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## Average velocity profile in a channel partially filled with a porous medium

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In this work, it is shown that the one-domain approach (Goyeau et al, 2003) can be used to model precisely the average fluid velocity in a channel partially filled with a porous medium. This conclusion is drawn from the comparison of the averages obtained from the solution of the effective transport equations, with position dependent coefficients, and the ones resulting by direct integration of the local velocity values. These were obtained by the solution of the boundary value problem given by Stokes and continuity equations subjected to the no slip condition at the surface of the solid particles and the limiting walls of the channel. It must be mentioned that the comparison at the transition region between the porous media and the fluid is also very good.

Initially, the methodology was derived for porous media formed by parallel plates. In this way, the local velocity, the average velocity, the permeability and the fluid volume fraction could be obtained by analytical expressions (Ochoa-Tapia et al, 2017). However, recently the same kind of results has been obtained using particulate porous media, which for the comparison required the numerical solution of the fully developed Stokes flow problem in the whole system. In principle, the methodology could be extended for porous media of microstructure as complex as required.

### References

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