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

Andro Mikelić
Université Lyon 1, Institut Camille Jordan, France

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.

Prof. Andro **Mikelic**, Département de Mathématiques, Institut Camille Jordan UMR CNRS 5208, Faculté des Sciences et Technologies, Université Lyon 1, 43, Bd du onze novembre 1918, 69622 Villeurbanne Cedex, **France ;**
E-mail: mikelic@univ-lyon1.fr