Abstract Submitted
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The Role of Vorticity Injection in Separation Control[1] KUNIHIKO TAIRA, PHILLIP MUNDAY, Florida State University — Large eddy simulation is performed to examine the role of vorticity injection in separation control of spanwise periodic flow over a NACA0012 airfoil. The computations are conducted with a high-fidelity LES solver CharLES with sufficient grid resolution to resolve the near-wall turbulence at a moderate Reynolds number of $Re = 23,000$. The actuator input is introduced to the flow field through the velocity boundary condition to specify the desired vorticity flux input. The aim of this investigation is to analyze the influence of the injected vorticity magnitude and direction on the separation physics over the airfoil such that the separation is delayed. The vortical perturbation is added to break apart the large spanwise vortices responsible for causing separation and hence delay stall. The range of the vorticity injected is chosen to match those from commonly used flow control devices for separation control. In this study, particular focus is placed on examining the interaction between the actuator input and the inherent Kelvin-Helmholtz and spanwise instabilities.

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