Contribution ID: **719** Type: **Poster (+) Presentation**

On compressibility error of the lattice Boltzmann method for pore scale modeling of non-Darcy flow

Tuesday, 1 June 2021 19:00 (1 hour)

Due to recent advances in imaging technology, calculating the macroscopic properties of a porous medium through pore-scale simulation has become very common. There are several methods to simulate pore scale flow patterns [1], [2]. Among those, lattice Boltzmann method (LBM) has been widely used by scientists because of its simple approach in modeling the complex pore space boundaries, a key challenge in pore-scale simulation [3]. One of the main concerns about the LBM is high compressibility errors that reduce the prediction capacity of the method at high Reynolds numbers. [4]. In this study, we have tried to minimize the prediction error generated by the variation of the compressibility via adjusting the solution conditions and without the need to refine the lattice size. This makes it possible to employ the LBM to reliably predict transition to the non-Darcy flow regime in real samples with complex pore structure. For this purpose, a multi-relaxation time collision model in the PALABOS library [5] is employed, and the fluid viscosity in the lattice unit is optimized. Thus, the effects of viscosity change on the bounce back boundary condition is minimize [6]. This enables us to predict the non-Darcy flow for fluids with LBM. Through these simulations it is concluded that the effect of the compressibility is significantly more important than the effect of the maximum velocity condition on the reliability of the LBM simulations.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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