



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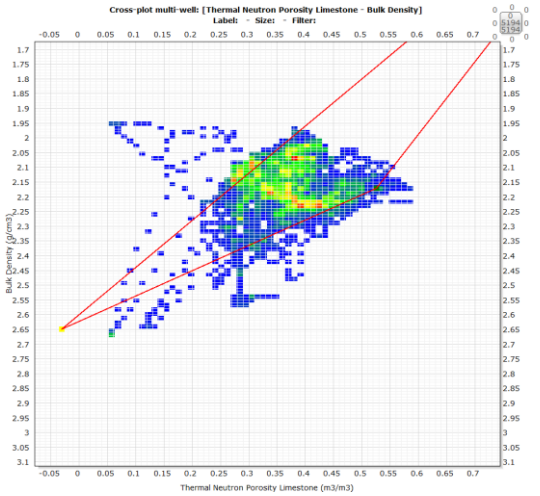
Quanti Workflow: Deterministic Approach

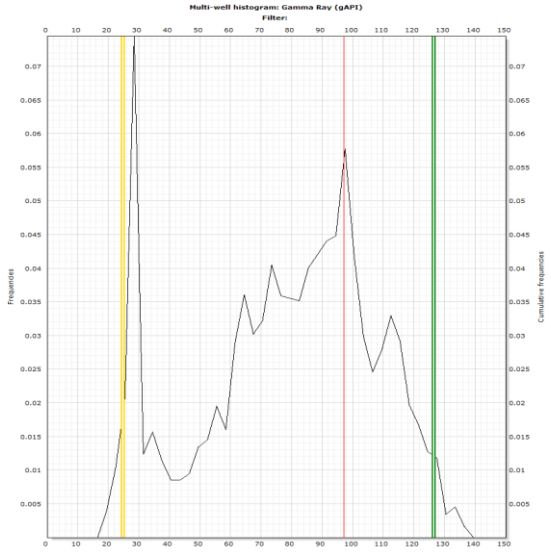
Borehole computation

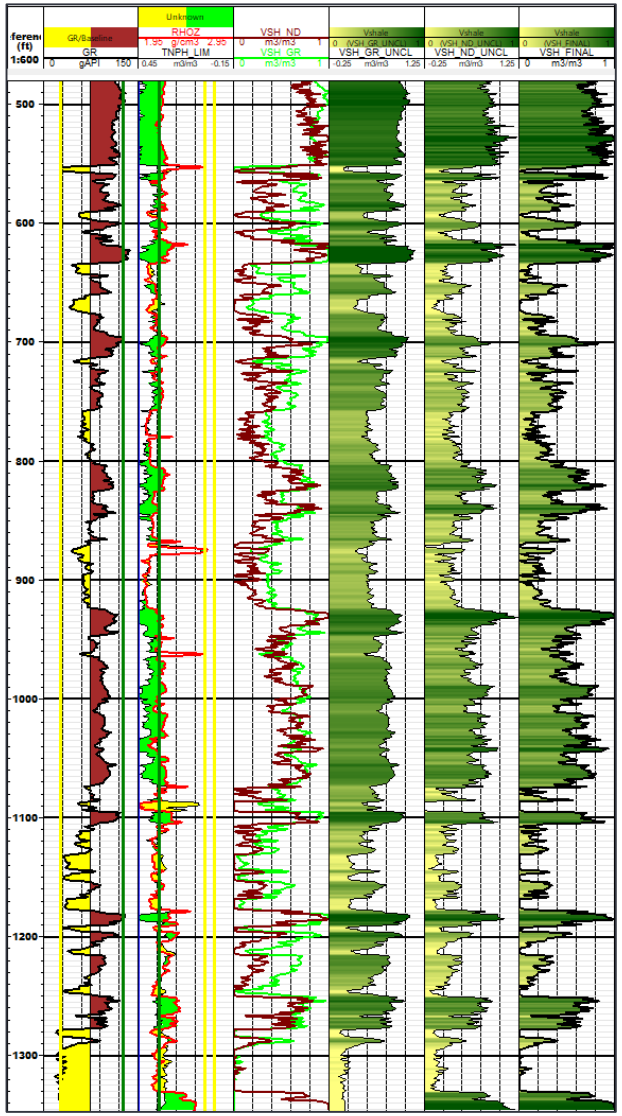
Shale Volume

Effective Porosity and Saturation

- Allows you to pick your parameters graphically
- Allows you to specify the equation you wish to use for the combination







