PhD Open Days

Simultaneous integration of geophysical and production data for hydrocarbon reservoir modeling and characterization

PHD PROGRAMME IN PETROLEUM ENGINEERING
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1. Challenge

The conventional geo-modeling workflow uses available information such as: historical production data, geophysical data, and well-log data; individually. Integrate all the available data in a unique workflow is still one big challenge for the oil and gas industry..

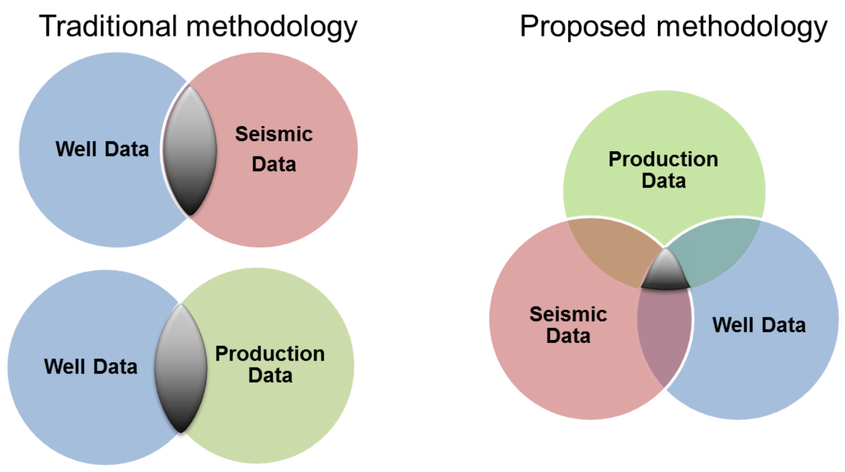


Figure 1: Traditional modeling methodology versus proposed methodology

2. Methodology

The proposed methodology aims to achieve one solution – the same petrophysical property models – which minimizes simultaneously the objective functions of both methods: seismic inversion and history matching This proposed algorithm can be summarized in the following methodological sequence:

1) In a first step, the models of subsurface petrophysical properties are obtained with seismic inversion (geostatistical seismic inversion). An average image of petrophysical properties is retained for the next step;

2) In a second step, to integrate the dynamic data into petrophysical properties model, a geostatistical history matching is proposed, conditioned to well data and the average model obtained from the seismic inversion.

