#### InterPore2022



Contribution ID: 435

Type: Poster Presentation

# Design of a model for the prediction of petrophysical properties from microstructural image data

Tuesday, 31 May 2022 15:20 (1h 10m)

We present the design of a prototype for the prediction of permeability from 2D microstructural image data. Fault rocks of a normal fault in a Jurassic limestone-marl sequence in northern Bavaria, Germany, are analyzed for the algorithmic integration of microstructural data (light microscopy and scanning electron microscopy) with petrophysical measurement results (including He pycnometry and MICP derived permeability). It is assumed that the rock microstructure is directly related to the petrophysical properties - such as permeability - of the rocks (Schmatz et al., 2017, Saxena et al., 2017). The good comparability in carbonates of e.g. He porosity with BIB-SEM porosity (Broad-Ion-Beam-Polishing in combination with SEM, Norbisrath, 2015) and pore space connectivity from mercury porosimetry and LMI-BIB- SEM (Liquid-Metal-Injection, Klaver et al., 2021) shows the empirical relationship between volume measurements and image information. With the help of deep learning algorithms, quantitative data on the porosity, permeability and mineralogical composition of the rock samples are analysed and linked. The step is first performed on homogeneous samples. The trained algorithm will first be tested on a test data set and finally compared with the simulation results

The trained algorithm will first be tested on a test data set and finally compared with the simulation results (e.g., Kottwitz et al. 2021). Subsequently, the analyses of the different fault rock facies will be combined and again integrated with the corresponding simulation results.

## Acceptance of the Terms & Conditions

Click here to agree

## **MDPI Energies Student Poster Award**

No, do not submit my presenation for the student posters award.

### Country

Germany

### References

Klaver, J., Schmatz, J., Wang, R, Jiang, M., Kleipool, L.M., Cilona, A., and Urai, J.L. (2021) Automated Carbonate Reservoir Pore and Fracture Classification by Multiscale Imaging and Deep Learning."In , 2021:1–5. European Association of Geoscientists & Engineers.

Kottwitz, M. O., Popov, A. A., Abe, S. and Kaus, B. J. P. (2021) Investigating the effects of intersection flow localization in equivalent-continuum-based upscaling of flow in discrete fracture networks. Solid Earth, 12, 2235–2254.

Norbisrath, J, Eberli, G. P., Laurich, B., Desbois, G. and Urai, J. L. (2015) Electrical and fluid flow properties of carbonate microporosity types from multiscale digital image analysis and mercury injection. AAPG Bulletin 99, 11, 2077-2098

Saxena, N., Mavko, G., Hofmann, R., Srisutthiyakorn, N. (2017). Estimating permeability from thin sections without Reconstruction: Digital rock study of 3D properties from 2D images. Computers & Geosciences. Vol.102, 79-99.

Schmatz, J., Klaver, J., Virgo, S., von Hagke, C., Urai, J.L. (2017). Standardized Automated Multiscale Imaging Technologies to Quantify Microstructure and Petrophysical Properties in a Range of Rock Types. Conference: 79th EAGE Conference and Exhibition 2017.

## **Time Block Preference**

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

## Participation

Online

**Primary authors:** Mr JIANG, Mingze (MaP - Microstructure and Pores GmbH); SCHMATZ, Joyce (MaP - Microstructure and Pores GmbH); Mrs WELLMANN, Eva (MaP - Microstructure and Pores GmbH); KLAVER, Jop (MaP – Microstructure and Pores GmbH)

Presenter: SCHMATZ, Joyce (MaP - Microstructure and Pores GmbH)

Session Classification: Poster

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