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Investigation of Modal Excitation of a Flexible Cylinder on Vortex Induced Vibrations ERSEGUN D. GEDIKLI, HARRISON ZIMMER, JASON M. DAHL, Department of Ocean Engineering/ University of Rhode Island — The Vortex-Induced Vibration (VIV) of low mode number flexible cylinders is investigated to observe the effect of modal excitation on synchronization of the wake in a uniform flow. Previous studies have focused on the analysis of two degree of freedom vibrations of a rigid cylinder by controlling the ratio between in-line and cross-flow natural frequencies. The present study holds this natural frequency relation constant while varying the anticipated mode shape associated with structural natural frequencies in air. It is found that a combination of an odd mode shape excited in the cross-flow direction with an even mode shape in the in-line direction results in an incompatible synchronization condition, where the dominant forcing frequency in-line may experience a frequency equal to the cross-flow forcing frequency, a condition not typically observed in rigid cylinder experiments. Excitations of odd mode shapes in both in-line and cross-flow directions result in typical VIV excitation of the flexible body, which compares well with rigid cylinder experiments. Observed motions of the flexible body are forced using a rigid cylinder to visualization the wake.

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