

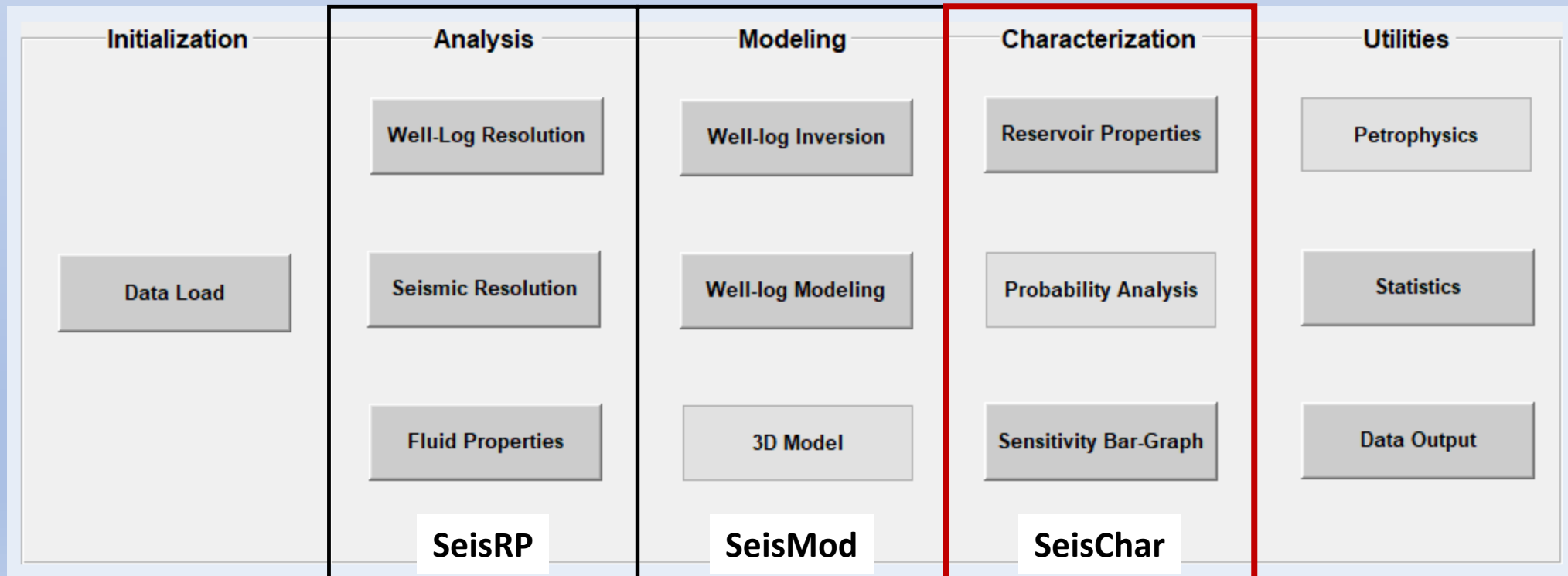
SeisChar

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SeisTool: Seismic – Rock Physics Tool



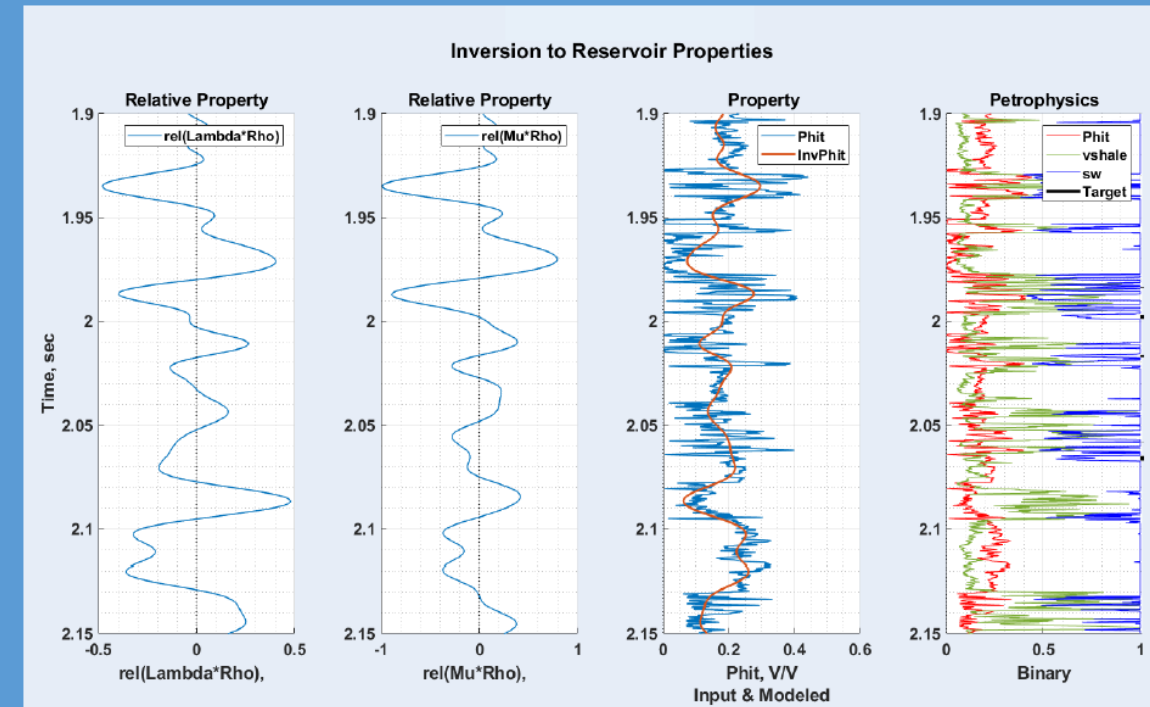
Consists of three modules, each with three programs. The analysis and modeling modules ([SeisRp](#) and [SeisMod](#)) are based on state-of-the-art rock physics relationships. These support the reservoir characterization module ([SeisChar](#)) in which parameters to compute reservoir properties (ϕ , lithology and fluids) are estimated through linear inversion of attributes computed from well-log or synthetic data



