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Three-dimensional flow visualization of a flexible cylinder wake subject to VIV JASON M. DAHL, Ocean Engineering Department, University of Rhode Island, EMMA THOMAS, Physics Department, University of Massachusetts Amherst, ERSEGUN D. GEDIKLI, Ocean Engineering Department, University of Rhode Island — The vortex-induced vibration of a low aspect ratio, low mode number, flexible cylinder is investigated in a recirculating flow channel under uniform inflow conditions. The cylinder had an aspect ratio of 40 and mass ratio of 3.76. The motion of the cylinder is tracked visually, using two high-speed cameras and the intersection of a laser sheet with the cylinder surface, capturing the cross-sectional response of cylinder at various locations along the span. Concurrent with the motion capture system, Particle Image Velocimetry is used to capture the velocity field in the wake of the cylinder at the same locations. The periodic nature of vibrations along the span of the cylinder is used to phase average the motion and wake of the cylinder, allowing for a phase averaged 3-D reconstruction of the cylinder wake. The 3-D reconstruction consists of stereoscopic PIV planar wake measurements obtained at 21 equally spaced locations along the span of the cylinder. The wake is investigated at several speeds showing the excitation of the first mode of the cylinder in the cross-flow direction and the transition to the excitation of the second mode of the cylinder in the in-line direction. This technique is shown to capture 3-D variation of vortex-shedding in the wake of the flexible cylinder.

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