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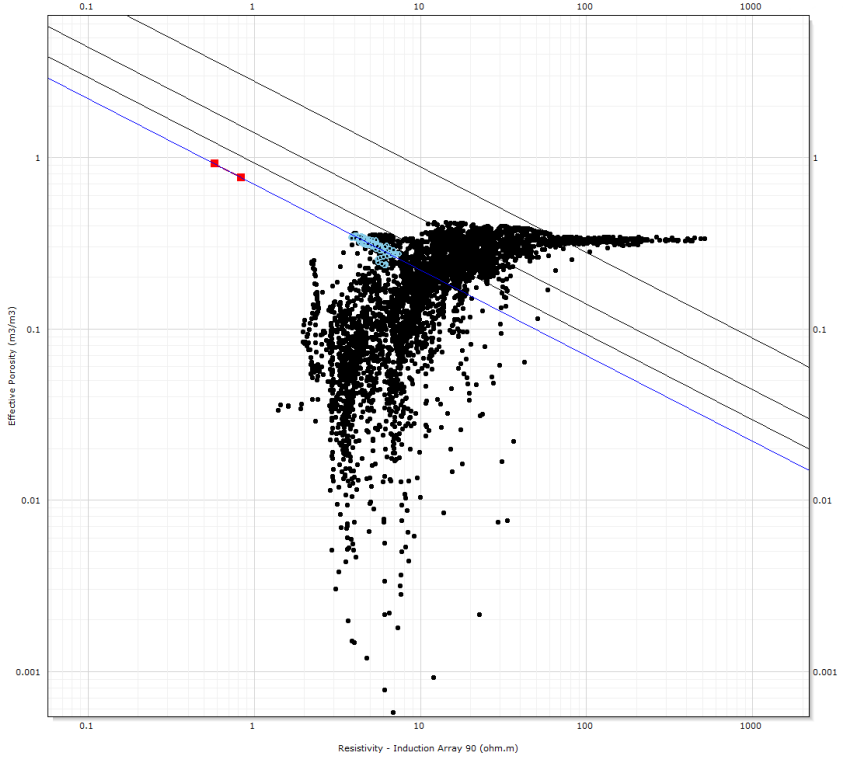
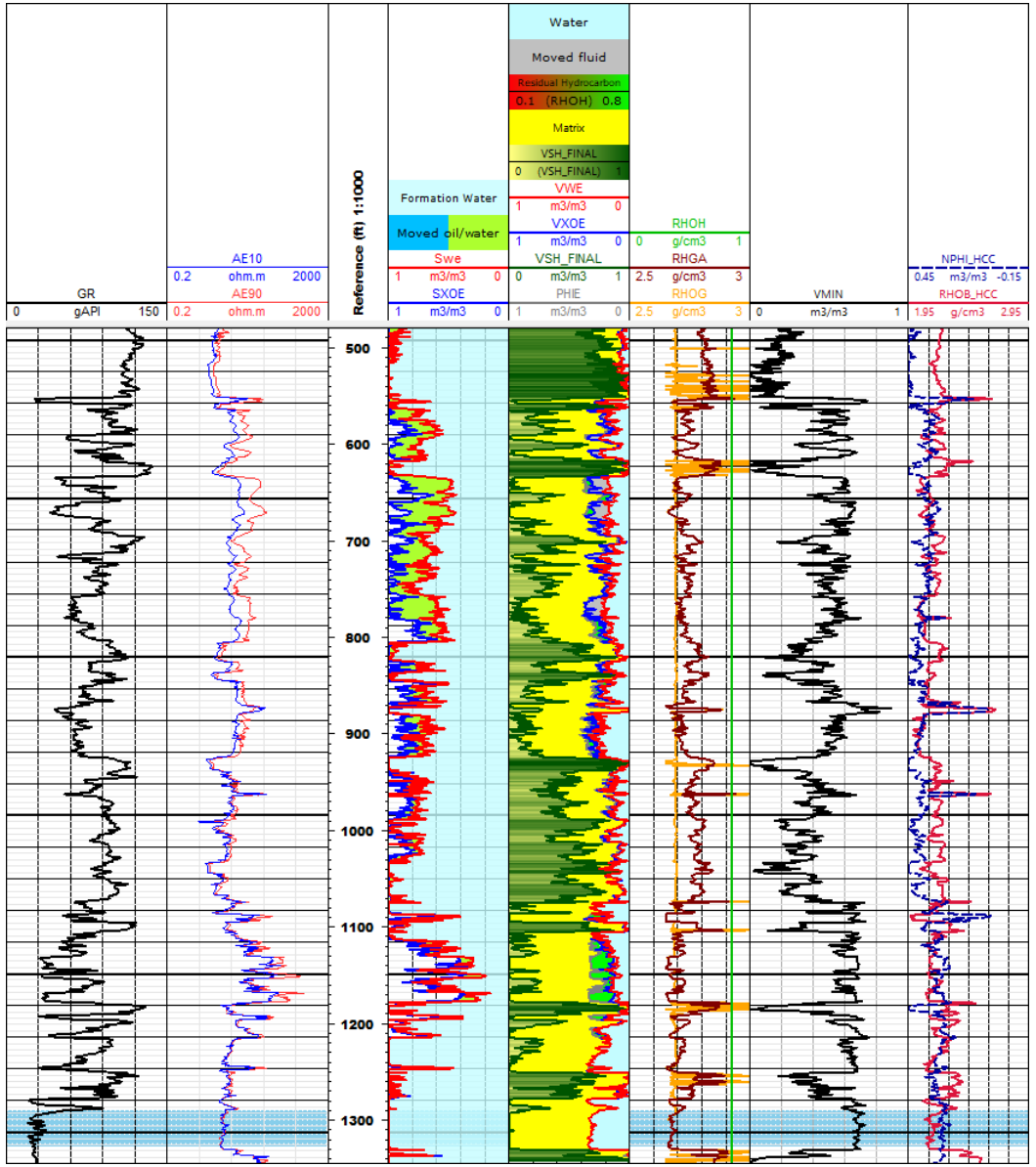


