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Contribution ID: **739**　　　　　　　　　　　　　　　　　　　Type: **Oral Presentation**

Free flow over porous media: Heterogeneity and the Beavers-Joseph interface condition

Wednesday, 2 June 2021 15:30 (15 minutes)

Whether it is river water slowly flowing over a sand bed, water flowing in between activated carbon electrodes in a Blue Energy setup, a gentle breeze of air across partially saturated soil or car fumes over the catalyst body in the exhaust pipe···the coupling of laminar free flow and parallel flow through porous media (Darcy) can be described by the Beavers-Joseph interface condition. The BJ-interface condition assumes a non-zero slip velocity at the interface between the free flow channel and the porous media. The slip velocity relates the free flow velocity to the Darcy velocity through the permeability of the porous media and a second material parameter, called the Beavers-Joseph coefficient. The latter is based on experimental data.

We investigate the coupling between a free flow channel (Poiseuille flow) and a heterogeneous porous medium. We find that introducing heterogeneity strongly influences the behavior at the interface. A perfect symmetry effectively prohibits mass exchange across the interface, while the non-symmetric porous media promotes mass exchange across the interface.

We will show the simulation results from a large collection of domains with free flow over a heterogeneous porous media and show that the evaluation of the BJ slip velocity may have surprising outcomes due to the exchange of mass across the interface. The mass exchange has also consequences for the efficiency of solute mixing across the interface. Moreover, we will focus in on the fluid behavior at pore scale levels and discuss our attempts to up-scaling our findings to Darcy length scales.

Time Block Preference

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

References

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Student Poster Award

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