frontiers | Frontiers in Earth Science

TYPE Editorial
PUBLISHED 09 December 2022
DOI 10.3389/feart.2022.1106622

Editorial: Advances in reservoir modelling and simulation

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KEYWORDS

reservoir simulation, reservoir modelling, unconventional reservoir, shale gas, shale oil

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SPECIALTY SECTION
This article was submitted to Environmental Informatics and Remote Sensing,
a section of the journal Frontiers in Earth Science

RECEIVED 24 November 2022
ACCEPTED 02 December 2022
PUBLISHED 09 December 2022

CITATION
Xu J, Chen Z, Hu J, Wu K and Zhou D (2022), Editorial: Advances in reservoir modelling and simulation.
Front. Earth Sci. 10:1106622.
doi: 10.3389/feart.2022.1106622

Editorial on the Research Topic
Advances in reservoir modelling and simulation

In light of the current energy crisis, the development of oil and gas resources must adhere to a higher standard of both efficiency and precision. Reservoir simulation and modelling has been a significant tool in increasing oil and gas recovery. Engineers are able to better visualize the subsurface environment, study fluid dynamics, and come up with ideas for production improvement by applying reservoir simulation and modelling (Fanchi, 2005; Islam et al., 2016). The growing complexity of reservoirs promotes the further advancement of reservoir modelling and simulation. In recent years, there has been a significant development in the investigation of reservoir modelling and simulation, particularly in the fields of heavy oil, shale gas, and shale oil. For instance, in the numerical simulation of heavy oil reservoirs, large-scale reservoir models directly serve production, and certain heterogeneity, such as lean zone, can also be successfully examined (Xu et al., 2014; Xu et al., 2016). The flow law of gas at the micro and nano scales is transferred to the real field size in the numerical modelling of the shale gas reservoir (Xu et al., 2017; Xu et al., 2018; Xu et al., 2019). The simulation technology of *in-situ* conversion is emerging at a quick pace with considering the effects of thermochemical reaction and thermophysical reaction on the production process (Xu et al., 2021).

This special issue gives a summary of the most current advancements in numerical reservoir modelling. We shall outline briefly to present this special issue:

To improve gas reservoir development, Xiao et al. built a CBM (coalbed methane) prediction model for wells. In this study, the influence of coal characteristics and reservoir geology conditions on CBM production was examined. They discovered that a larger absorption capacity increases CBM production.

Wang et al. used numerical and physical simulation to investigate the water control process in a gas field. In addition, their research revealed that the water-blocking and water-sensing capacities affect the water control process. The use of a continuous packer is suggested based on simulation findings.

Using panel data modelling and simulation methods, Shi et al. evaluated China's oil resources. In this study, the Malmquist-Luenberger Index was used to more accurately measure the static efficiency of time nodes. Their research demonstrated that the development of oil fields in China's eastern area is superior to the west.

Cai et al. used deep learning into the indicator modelling and simulation. In this study, the AlexNet model was enhanced by adding more convolution layers. The comparison to actual working situations revealed that the model presented in this study is greatly enhanced in terms of estimation precision.

The influence of natural gas hydrates on the pressure of a deep-water pipeline was anticipated by Mo et al. In this study, a mathematical model connecting pipeline flow and hydrate volume is constructed. The modelling findings indicate that hydrate development will result in a more severe pipeline obstruction.

Deng et al. analyzed the production of a multilayer heterogeneous reservoir using a production model that took experimental data into account. Their research shown that an increase in the permeability gradient increases oil output, with the high-permeability layer contributing more to oil recovery.

To analyze the flow efficiency, Li et al. devised a gas/water relative permeability model based on fractal theory. In this study, the authors linked the geomechanical equation, the flow equation, and the fractal equation to demonstrate that stress and slip flow jointly govern the gas/water flow efficiency. Also noted is the link between wettability and relative permeability.

Liu et al. conducted research on the mechanism of hydraulic fracture propagation in infill horizontal wells. Based on geomechanical models, they examined the interactions between original fractures and artificial fractures. Their research revealed that fracture spacing and well spacing influence the propagation trajectory.

Author contributions

JX-Draft manuscript; ZC, JH, KW, and DZ-Review and revision.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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