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On the Wake Dynamics of a Freely Vibrating Sphere at Moderate Reynolds Number AMIR CHIZFAHM[1], RAJEEV JAIMAN, University of British Columbia — Fluid-structure interaction of an elastically-mounted sphere exhibits a wide range of complex flow-induced vibration (FIV) regimes. Unlike a vast amount of literature available on the vortex-induced vibration of an elastically-mounted circular cylinder, such studies on a sphere are limited. We aim to understand the fundamentals of new vortex-shedding modes and coupled dynamics pertaining to the FIV response of a freely vibrating sphere in all three spatial directions, using a body-fitted finite-element based fluid-structure interaction framework. To predict and analyze the vortex synchronization regimes and the wake patterns, the FIV response of the sphere at a low mass ratio is investigated over a broad range of reduced velocity and Reynolds number. We find that the sphere begins to move along a linear trajectory with hairpin vortex-shedding mode, finally transforming into a circular trajectory with spiral mode in its stationary state. We systematically examine these mode transitions and motion trajectories in the three degrees-of-freedom for the Reynolds number up to 30,000 which has not been studied in detail in the literature.

[1]Membership Pending

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