Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Reynolds number dependent flow regime characteristics for flow in porous media[1] JAMES LIBURDY, VISHAL PATIL, Oregon State University — The flow characteristics of distinct flow regimes in porous media and the evolution with Reynolds number is poorly understood at high Reynolds numbers. Typical means of measurement are MRI imaging, PTV and PIV, the latter two require refractive index matching. This study presents PIV measurements in a porous bed of spherical beads, for pore Reynolds numbers from 100 to 1500 resulting in flow in the inertial, unsteady inertial and turbulent flow regimes. The bed is a cube with five bead diameters on a side, with 15 mm beads. Measurements are based on two dimensional slices (five along the optical axis) using two fields of view; the first is four beads by four beads, and the second is of individual pores to provide highly spatial resolution. Fluorescent dye studies are presented. Velocity data are analyzed based on statistical results of two dimensional time series vector fields with emphasis on (i) identification of Reynolds number dependent flow structures (spatial and temporal), (ii) delineation of flow regime transitions, (iii) establishing pore-based fluctuation energy budgets and (iv) illustration of local dispersion characteristics. The goal is to provide statistical flow structure characteristics at the pore level for high Reynolds number flows to better understand dispersion characteristics.

[1]This study was supported in part by NSF through grant 0933857

James Liburdy
Oregon State University

Date submitted: 05 Aug 2011 Electronic form version 1.4