



Contribution ID: 465

Type: **Poster (+) Presentation**

## Transport properties modelled on multiscale porous media images

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

Carbonate rocks are characterized by their complicated and heterogeneous pore structure [1]. In general, mechanical and chemical compaction, cementation, dissolution, mineral transformation and fracturing are among the most important factors typically affecting the fabric of a carbonate rock, and so, its lithofacies and petrophysical properties (e.g. porosity and permeability) [2]. In this case, a detailed knowledge of pore scale geometry is inevitable for a deeper understanding from the physics of fluid flow and transport through such a porous media. In recent years, emergence of the non-invasive micro-computed tomography ( $\mu$ CT) technique has made it possible to visualize the internal structure of porous materials [3-5]. However, quantification of pore scale heterogeneities depends largely on sample size and detector specifications. In other words, despite a larger volume of the samples can be imaged in a low resolution imaging, in which are more representative of a typical heterogeneous sample, but more microstructural details can be lost due to partial volume effect which in turn limits the direct simulation of transport processes [6, 7]. The primary aim of this work is to present an image processing and computational workflow for predicting absolute permeability in low-resolution images of selective carbonate samples that are too large to allow direct simulation. After acquisition of  $\mu$ CT images with different spatial resolutions on a tight carbonate rock sample, the workflow involves direct pore scale simulation of permeability by the Lattice-Boltzmann method in a high-resolution image, together with a number of geometrical and topological characteristics obtained from spatially registered lower resolution images of the same sample. In addition, a machine learning technique was developed based on Convolutional Neural Networks (CNNs) to correlate the parameters obtained from low-resolution images to the ones driven from higher resolution images. Note that a texture interpolation technique was employed for the purpose of data augmentation between images acquired at different scales. The results of CNN modelling confirmed the permeability values estimated from lower resolution images for which high-resolution images are needed for direct simulation.

### Time Block Preference

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

### References

#### References

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**Primary author:** Mr NABIPOUR, Iman (PhD Student of Petroleum Engineering, Department of Petroleum Engineering, School of Chemical and Petroleum Engineering, Shiraz University, Shiraz, Iran)

**Co-authors:** Dr QAJAR, Jafar (Assistant Professor of Petroleum Engineering, Digital Rock Physics Research Group, IOR-EOR Research Institute, Shiraz University, Shiraz, Iran); Dr AGHAEI, Hamed (Affiliated research staff, School of Earth, Atmosphere and Environment, Monash University, Clayton, Australia)

**Presenter:** Mr NABIPOUR, Iman (PhD Student of Petroleum Engineering, Department of Petroleum Engineering, School of Chemical and Petroleum Engineering, Shiraz University, Shiraz, Iran)

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