State of development to October 2019 Dark gray buttons correspond to operational programs

SeisTool: Seismic – Rock Physics Tool

- SeisRP
- SeisMod
- **SeisChar**
 - Sensitivity bar-graph. Under development. Evaluates the weight that selected attributes have in the estimation of a given reservoir property. Results are presented in bar-graph
 - **Reservoir Properties. Estimate reservoir properties through combinations of rock properties and derived properties. Parameters for estimation of reservoir properties from seismic are computed**
 - Probability Analysis. Under development



Analysis at seismic resolution (binary petrophysical evaluation)

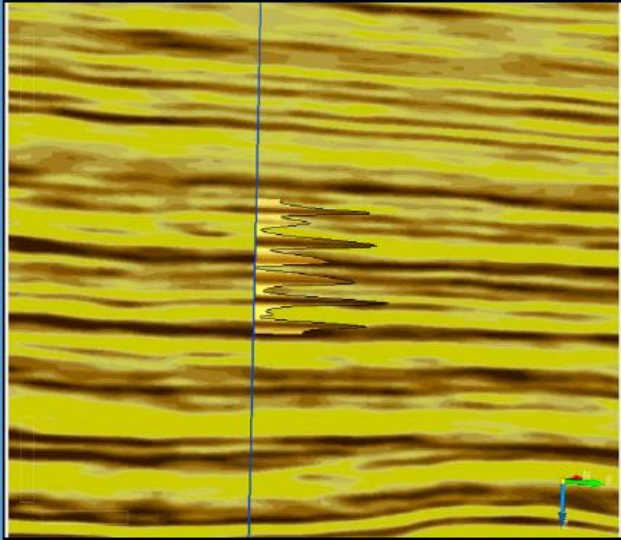
Relative $\lambda\rho$ (track 1) and relative $\mu\rho$ (track 2) are combined to estimate porosity (brown curve in track three).

The linear combination of relative rock properties is equivalent to a coordinate rotation (150°) of attributes

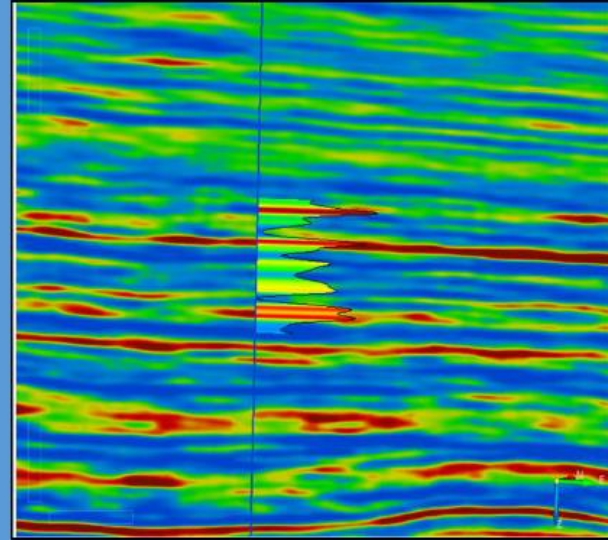
$$\text{Phit} = +0.1623 + 0.1475 \cdot \text{ROT}[\text{rel}(\text{Lambda}^*\text{Rho}), \text{rel}(\text{Mu}^*\text{Rho}), +150.0 \text{ deg}]$$

