Abstract Submitted
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Modeling Approach for a 2D Synthetic Jet[1] EMILE TOUBER, ROBERT MOSER, University of Texas — Synthetic jets are promising flow control actuators, especially for applications such as boundary layer separation control on airfoils. To simulate the effect of such devices in large-scale applications, it is important to be able to simulate the net effect of the synthetic jet on the average flow, without simulating the actuator in great detail. In our modeling approach, a triple decomposition of the velocity field is used, as in a classical RANS method, with the extra field being the periodic (phase-averaged) fluctuations. It is shown that the Reynolds-like stresses due to these phase-averaged fluctuations dominate over the turbulence fluctuations near the orifice, and cannot be represented via an eddy viscosity model. We thus propose a simple model, based on vortex dynamics, that allows us to simulate the mean effect of the periodic excitation. The mean field obtained from this model is then coupled with the RANS equations to directly obtain the averaged flow of interest. This numerically inexpensive approach will enable hybrid models such as DES to be used to simulate large-scale synthetic jet-actuated flows (e.g. on an airplane wing).

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