14th Annual Meeting
30 May - 02 June 2022
Abu Dhabi, United Arab Emirates & Online

Satellite Short Courses 29 May & 03 June

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 (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.

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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.

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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

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Time Block Preference

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

Participation

Online

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Session Classification: Poster

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