SeisChar: Reservoir Properties

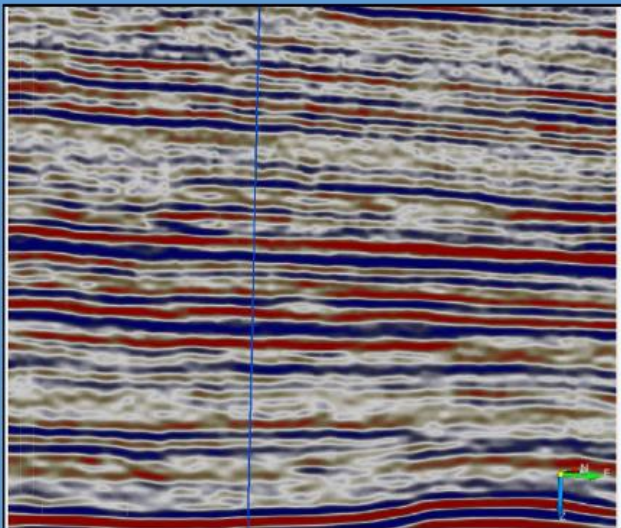
VShale



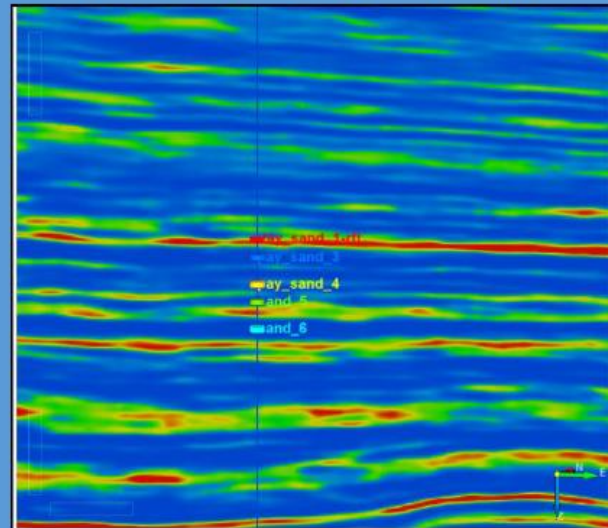
Phit



Initial stack



Reservoir quality : $\text{phit} \cdot (1 - V_{\text{Sh}})$

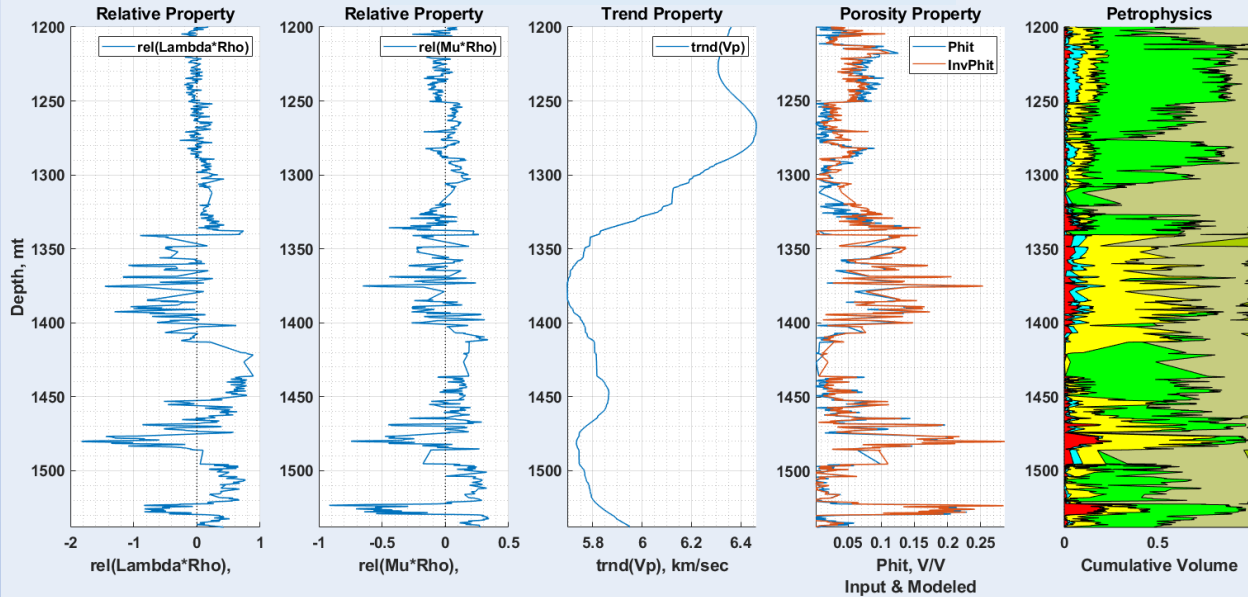


Reservoir properties from seismic

The upper images show the reservoir properties (porosity and lithology) estimated from seismic data. The log trace along the well is the reservoir property that was computed from well-log data at seismic resolution (previous slide).

