

EFFECTIVE PRESSURE INTERFACE LAW FOR TRANSPORT PHENOMENA BETWEEN AN UNCONFINED FLUID AND A POROUS MEDIUM USING HOMOGENIZATION

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In this talk we present rigorous justification of the interface law describing contact between the flow in an unconfined fluid and a porous bed. The velocity of the free fluid dominates the filtration velocity, but the pressures are of the same order. Main results are the following:

1. We confirm Saffman's form of the Beavers and Joseph law in a new, more general, setting.
2. We show that a perturbation of the interface position, which is an artificial mathematical boundary, of the order $O(\varepsilon)$ implies a perturbation in the solution of order $O(\varepsilon^2)$. Consequently, there is a freedom in fixing position of the interface. It influences the result only at the next order of the asymptotic expansion.
3. We obtain a uniform bound on the pressure approximation. Furthermore, we prove that there is a jump of the effective pressure on the interface and that it is proportional to the free fluid shear at the interface.

This is a joint work with Anna Marciniak-Czochra (IWR and BIOQUANT, Universität Heidelberg, Germany), presented in a joint article under revision in SIAM: Multiscale modeling and simulation 2011.

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