Rw = 0.5 ohm.m
m = n = 2
a = 1



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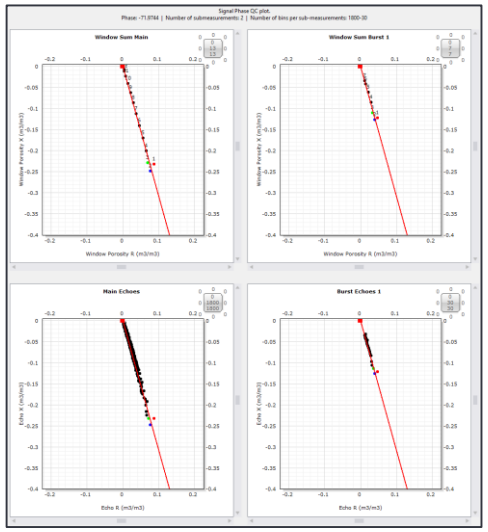
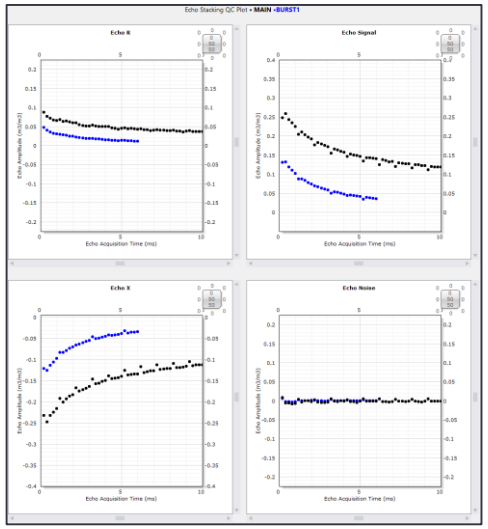
CMR Processing

Window sums

Inversion

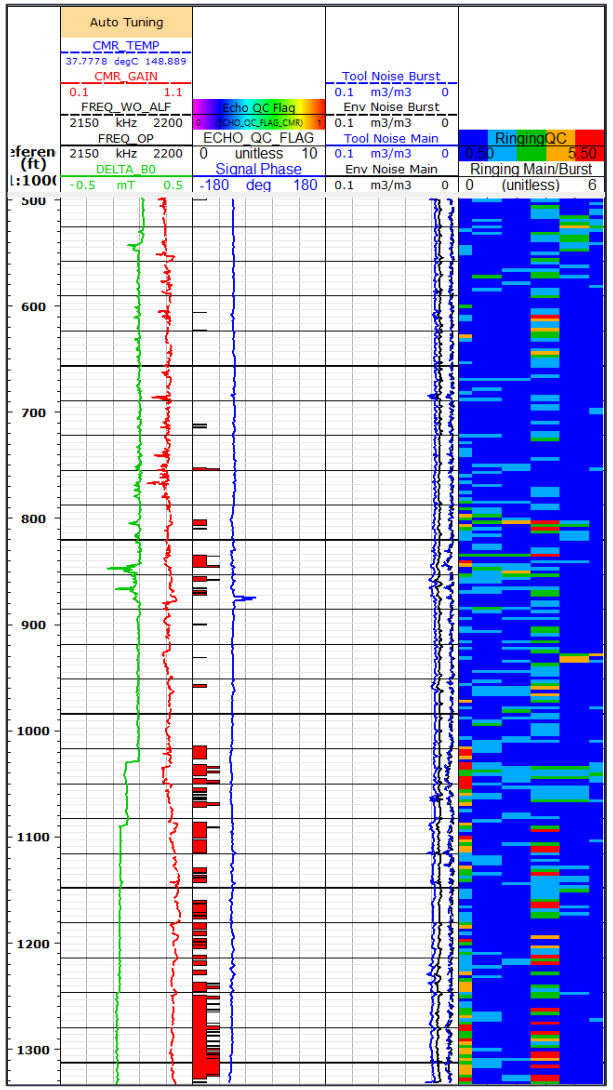
Standard Answers (BFV, FFV, Bin porosity…)



