Contribution ID: **98** Type: **Oral Presentation**

Deep Learning enhanced multiscale rock typing for digital core modeling

Monday, 13 May 2024 14:40 (15 minutes)

Currently, there is rapid development in the approaches for constructing and utilizing digital cores. Digital Rock Physics (DRP) methods allow for quick and non-destructive acquisition of rock properties. The process of digital rock physics involves two primary stages: model construction and simulation of physical processes on the created models.

For heterogeneous reservoir rocks, the usage of DRP is not as straight forward as for high porosity sandstones. This is due to the inherent trade-off between the spatial resolution of data and the representativeness of the model size. The primary goal of this study was to establish a technique for upscaling digital core models from micro to macro scale, enabling the computation of rock properties while accounting for heterogeneities of various scales.

The upscaling procedure involved searching for correlations between tomography data of different resolutions and transforming low-resolution tomography into a multiclass model according to the found correlation. The approach of using convolutional neural networks for high-resolution tomography data was considered as the optimal algorithm for transforming low-resolution tomography into a multiclass model. The output of the neural network was an upscaled model of lower resolution than the original tomography. Each element (voxel) of the upscaled model belonged to one of several digital types of rock, whose generalized characteristics were determined based on the analysis of high-resolution tomography data.

To validate the upscaling technique we constructed a digital model of complex carbonate reservoirs based on data from multiscale microtomography. A multiclass model concept has been created and experimented with, enabling the computation of flows in pore spaces of various scales. By incorporating diverse pore space structures as supplementary classes in the multiscale model, it is possible to preserve a substantial physical size of the model while enhancing its level of intricacy.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

Russia

Porous Media & Biology Focused Abstracts

References

Primary author: ORLOV, Denis (Skolkovo Institute of Science and Technology)

Co-authors: Mr GAINITDINOV, Batyrkhan (Skolkovo Insitute of Science and Technology); Prof. KOROTEEV, Dmitry (Skolkovo Insitute of Science and Technology)

Presenter: ORLOV, Denis (Skolkovo Institute of Science and Technology)

Session Classification: MS15

Track Classification: (MS15) Machine Learning and Big Data in Porous Media