CAYROSsolutions

Complex 3-D Geological Modeling

"Cayros: The opportunity not to be missed"

3D STATIC MODELING

- Data base creation and validation
- Well log correlation and Mapping
- Seismic Interpretation
- Structural framework in time & depth domains
- Velocity Modeling & Depth Conversion
- 3D Geometrical Modeling, Zonation & layering structure
- Upscale petrophysical properties.
- Seismic Attributes & Seismic Facies & Petrophysics Data Integration.
- Facies model using stochastic and deterministic models
- Stochastic properties distribution

INTEGRATED WORKFLOW


STRUCTURAL FRAMEWORK


STRATIGRAPHIC MODELING


LITHOLOGY & FACIES MODELING


GEOCHEMISTRY & BASIN MODELING


ROCK PROPERTIES MODELING


DYNAMIC MODELING


RESERVOIR MANAGEMENT

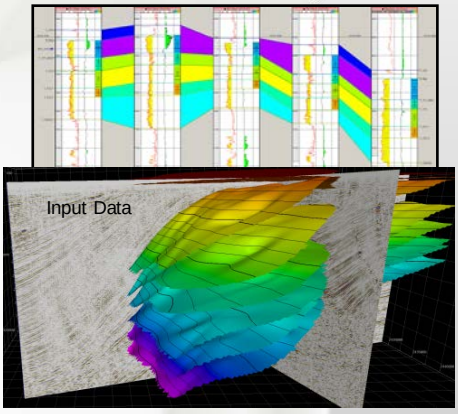
Reservoir modeling is the art of combining information from a variety of engineering and scientific disciplines, most of them indirect measurements of the subsurface, to recreate a 3D version of a reservoir. These geo-fantasy models are not just the result of high-tech software and expensive hardware, but also of our understanding the close relationship between all disciplines involved in reservoir characterization studies. Each reservoir has its unique fingerprint, and different types and volumes of data needed to build a model are available – that's why high-quality, customized workflows need to be created when starting a new 3D model.

Cayros Solutions is an expert at building 3D models for different tectonic settings, clastic and carbonates reservoirs, exploration prospects, green and brown fields, creating innovative solutions to face the challenges associated with each model.

Likewise, Cayros Solutions has developed a unique "modeling while interpreting" methodology, which not only reduces the timeframe to build a 3D reservoir model, but also allows real-time integration and validation of the information coming from geosciences and engineering, making it possible to identify any misinterpretation and generate new scenarios to deal with any uncertainties.

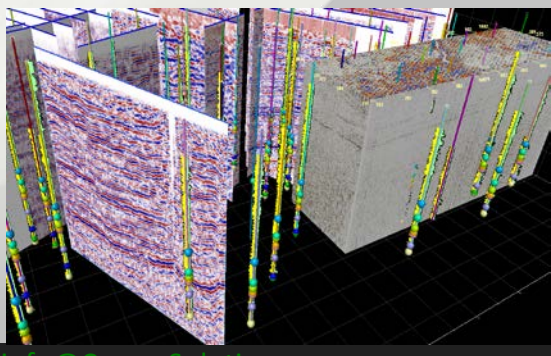
Database creation / mapping

Data loading and quality control are key to ensure the overall quality and accuracy of a 3D model. Selecting the right geographic projection system and the appropriate unit system can prevent errors when running calculations. Well data and stratigraphic information can be screened with structural mapping, isocore mapping and cross-plotting graphs, which help to identify outliers.



A complete database composed of seismic information (2D and 3D) and interpretation, velocity data and checks-shots, RE information such as completion information, perforations, casings, production rates, pressure data and more is also created. Finally, cultural data is also critical, including lease limits, topographic information, rivers and road trajectories, etc. All these elements help us build a 3D model.

A successful modeling project integrates environmental considerations, topographic characteristics and surface facilities with the subsurface, providing a portfolio of development opportunities that considers all uncertainties and risks associated with them.