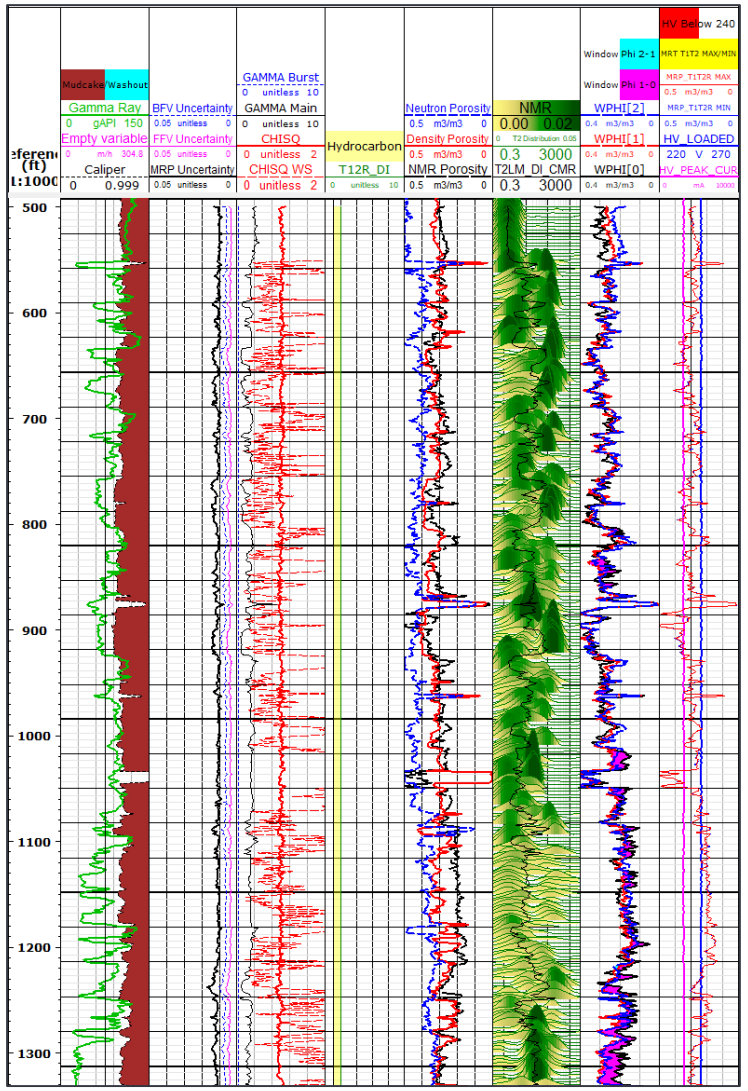


QC Plots

Window sums



Inversion



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