3. Workflow

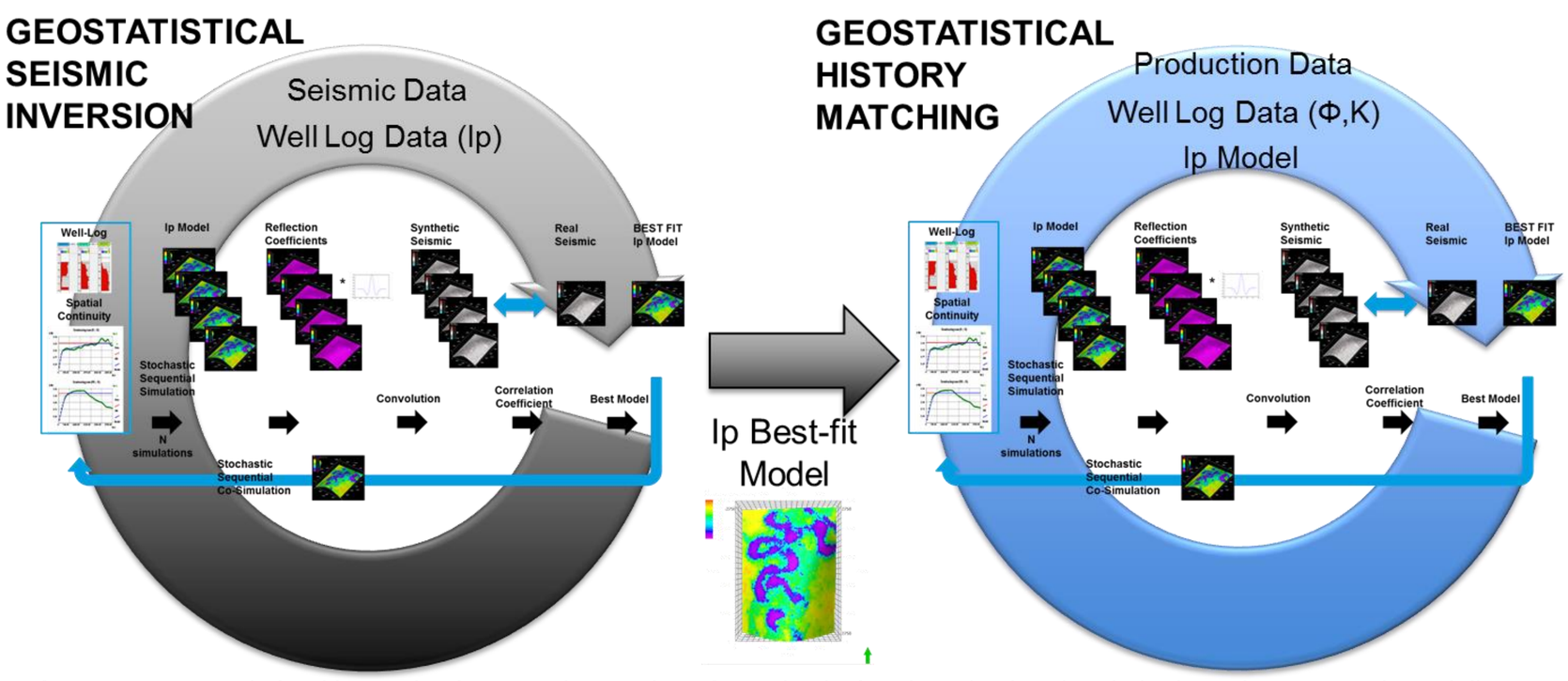
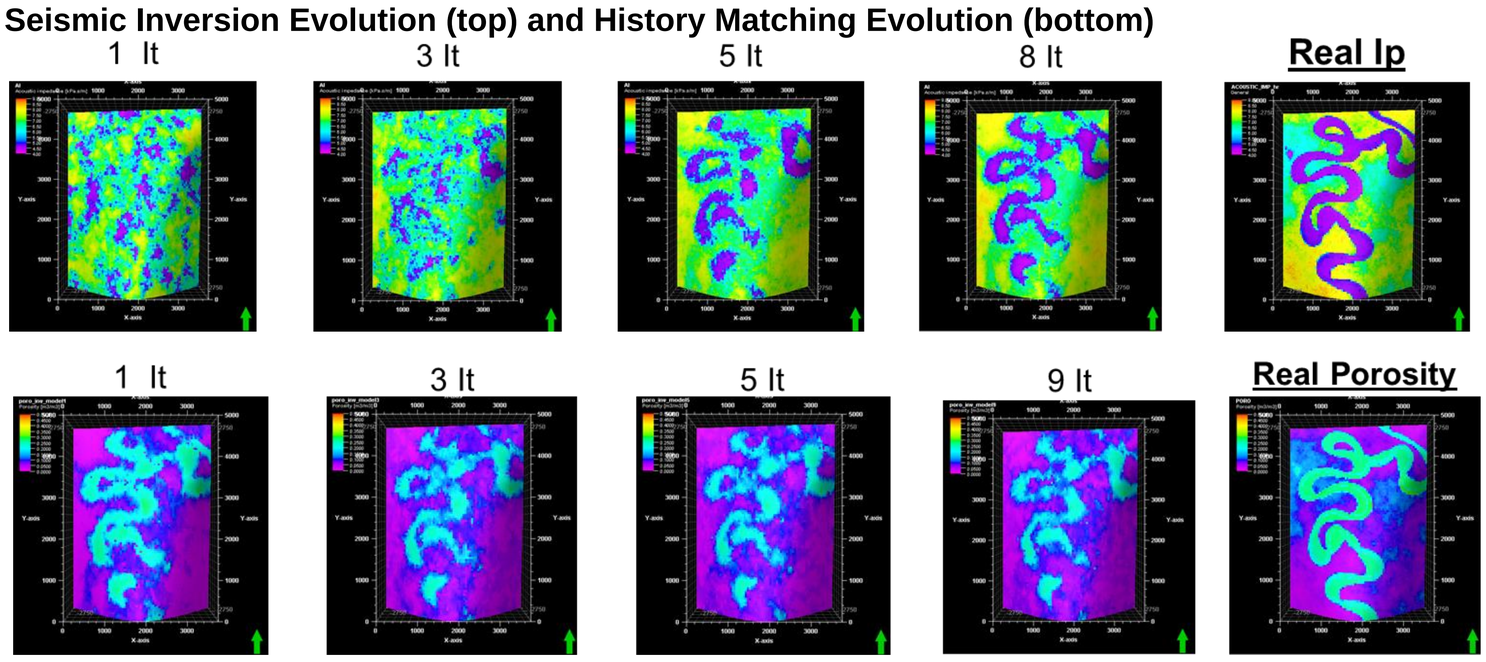


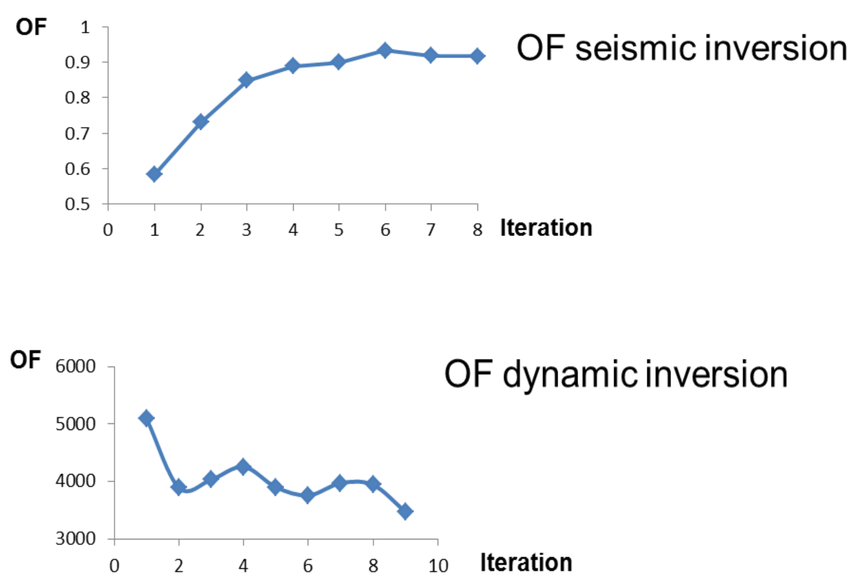
Figure 2: Proposed algorithm – simultaneous integration of geophysical and production data in hydrocarbon reservoir modeling

4. Results

Seismic Inversion Evolution (top) and History Matching Evolution (bottom)



Objective Function Evolution



5. Conclusions

. This method is able to integrate seismic information into history matching workflow;
. The final models have geological consistence, reproduce histograms, honour the experimental data (well log and production data), and reproduce the seismic data;
. Uncertainty coming from seismic inversion and history matching is taken into account

6. Acknowledgements
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7.References

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