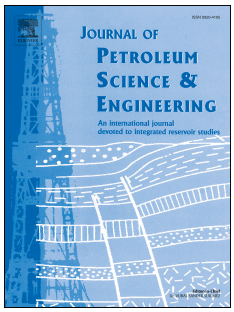
Accepted Manuscript



An adaptive pluri-Gaussian simulation model for geological uncertainty quantification

Bogdan Sebacher, Remus Hanea, Andreas S. Stordal

PII: S0920-4105(17)30050-5

DOI: 10.1016/j.petrol.2017.08.038

Reference: PETROL 4201

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 5 January 2017

Revised Date: 26 July 2017

Accepted Date: 15 August 2017

Please cite this article as: Sebacher, B., Hanea, R., Stordal, A.S., An adaptive pluri-Gaussian simulation model for geological uncertainty quantification, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.08.038.

An Adaptive Pluri-Gaussian Simulation Model for Geological Uncertainty Quantification

Bogdan Sebacher, Remus Hanea and Andreas S. Stordal

August 23, 2017

Abstract

In the reservoir exploration phase, different types of information are gathered and used for a reliable geological description. Combining seismic data, well log analysis, statistical rock physics or even paleobathymetry ranges, several methods have been proposed to estimate a probability field for each facies type in the reservoir model. However, these probability fields are typically not conditioned to the reservoir production history. Once the reservoir starts production new information becomes available, and an update of the probability fields is needed. The work presented here introduces a new framework for simulation of facies fields in the context of plurigaussian simulation where the facies fields are conditioned to the prior probability fields provided. The methodology is based on the probability integral transform and the topological characteristics of the facies types (number of the facies type and relative position among facies types). The developed method generates an ensemble of facies fields that honor the facies distribution as described by a probability field. The proposed method can easily condition the facies field to hard data and preserve the facies field during history matching in an ensemble based framework. A demonstration with the adaptive Gaussian mixture filter is presented here.

Keywords: Plurigaussian truncation, probability fields for facies distribution, ensemble methods, Assisted History Matching, geological realistic updates