The lower left image is the initial stack and the lower right is the reservoir quality computed from the porosity and lithology cubes

Well: NMR Petrophysics #1 Pay
Inversion to Reservoir Properties

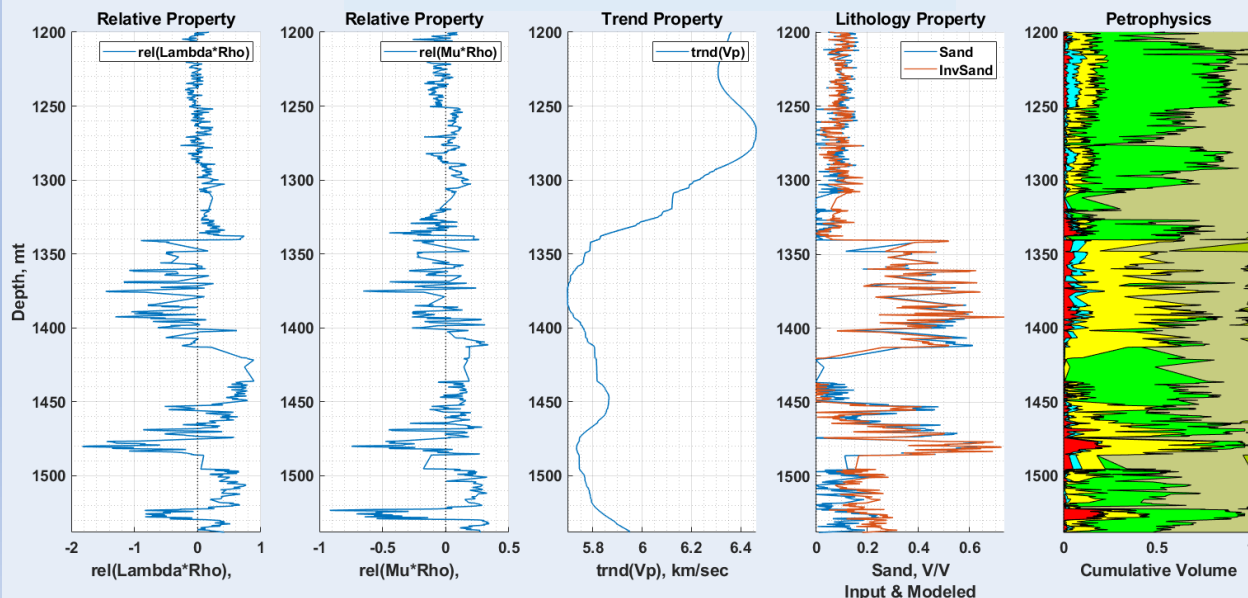


SeisChar: Reservoir Properties

Reservoir properties in a multi-mineral well. Well-log resolution

The images show the estimation of porosity and Sand volume from combinations of $rel(\lambda\rho)$, $rel(\mu\rho)$ and the low frequency trend of V_p (trend(V_p)).