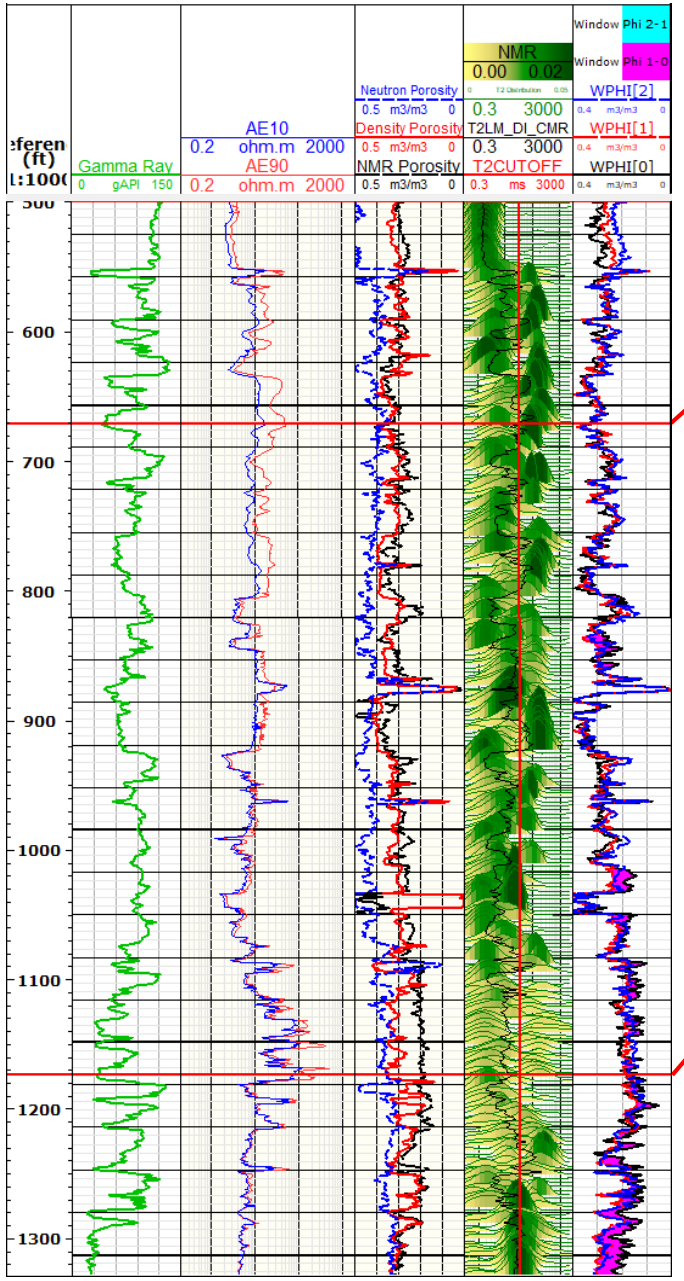
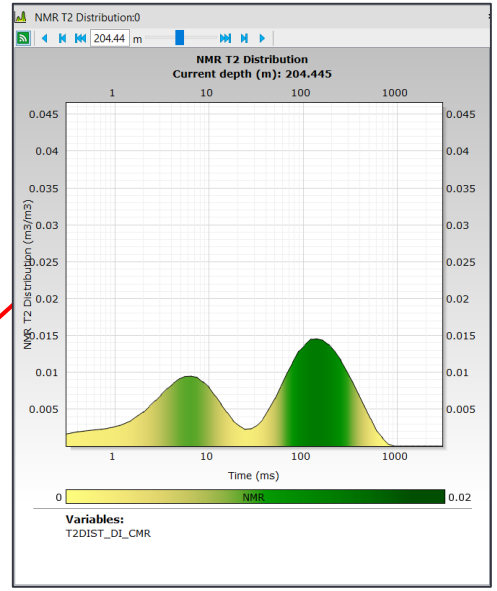
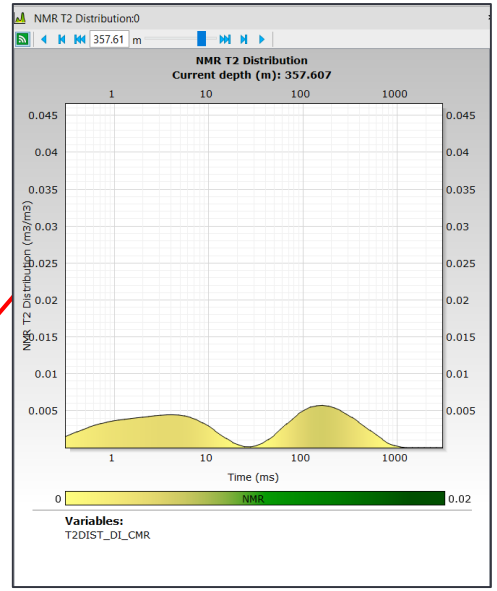
NMR Porosity

