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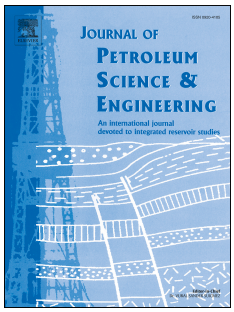

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Vinícius Luiz Santos Silva, Alexandre Anozé Emerick, Paulo Couto, José Luis Drummond Alves

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History Matching and Production Optimization under Uncertainties – Application of Closed-Loop Reservoir Management

Vinícius Luiz Santos Silva[1] Alexandre Anozé Emerick[1] Paulo Couto[2]
José Luis Drummond Alves[2]

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[1]Petrobras
[2]Universidade Federal do Rio de Janeiro

Abstract

There is an intensive investigation reported in the literature regarding the development of robust methods to improve the economical performance during the production management of petroleum fields. One paradigm that emerged in the last decade and has been calling the attention of various research groups is known as closed-loop reservoir management. The closed-loop entails the application of history matching and production optimization in a near-continuous feedback process. This work presents a closed-loop workflow constructed with ensemble-based methods. The proposed workflow consists of three components: history matching, model selection and production optimization. For history matching, we use the method known as ensemble smoother with multiple data assimilation. For model selection, we propose a procedure grounded on the calculation of distances defined in a metric space and a minimization procedure to determine the optimal set of representative models. For production optimization, we use the ensemble-based optimization method. We investigate the performance of each method separately before testing the complete closed-loop in a benchmark problem based on Namorado field in Campos Basis, Brazil. The results showed the effectiveness of the proposed methods to form a robust closed-loop workflow.

Keywords: Closed-loop reservoir management; history matching; models selection; production optimization.

1 Introduction

Recent advances in geological modeling and reservoir simulation have changed several aspects of the history-matching practice leading to a dramatic increase in research and development in this area. The purpose of history matching evolved from finding a single “best”