USE OF SEISMIC TO CONSTRAIN GEOSTATISTICAL RESERVOIR MODELS: A QUANTITATIVE APPROACH USING PROPORTIONS OF FACIES

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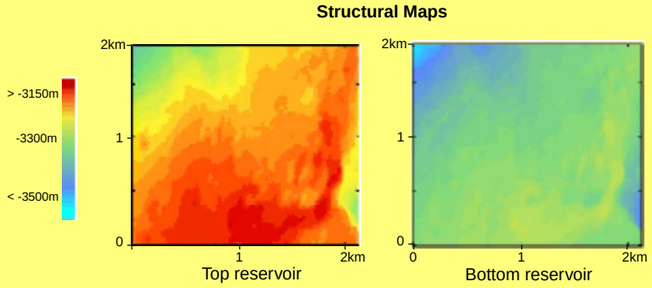
RML - HERESIM WORKFLOW

Abstract

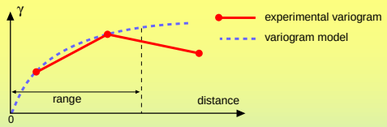
Well data are the main data which are used to build geological probabilistic models in terms of lithological description and petrophysical characteristics, associated with the control of the stratigraphic depositional environment. However, their spatial coverage is low, even at a development stage. Thus a lot of recent research works have focussed on the introduction in probabilistic models of secondary data characterized by a relationship, often indirect, with the reservoir properties. These secondary constraints as seismic data have a good spatial coverage but a different measurement scale than geology. Previous works have widely present new algorithms but the practical aspects of seismic information integration in the geological models are not enough developped.

The objective of this paper is to present a complete analysis and evaluation of the real impact of these seismic derived constraints on the reservoir model in terms of reduction of uncertainties, heterogeneities distribution, and key geological characteristics… Using a synthetic but realistic case, different constraints, and different methods of integration are compared and the impact of seismic is analyzed in the framework of the truncated gaussian methodology.

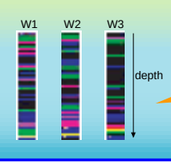
Geological Data

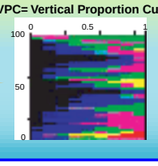


From well data to geostatistical parameters

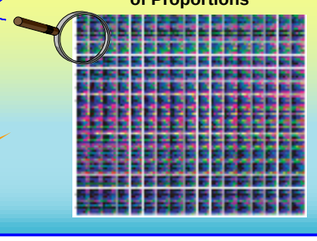


Each cell is a local vertical proportion curve. It represents the local geological vertical sequence of facies



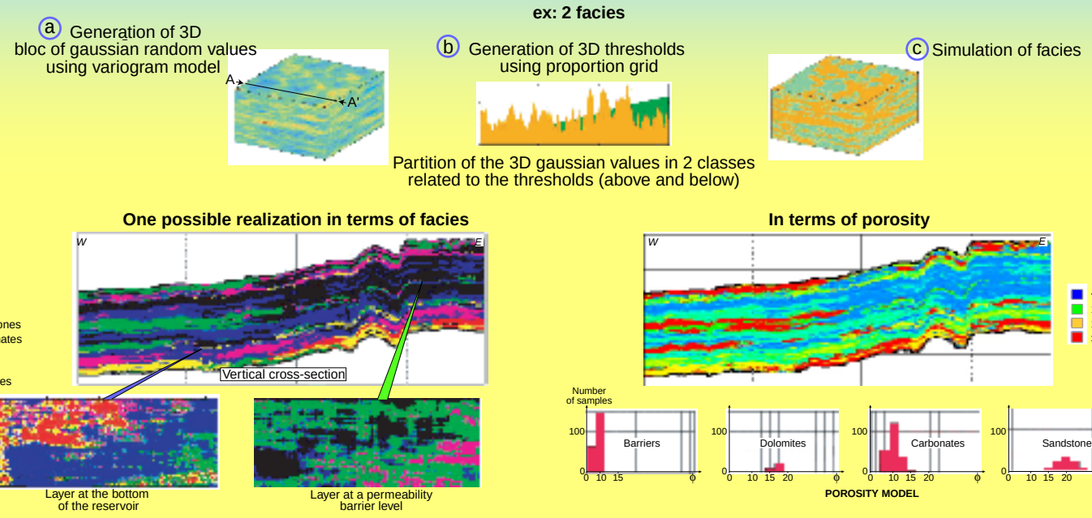


or

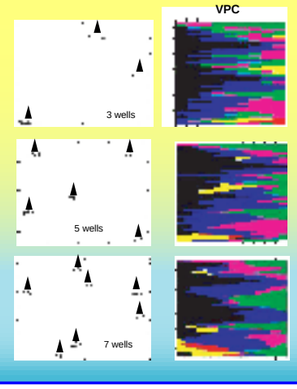


I Truncated Gaussian Simulation Methodology

From geostatistical parameters to conditional simulations



Impact of wells representativity



ⓐ **Synthetic model =**
- Initial model built from real data
- Mixed carbonate - siliciclastic environment

ⓑ **3 wells / 5 wells / 7 wells =**
- Datasets extracted from the initial synthetic model

WARNING
Primary importance of the geological sampling of the wells dataset.

Histograms of porous volumes computed on 100 realizations generated from different random seeds