Well: NMR Petrophysics #1 Pay
Inversion to Reservoir Properties

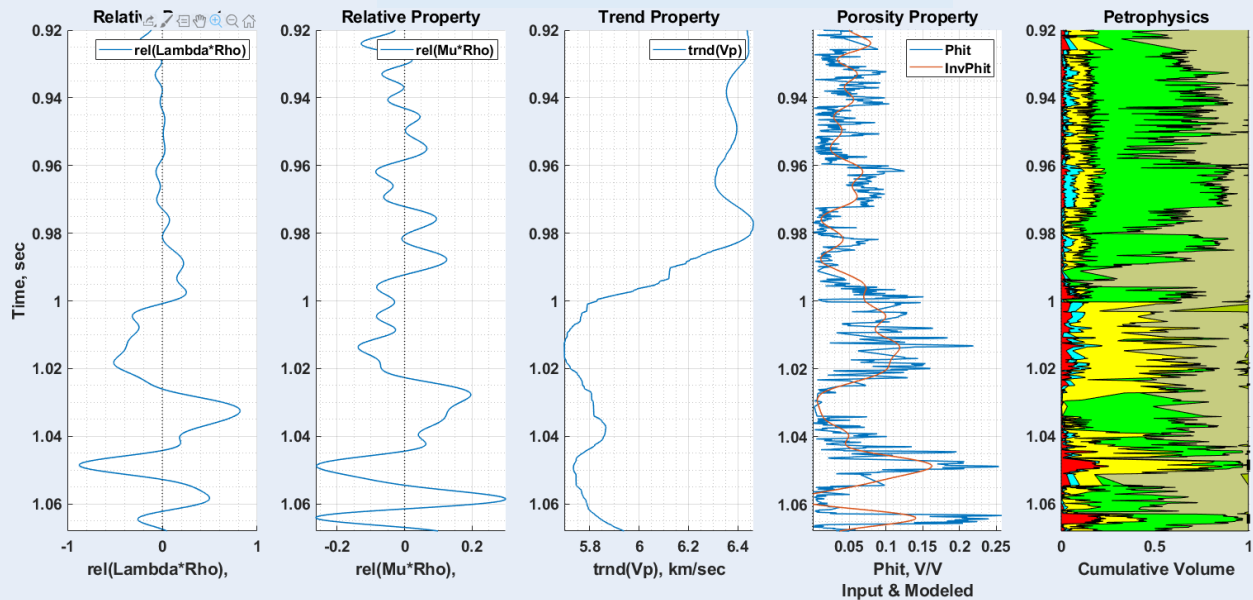


Estimation of reservoir properties required, in this well, a low frequency trend; hence the use of trend(V_p). Migration velocities can provide the low frequency trend when estimating reservoir properties from seismic data.

The brown line in the fourth track is the estimated reservoir property. The blue line in the same track is the reservoir property log

The next slide shows the equivalent estimations at seismic resolution.

Well: NMR Petrophysics #1 Pay
Inversion to Reservoir Properties

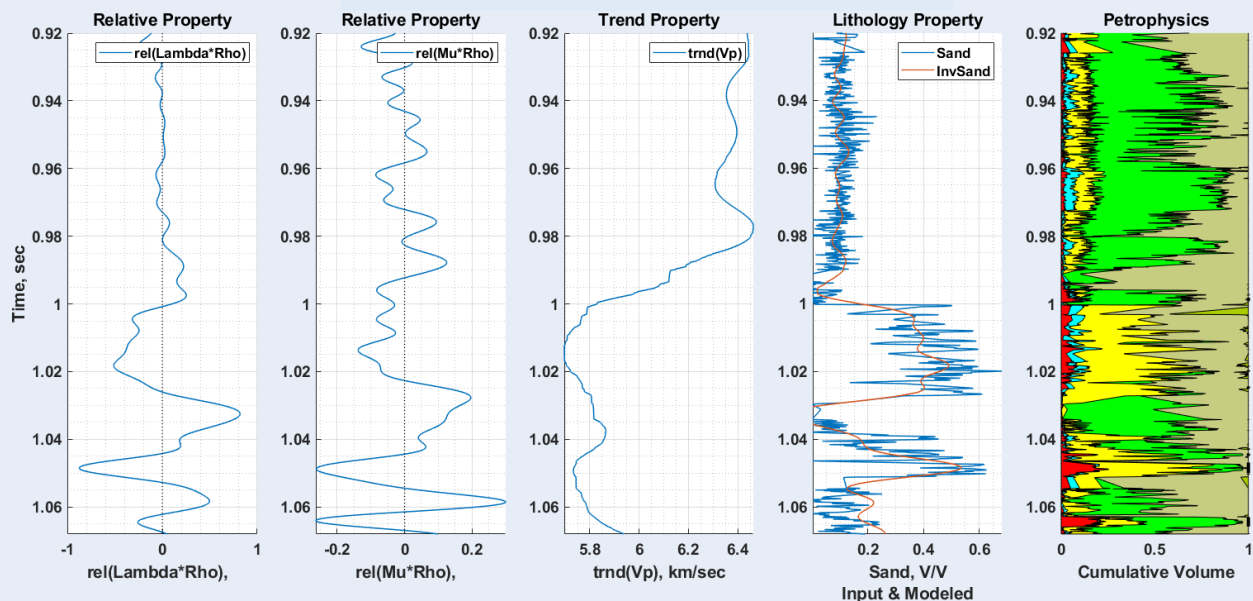


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The previous slide shows the equivalent estimations at well-log resolution.