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Experimental Investigation of Two Phase Fluid Flow and Passive Scalar Mixing around a Periodic Array of Spheres MAHDI RAMEZANI, SHANKAR SUBRAMANIAM, MICHAEL OLSEN, Iowa State University — Solid-liquid two-phase flow occurs in colloidal suspensions in a variety of applications, from catalytic reactions in chemical plants to bio oil production reactors. Detailed experimental study of these flows can both improve the understanding of the underlying phenomena and also assist in the development of accurate computational modeling. In the presented work, particle image velocimetry (PIV) and planar laser induced fluorescence (PLIF) are used to collect quantitative velocity and scalar field data in a liquid flow containing solid spheres. The velocity and scalar data are collected with sufficient spatial resolution to accurately capture turbulent flow statistics, allowing for precise validation of numerical models. This study is focused on presenting experimental data for periodic arrays of spheres that can be efficiently modeled numerically. For example, one flow geometry investigated consists of a square duct incorporating 5 spheres in line in the axial direction in the middle of the channel. Mixing of a passive scalar as well as the velocity field for this configuration of particles will be presented in the range of Reynolds numbers 50-400 and volume fractions of 5 to 20 percent.

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