Experimental characterization of the deviation from Darcy flow at low Reynolds numbers through elastic porous matrices[1] SID BECKER, BEN MUNRO, University of Canterbury; Mechanical Engineering — The subject of this study concerns viscous flow through an elastic porous matrial for which the solid matrix is capable of experiencing deformation under the influence of the flow field. The inherent challenges associated with developing experimental testing of flow in deformable porous media are largely related to the fabrication of a deformable matrix. In this study a method of media fabrication is presented that uses an indirect solid free form fabrication process combining 3D Printing with an infused Polydimethylsiloxane elastomer. This allows for the precise control of the matrix parameters: elasticity and pore geometry. The conjugate flow-media behavior is then observed in an experimental test rig which captures the global flow behavior, the local matrix deformation, and the onset of the deviation from Darcy flow at low Re. The experimental data is presented such that the results can be used for numerical validation. Dimensionless combinations of parameters are considered in the prediction of the point of deviation from Darcy flow at low Re and confirmed from the experimental data.

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