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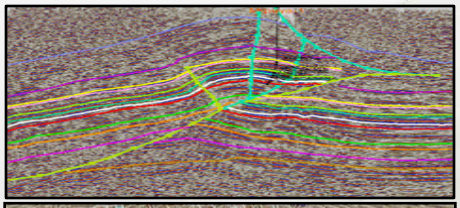
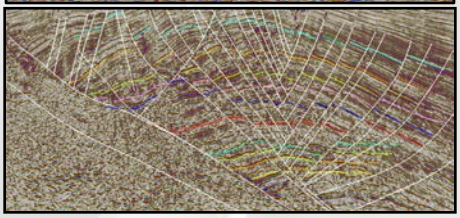
Structural framework

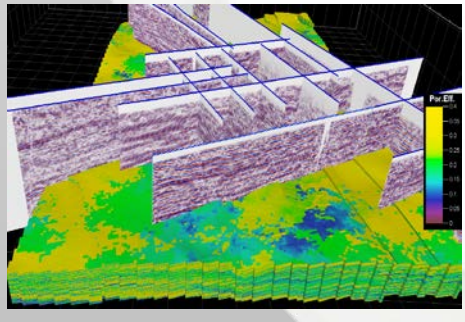
Complex compressional and extensional settings have being successfully modeled for areas including South America trust fold belts and the normal faults of Columbus basin.





Time & Depth 3D Modeling

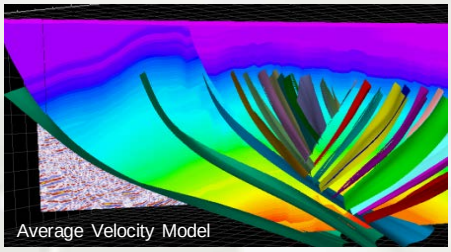
In order to capture the structural complexity of a particular model and its reflectivity behavior related to rock physics, the 3D modeling process begins with building solid models in the time domain using the interpreted horizons and faults, tied to well data. After the time-depth conversion process, the 3D modeling in the depth domain is enriched will all well data.



Time-Depth Conversion Modeling

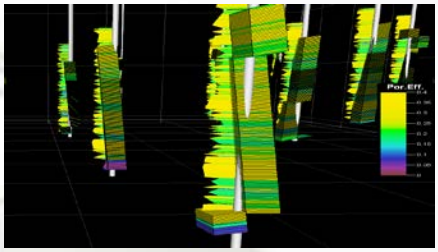
Having a 3D model in the time domain provides the flexibility of building multiple geo-cellular time-depth conversion models, where seismic velocity anomalies can be inserted inside the model in different ways.

In recent years, we have developed different approaches to building conversion models, based on the focus of the project, small scale infill development programs and large scale exploration prospects.



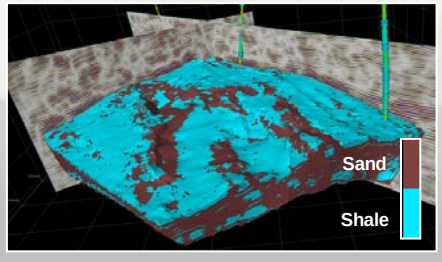
Upscale methods

To properly capture the well log data inside a model, there are two critical factors: 1) Layering and 2) The upscale method. Each petrophysical property has a particular data distribution and requires particular scaling methods.



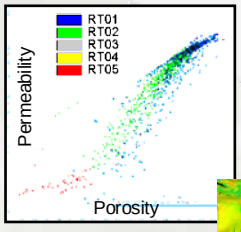
Facies modeling

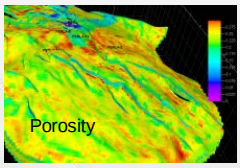
Cayros Solutions and its advisors have successfully modeled carbonate and clastic reservoir, using a wide variety of deterministic and stochastic methods, where the facies models are carefully tied to sedimentological studies, core data information and seismic Inversion volumes.

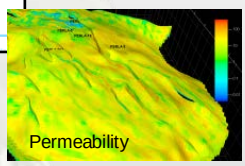


Properties distribution

The close relationship between sedimentary facies, rock types and petrophysical properties, and a solid geostatistical background are required to populate the properties of a 3D model.

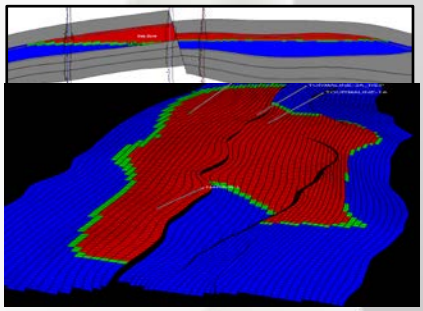






Volumetric estimation

3D models also give the possibility to have not only one deterministic volume, but estimate multiple scenarios, which, for example, consider properties variations and so on.



Structural Uncertainty

When converting seismic interpreted surfaces from the time domain to the depth domain, uncertainty regarding areas without well control is a given. The structural uncertainty allows us to assess the impact of overestimated or underestimated seismic velocities in the conversion and impact on volumetric estimation.