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Scale Estimation for Turbulent Flows in Porous Media[1] VISHAL PATIL, JAMES LIBURDY, Oregon State University — Flow in porous media, once extended into the turbulent flow regime can become very complex due to the nature of the flow geometry and related scales of motion. The ability to model porous media turbulence flow has been hampered by the inability to develop an appropriate understanding of the complexities associated with the impact of pore scale dynamics on the overall turbulence contributions to dispersion and mixing. In this paper we use direct PIV measurements of the turbulence within a randomly packed porous bed of uniform size spheres to better understand scaling distributions. Refractive index matching was used to obtain time resolved velocity vector data within specific pores to compare turbulence quantities versus pore Reynolds numbers. Results are used to determined the characteristics of scales associated with velocity, length and time. The large scale events, within the domain of the pore size are evaluated based on correlation functions within the pore. In addition, estimates of the Komolgorov scales are presented versus pore Re based on integral scale results. The relationships between characteristics pore sizes, pore Re, the integral scales and turbulent statistics are presented and shown to reach an asymptotic limit for large pore Re.

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