- Single Depth Plot
- Logview Synchronization







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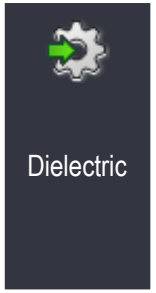
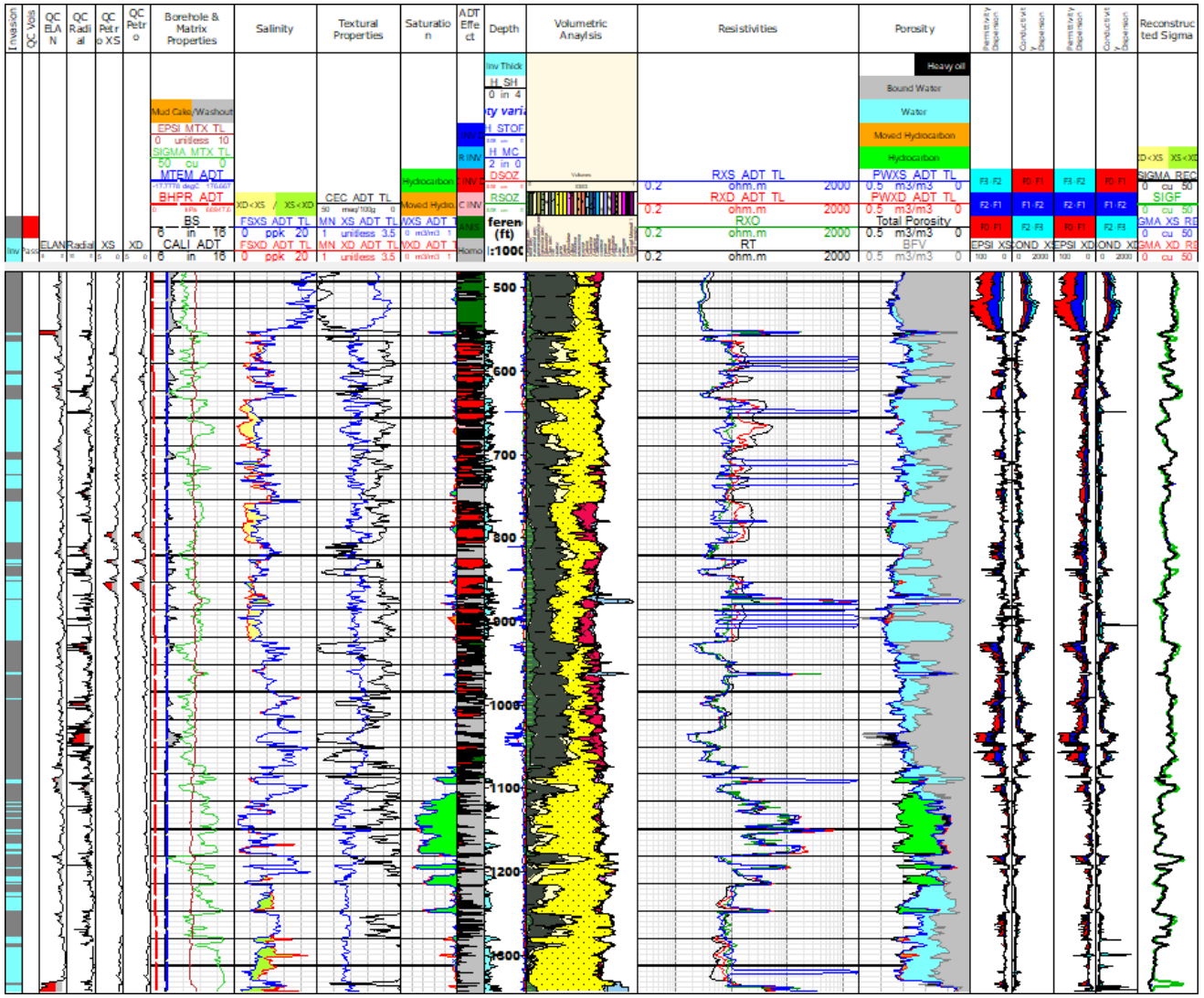
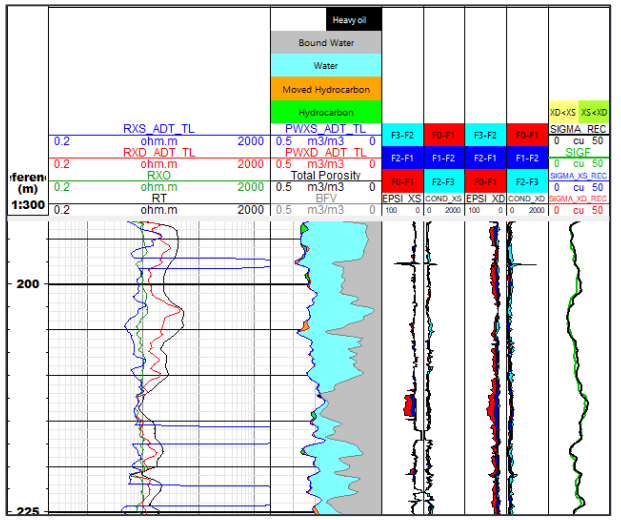
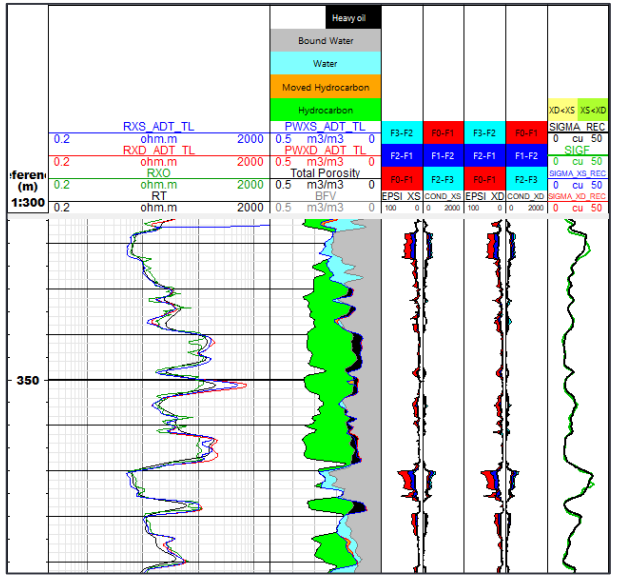
Dielectric









