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Simultaneous Velocity Discrimination Method of Two-Phase Flows Using Time Resolved Stereo PIV and PTV P.B. VANDERWERKER, Y. CHEN, M.M. TORREGROSA, F.J. DIEZ, Rutgers University, S. PHOTOS, D. TROOLIN, TSI Inc — Multiphase jets laden with particles appear in many engineering and environmental processes. Typical examples are sprays containing liquid fuel drops in combustion processes, air jets laden with coal particles in a power plant, and the dispersion of harmful substances like soot and pollutants from steady exhaust flows, among others. Studies of particle-laden turbulent flows suggest that particle distribution is not uniform but preferential. In order to understand the mechanism of particle dispersion, time resolved simultaneous 3D velocity measurements of the disperse phase and of the fluid flow were made. Two-phase discrimination algorithms were developed based upon the filtering methodology proposed by Khalitov & Longmire (2002), allowing for complete separation of the two-phases in stereo PIV images. The different filtering methods studied include separation of the two-phases using: (1) particle size discrimination, (2) particle intensity discrimination, (3) particle size and intensity discrimination, and (4) fluorescent particles for one of the two-phases. This methodology also enables time-resolved instantaneous 3D velocity fields using PTV and PIV on the disperse phase and fluid flow phase respectively. These allow visualization of 3D turbulent coherent structure evolution in the fluid as well as the evolution of the dispersed phase.

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