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Quantifying copepod sensing and swimming in unsteady flow fields using time-resolved tomographic PIV + 3D PTV[1] DEEPAK ADHIKARI, ELLEN LONGMIRE, University of Minnesota — Copepods respond to hydrodynamic disturbances by executing an escape response jump (Buskey et al 2002; Fields and Yen 1996; Kiørboe et al 1999; Strickler and Bal 1973). 3D PTV and tomographic PIV are combined to track the motion of the copepods and the surrounding fluid velocity field respectively, to provide quantitative measure on their sensing and swimming behavior. The measurements are time-resolved to obtain the entire trajectories of copepods. Fluid velocity and velocity gradients are estimated at the location of the copepod by applying a Taylor-series least-square method to the surrounding PIV grid points. Copepod sensing and swimming are analyzed upstream and downstream of a wall-mounted cylinder in cross-flow at Re $\sim$ 930. At the upstream location, when copepods approach the cylinder, they respond by rapidly accelerating (or jumping) away from it. Their jump location suggests that they sense and respond to a range of flow velocity gradients. Preliminary results indicate that copepods in the cylinder wake do not jump frequently as compared to upstream. The velocity gradient thresholds for sensing and range of maximum velocities during jumping will be presented and discussed.

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