Contribution ID: **107** Type: **Poster (+) Presentation**

Event-based measurements of contact angles during imbibition to evaluate contact angle hysteresis on a pore-by-pore basis using micro-CT

Wednesday, 2 June 2021 09:00 (1 hour)

Multiphase flow in porous rocks plays a key role in CO2 sequestration, groundwater remediation and petroleum reservoir management. In the subsurface, drainage and imbibition typically take place at low capillary numbers, meaning capillary forces dominate the pore scale behavior. The fluid displacement is then strongly influenced by the wetting properties of the pore walls, which is typically characterized by defining an effective contact angle. Significant effort has been devoted to measuring contact angles in-situ on X-ray micro-computed tomography images of fluids in the pore space (AlRatrout et al., 2017; Sun et al., 2020). To maximize the relevance of the measured values to fluid displacement, Mascini et al. (2020) introduced an event-based approach, measuring local contact angles on time-resolved micro-CT data just before fluid redistribution events (Haines jumps) during drainage. Here, we assess whether event-based contact angles can be reliably determined during imbibition, considering the latter as a sequence of piston-like displacements, snap-offs and cooperative pore filling events. This can be compared with drainage measurements in order to evaluate contact angle hysteresis on a pore-by-pore basis. A contact angle analysis was performed on a glass beads dataset which consists of time resolved images taken during an imbibition experiment, using micro-computed tomography (Schlüter et al., 2016). The contact angles at every point on the three-phase-contact-line were determined for every time step. These were then used to identify imbibition events and calculate the event-based contact angles. Preliminary results reveal an average 8 degree contact angle hysteresis in individual pores for this dataset. Imbibition measurements reveal a positive correlation between event-based contact angles and time, while this relationship is not seen during drainage. The results indicate the existence of contact angle hysteresis, even in a medium as simple as a glass bead pack. Understanding and quantifying this hysteresis in the more complex media of porous rocks is crucial to understanding multiphase flow in nature.

Time Block Preference

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

References

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Primary author: Mrs ELLMAN, Sharon (Ghent University)

Co-authors: MASCINI, Arjen (University of Gent); BULTREYS, Tom (Ghent University)

Presenter: Mrs ELLMAN, Sharon (Ghent University)

Session Classification: Poster +

Track Classification: (MS6-A) Physics of multi-phase flow in diverse porous media