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Quanti Elan: Volumetric Inversion

Initialization

Quanti Elan

Quanti Elan_ECS_NMR_ADT | display

Inputs | Zonation | AdvancedMeasurements_Working

Input properties | Component Specification | Wet clays | Special Models | Additional constraints | Post-process parameters | Uncertainties

	Family	Uncertainties	Uncertainty Type	Input Weight	Jnflushed factoı	Equation type	Tool type	Constants	Activate
1	Bulk Density	0.027	Absolute	1	0.3807818	Linear		Bulk ...	yes
2	Neutron Porosity	0.015	Absolute	1	0.4895766	Linear	NPHI	Neutr...	yes
3	Compressional Slowness	2.25	Absolute	0.75	0	Linear		Com...	yes
4	Porosity	0.015	Absolute	0.5	0	Linear		Poros...	no
5	U	0.225	Absolute	0.5	0	Linear		Volu...	yes
6	UI_Gamma Ray	6	Absolute	0.3	0	Linear		Gam...	yes
7	UI_Bound Water Volume Fraction	0.015	Absolute	1	0	Linear		Boun...	no
8	UI_Silicon Weight Fraction	DWSI_SIG_WA...	Absolute	1	0	Dry Weight		Silico...	yes
9	UI_Calcium Weight Fraction	DWCA_SIG_W...	Absolute	1	0	Dry Weight		Calci...	yes
10	UI_Aluminum Weight Fraction	DWAL_SIG_WA...	Absolute	1	0	Dry Weight		Alum...	yes
11	UI_Iron Weight Fraction	DWFE_SIG_WA...	Absolute	1	0	Dry Weight		Iron ...	yes
12	UI_Titanium Weight Fraction	DWTI_SIG_WA...	Absolute	1	0	Dry Weight		Titani...	yes
13	UI_Gadolinium Weight Fraction	DWGD_SIG_W...	Absolute	1	0	Dry Weight		Gado...	yes
14	UI_PWXD_ADT_TL	0.015	Absolute	1	1	Linear			yes
15	UI_PWXS_ADT_TL	0.015	Absolute	1	0	Linear			yes

NMR

NMR

Spectroscopy

Dielectric

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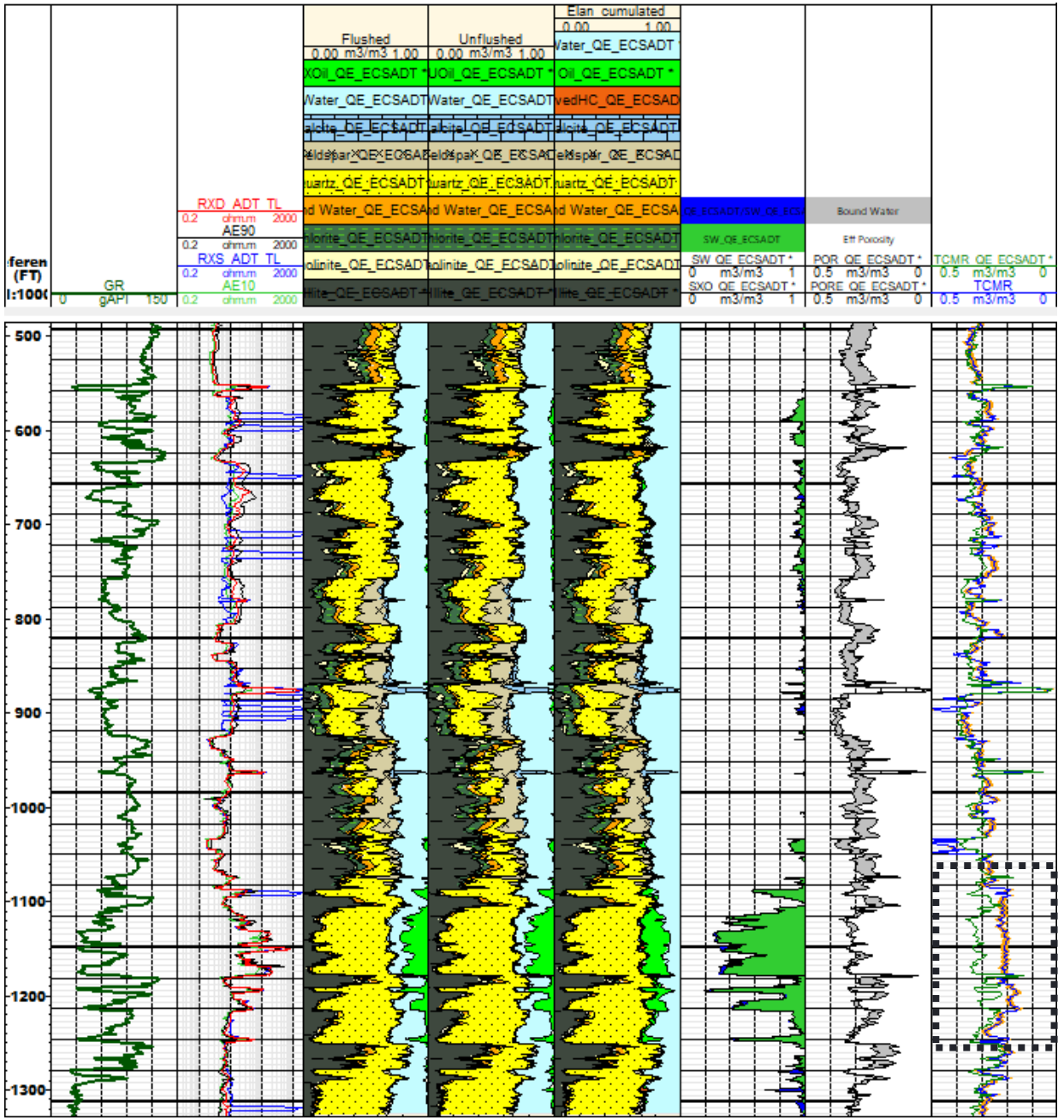
Quanti Elan

