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3-D Velocity Measurements Around an Optically Suspended Sphere CHRIS HINOJOSA, JEREMIAH ZIMMERMAN, NATHALIE NEVE, DEREK TRETHEWAY, Portland State University — The 2-D velocity fields at the mid-plane of an optically trapped sphere can be obtained using the μPIVOT (Neve et al. 2008), an integrated optical tweezers (OT) and micron-resolution particle image velocimetry (μPIV) instrument. Typically, the optical trap location is centered in the μPIV measurement plane and their movements coupled. However, positioning lenses in the path of the OT laser allow the optical trap to be moved independently of the measurement plane. In order to suspend a sphere at a fixed point in space while measuring velocities around the sphere, the positioning lenses must compensate for the movement of the measurement plane. In this work, the relationship between positioning lens movement and trap location is determined by measuring the settling time of a sphere initially positioned out of focus. With this relationship determined, 2-D velocity fields are measured at different planes around a sphere in uniform flow. The measured velocity fields are compared to analytical and computational predictions to examine the effects of optical tweezers on μPIV tracer particle motion and to validate the 3-D velocity measurement potential of the μPIVOT.

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