Contribution ID: **34**

Type: **Oral Presentation**

Quantification of geometric and flow characteristics for CO2 storage at pore-scale using a DC-GAN based digital experiment approach

Monday, 13 May 2024 17:30 (15 minutes)

The trapping efficiency of CO2 storage in porous subsurface is influenced by various geometric and flow characteristics. Conducting experimental studies on reservoir structure characteristic parameters and actual storage efficiency consumes a significant amount of resources, making it difficult to analyze the uncertainty of parameters through a large number of experiments. In this work, a deep convolutional generative adversarial network (DC-GAN) was employed to generate 1000 sets of images that are visually indistinguishable by using tomographic images of Bentheimer sandstone as the training data. This is followed by performing image analysis and pore network modelling to obtain geometric (e.g. Minkowski functionals) and flow (absolute and relative permeability, capillary pressure, saturation, and trapping efficiency) properties. With maximum capillary of 7.0 KPa, we found that the trapping efficiency ranged from 32% to 40%. We then explored the uncertainty of all geometric and flow characteristics to determine the minimum number of digital experiments to reproduce the same statics. This work proposes a strategy for coupling deep learning method and pore network models to conduct a large number of digital experiments on complex porous media. This can be used to correct experimental errors obtained through traditional experimental methods and guide the design of geological CO2 storage systems.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

China

Porous Media & Biology Focused Abstracts

References

Primary author: Ms ZHANG, Yifan (Zhejiang University)

Co-authors: FOROUGHI, Sajjad (imperial college london); QU, Mingliang (Zhejiang University); Mr YANG, Jinping (Zhejiang University); Dr LIN, Qingyang (Imperial College London); BLUNT, Martin (Imperial College London)

Presenter: Ms ZHANG, Yifan (Zhejiang University)

Session Classification: MS09

Track Classification: (MS09) Pore-scale modelling