- Solves for flushed and unflushed systems
- Derives porosity



Heavy Oil

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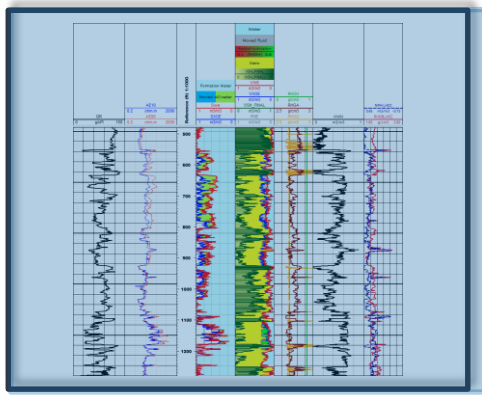
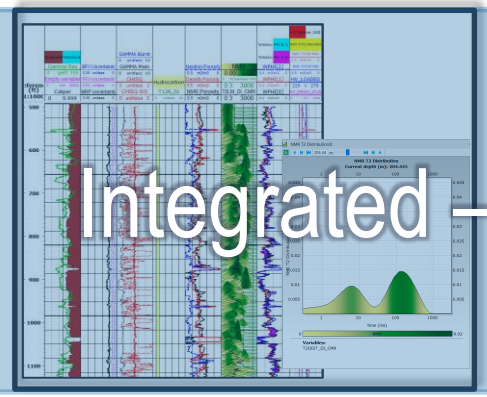
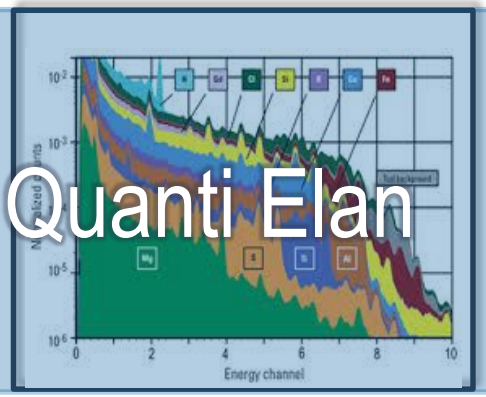
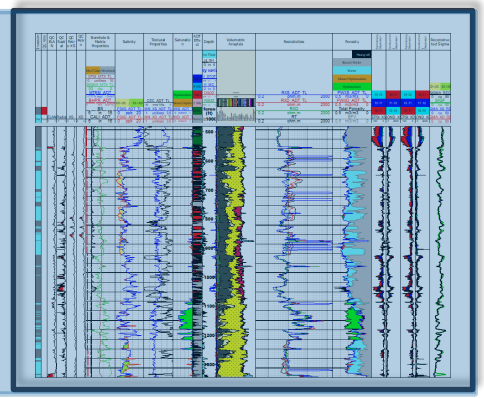
Conclusion

Triple-Combo	NMR	Elemental Spectroscopy	Dielectric
			
▪ Formation properties (Vsh, Φ, Sw…)	▪ Porosity ▪ Bound Fluid, Free Fluid	▪ Matrix ▪ Clay volumes	▪ Water-filled porosity ▪ Formation water Salinity

Techlog Wellbore Software Platform

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