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On the effect of the interface heterogeneity between porous and free flow domain PARISA MIRBOD, Clarkson University, NADINE FALKNER, University of Stuttgart, ZHENXING WU, Clarkson University, HOLGER STEEB, University of Stuttgart, UNIVERSITY OF STUTTGART TEAM, CLARKSON UNIVERSITY TEAM — We study microscopic velocity and shear stress profiles in interfacial transition zones that separate a free Navier-Stokes flow domain and a porous Darcy flow domain using pore scale Direct Numerical Simulation (DNS) and physical experiments using Particle Image Velocimetry (PIV). We focus on the impact of the interfacial heterogeneity and the influence of the onset of sediment transport in shallow water. While both DNS and PIV measurements show that far from the interface velocity profiles are parallel and representative of creeping flow, shear stress-induced recirculating flows exist in micro-cavities of the permeable porous surface. Local velocity and shear stresses inside recirculating flows are irregular, distinct enveloping upper and lower bounds can be constructed. The upper bound corresponds to a no-slip condition at interfaces to the solid phase of the porous material. The lower bound is related to the largest micro-cavity size.

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