Contribution ID: **233** Type: **Poster (+) Presentation**

Statistical prediction of waterflooding performance by K-means clustering and empirical modeling

Wednesday, 2 June 2021 10:00 (1 hour)

Statistical prediction is often required in reservoir simulation to quantify production uncertainty or assess potential risks. Most existing uncertainty quantification procedures aim to decompose the input random field to independent random variables, and may suffer from the curse of dimensionality if the correlation scale is small compare to the domain size. In this work, we develop and test a new approach, K-means clustering assisted empirical modeling, for efficiently estimating waterflooding performance for multiple geological realizations. This method performs single-phase flow simulations in a large number of realizations, and uses K-means clustering to select only a few representatives, on which the two-phase flow simulations are implemented. The empirical models are then adopted to describe the relation between the single-phase solutions and the two-phase solutions using these representatives. Finally, the two-phase solutions in all realizations can be predicted using the empirical models readily. The method is applied to both 2D and 3D synthetic models and is shown to perform well in the P10, P50 and P90 of production rates, as well as the probability distributions as illustrated by cumulative density functions. It is able to capture the ensemble statistics of the MC results with a large number of realizations, and the computational cost is significantly reduced.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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Primary authors: Dr LIAO, Qinzhuo (King Fahd University of Petroleum and Minerals); Dr LEI, Gang (King Fahd University of Petroleum and Minerals); Dr LIU, Xu (King Fahd University of Petroleum and Minerals); XUE,

Liang (China University of Petroleum-Beijing); SUN, Shuyu (King Abdullah University of Science and Technology (KAUST)); Prof. PATIL, Shirish (King Fahd University of Petroleum and Minerals)

Presenter: Dr LIAO, Qinzhuo (King Fahd University of Petroleum and Minerals)

Session Classification: Poster +

Track Classification: (MS14) Uncertainty Quantification in Porous Media