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Tomo-PIV measurements of the flow field in the wake of a sphere[1]
LIOR ESHBAL, TOM DAVID, VLADISLAV RINSKY, RENE VAN HOUT, DAVID GREENBLATT, TECHNION — A sphere can be considered as a prototypical 3D bluff body. In order to improve our understanding of its 3D wake flow, a combination of time-resolved planar particle image velocimetry (PIV) and tomographic PIV (tomo-PIV) was implemented. Experiments were performed in a closed-loop water channel facility and sphere Reynolds numbers $\mathrm{Re}_D = \mathrm{UD}/\nu = 400$, 800, 1200 and 2000, where U is the free-stream velocity, ν the kinematic viscosity and D the sphere diameter. The measurement volume (Height x Length x Width, 5 x 5 x 1.5 D^3) comprised the sphere and the downstream wake. Tomo-PIV snap-shots were correlated with the time-resolved PIV such that the 3D temporal evolution of the shed vortices became clear. At $\mathrm{Re}_D = 400$, this procedure revealed shed hairpin vortices having a vertical plane of symmetry in agreement with many dye visualization studies. However, the measurements also revealed weaker induced hairpins resulting from the interaction of the near-wake flow and the surrounding free stream. These induced vortices were not visible in previous dye and smoke visualizations and have only been observed in simulations. Data processing of the data at higher Re_D is currently ongoing.

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