Geostatistical History Matching coupled with Adaptive Stochastic Sampling
A zonation-based approach using Direct Sequential Simulation
Ph.D. in Petroleum Engineering
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1. Abstract
This study proposes a Geostatistical History Matching (GHM) technique applied in uncertain reservoir conditions, represented by a geologically consistent reservoir zonation methodology, coupled with adaptive stochastic sampling for geologic and engineering parameter optimization.

Geostatistical History Matching provides a way of assimilating perturbation of a reservoir model to ensure its geological consistency.

A geologically consistent perturbation methodology aims to avoid solutions that are unrealistic under the reservoir’s general geological characteristics.

By handling multiple stochastic realizations, GHM, coupled with adaptive stochastic sampling can iteratively update static reservoir model properties through conditional assimilation constrained to the production data, using geologically consistent perturbation.

2. Algorithm Workflow

3. Zonation Methodology
Fault and Streamline zonation:

4. Parameter Uncertainty/Perturbation

5. Results

6. Conclusions:
- Addresses local matching of the well data;
- Using a zonation-based methodology, explores the value in fault and fluid flow pattern zonation;
- Avoids geological and dynamic unrealistic solutions;
- Iterative model update through conditional assimilation constrained to the production data.
- Addresses global matching of the well data;
- Calibration of geological uncertain parameters (i.e. variogram parametrization, histograms) or relevant engineering parameters (i.e. fault transmissibilities).