Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Multiscale modeling of turbulent channel flow over porous walls[1]
SUDHAKAR YOGARAJ, UGIS LACIS, SHERVIN BAGHERI, KTH Royal Institute of Technology, Sweden — We perform direct numerical simulations of fully developed turbulent flow through a channel coated with a porous material. The Navier-stokes equations governing the fluid domain and the Darcy equations of the porous medium are coupled using an iterative partitioned scheme. At the interface between the two media, boundary conditions derived using a multiscale homogenization approach are enforced. The main feature of this approach is that the anisotropic micro-structural pore features are directly taken into consideration to derive the constitutive coefficients of the porous media as well as of the interface. The focus of the present work is to study the influence of micro-structure pore geometry on the dynamics of turbulent flows. Detailed turbulence statistics and instantaneous flow field are presented. For comparison, flow through impermeable channel flows are included.

[1]Supported by the European Unions Horizon 2020 research and innovation programme under the Marie Skodowska-Curie grant agreement No 708281

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Date submitted: 27 Jul 2016 Electronic form version 1.4