Contribution ID: **309** Type: **Oral Presentation**

10,000-cubed Digital Rock Analysis: Beyond Hardware Super Resolution Imaging and Efficient HPC Modelling

Tuesday, 31 May 2022 17:45 (15 minutes)

The trade-off between the field of view (FOV) and the resolution of micro-computed tomography (micro-CT) is a hardware bottleneck that limits the capturing of both heterogeneity and micro-structure detail for analysis and modelling. Rather than choosing between high resolution or wide FOV, efficient super resolution methods can achieve both, while efficient modelling methods permit full analysis of the resulting large image. Low resolution images of porous rock and 4x scale high resolution images train an efficient 3D super resolution convolutional neural network (SRCNN). An unseen test image of a full coreplug with an otherwise unsegmentable wide FOV and low resolution.is then super resolved to 10,000-cubed, and its permeability, flow field, and 2-phase flow is calculated with a High Performance Computing (HPC) cluster using efficient hybrid implementations of Semi-Analytical Solvers (SAS), Morphological methods, and Lattice Boltzmann Methods (LBM). A similar result is also obtained with other types of porous structures, such as a Proton Exchange Fuel Cell. This extent of resolution-FOV is 2 orders of magnitude above hardware limitations, and brings digital rock analysis closer in scope to conventional core-plug analysis.

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References

Wang Y.D., Blunt M.J., Armstrong R.T., Mostaghimi P.
Deep learning in pore scale imaging and modeling
Earth-Science Reviews (2021), p. 103555, 10.1016/j.earscirev.2021.103555

Time Block Preference

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

Participation

In person

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