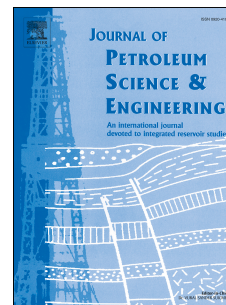


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# 1 Applying a Localization Technique to Kalman Gain and Assessing 2 the Influence on the Variability of Models in History Matching

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## 7 ABSTRACT

8 History matching (HM) is an important process that considers dynamic data to reduce  
9 uncertainties of parameters. As an ill-posed inverse problem, different combinations of  
10 uncertainties can result in matched models and, as the real response is unknown,  
11 methodologies for HM must be capable of representing all possible answers in a certain  
12 search space, mitigating the risk of convergence to a local minimum that may not represent  
13 the real answer. This work presents a study of an ensemble-based method, derived from the  
14 Kalman Filter (KF), the Ensemble Smoother with Multiple Data Assimilation (ES-MDA), in  
15 conjunction with a localization technique applied to a benchmark model with a known  
16 response, seeking to evaluate the final variability of the models and potential exclusion of  
17 better models in a HM problem. We used three different approaches of the same model  
18 aiming to identify the main applications and limitations of the method: the first approach uses  
19 ES-MDA without localization and the other two use ES-MDA with localization under distinct  
20 approaches. Results showed that ES-MDA without localization generated an ensemble with  
21 excessive uncertainty reduction. The localization technique was able to deal with this issue.  
22 However, the different approaches with localization presented different answers, suggesting  
23 that careful analysis is required. In addition, key parameters, such as the number of models  
24 and iterations also influence the results.

25 *Keywords: History Matching; Ensemble Kalman Filter; Ensemble Smoother with Multiple*  
26 *Data Assimilation; Localization.*

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