Abstract Submitted
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Reduced-order modeling of the flow around a high-lift configuration with unsteady Coanda blowing[1] RICHARD SEMAAN, Tech Univ Braunschweig, LAURENT CORDIER, PPRIME, Universite de Poitiers, BERND NOACK, PPRIME, Universite de Poitiers, Tech Univ Braunschweig, PRADEEP KUMAR, MARCO BURNAZZI, Tech Univ Braunschweig, GILLES TISSOT, PPRIME, Universite de Poitiers — We propose a low-dimensional POD model for the transient and post-transient flow around a high-lift airfoil with unsteady Coanda blowing over the trailing edge. This model comprises the effect of high-frequency modulated blowing which mitigates vortex shedding and increases lift. The structure of the dynamical system is derived from the Navier-Stokes equations with a Galerkin projection and from subsequent dynamic simplifications. The system parameters are determined with a data assimilation (4D-Var) method. The boundary actuation is incorporated into the model with actuation modes following Graham et al.(1999); Kasnakoğlu et al.(2008). As novel enabler, we show that the performance of the POD model significantly benefits from employing additional actuation modes for different frequency components associated with the same actuation input. In addition, linear, weakly nonlinear and fully nonlinear models are considered. The current study suggests that separate actuation modes for different actuation frequencies improve Galerkin model performance, in particular with respect to the important base-flow changes.

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