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On the wake dynamics of flapping inverted flags[1] ANVAR GILMANOV, FOTIS SOTIROPOULOS, Univ of Minn - Minneapolis, JULIA COSSE, MORY GHARIB, California Institute of Technology — As recently shown experimentally by Kim et al. (*JFM*, 2013), when a flexible flag with a fixed trailing edge (an inverted flag) is exposed to a uniform inflow it can exhibit complex structural response and rich fluid-structure interaction (FSI) dynamics. We employ a new FSI numerical method to carry out large-eddy simulation (LES) of inverted flags in the range where large-amplitude flapping instabilities have been found experimentally. The numerical method integrates the curvilinear immersed boundary (CURVIB) FSI method of Borazjani et al. (*JCP*, 2008) with the thin-shell, rotation-free, finite-element (FE) formulation of Stolarski et al. (*Int. JNME,* 2013) and is able to simulate FSI of flexible thin bodies undergoing oscillations of arbitrarily large amplitude. The dynamic Smagorinsky model is employed for subgrid scale closure and a wall model is employed for reconstructing velocity boundary conditions. Comparisons with the experimental data show that the simulations are able to capture the structural response of the flag with very good accuracy. The computed results are analyzed to elucidate the structure and dynamics of the massively separated, unsteady flow shed off the flag edges.

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