Abstract Submitted
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Symmetry properties of the reverse Bénard-von Kármán vortex street produced by a flapping foil RAMIRO GODOY-DIANA, JEAN-LUC AIDER, JOSE-EDUARDO WESFREID, Laboratoire PMMH (UMR 7636 CNRS-ESPCI-P6-P7) — We study experimentally the vortex streets produced by a high-aspect-ratio pitching foil placed in a hydrodynamic tunnel. Particle image velocimetry (PIV) measurements give access to the spatio-temporal characteristics of the vorticity field in the wake and allow for a calculation of the spatial distribution of velocity fluctuations as well as an indirect estimate of the forces on the foil. A parametric study in terms of the non-dimensional frequency (the Strouhal number) and amplitude of the flapping motion allows to identify: 1) the transition from the well-known Bénard-von Kármán (BvK) wake to the reverse BvK vortex street that characterizes propulsive wakes, and 2) the symmetry breaking of this reverse BvK wake. The latter constitutes a spontaneous mechanism giving rise to a mean vortex-induced lift force on the flapping foil.

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