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Wall-resolved and wall-modeled LES of active flow control for external aerodynamics[1] ORIOL LEHMKUHL, Barcelona Supercomputing Center, ADRIAN LOZANO-DURAN, Stanford University, IVETTE RODRIGUEZ, Universitat Politecnica de Catalunya — We investigate the aerodynamic performance of active flow control of airfoils and wings using synthetic jets with zero net-mass flow. The study is conducted via wall-resolved and wall-modeled large-eddy simulation using two independent CFD solvers: Alya, a finite-element-based solver; and charLES, a finite-volume-based solver. Our approach is first validated in a NACA4412, for which numerical and experimental results are already available in the literature. The performance of synthetic jets is evaluated for two flow configurations: a SD7003 airfoil at moderate Reynolds number with laminar separation bubble, which is representative of Micro Air Vehicles, and the high-lift configuration of the JAXA Standard Model at realistic Reynolds numbers for landing. In both cases, our predictions indicate that, at high angles of attack, the control successfully eliminates the laminar/turbulent recirculations located downstream the actuator, which increases the aerodynamic performance. Our efforts illustrate the technology-readiness of large-eddy simulation in the design of control strategies for real-world external aerodynamic applications.

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