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PRELIMINARY RESULTS FOR A NEW TWO-PARAMETER HYBRID RANS-LES MODEL

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Although computational fluid dynamics (CFD) has been employed for many years to simulate turbulent flows, accurate prediction of these flows remains as one of the most challenging problems for aerodynamics. Typically, Reynolds-averaged Navier-Stokes (RANS) are employed to simulate turbulent due to their relatively low computational cost. However, a high degree of phenomenological modeling is required for RANS approaches. On the other hand, large-eddy simulation (LES) incorporates more flow physics at a much higher computational cost. As an alternative, a hybrid RANS/LES modeling methodology combines the characteristics of both RANS and LES and thus has the potential to offer more accuracy than RANS at a reduced cost relative to LES. It has been pointed out by a number of researchers that the primary weakness of current hybrid models lies in the treatment of the transition zone, where the value and the physical interpretation of the eddy viscosity changes from LES to RANS, or vice versa. Here, we present preliminary results from a new hybrid RANS/LES model that incorporates two separate turbulent stress parameters (one from the LES model and the other from the RANS model) to overcome this transition problem. These results indicate that the new model enhances prediction of the flow over a backstep, which is one of the standard models used for validation of turbulence models.

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