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The compressible hybrid RANS/LES governing equations MARTIN SANCHEZ-ROCHA, SURESH MENON, Georgia Institute of Technology — In this work, the compressible governing equations for hybrid Reynolds-Averaged/Large-eddy simulations are formally derived by applying a hybrid filter in the Navier-Stokes equations. This filter is constructed by linearly combining the Reynolds-Average (RANS) and Large-eddy simulation (LES) operators with a blending function. The derived equations include additional terms that represent the interactions between RANS and LES formulations. The importance of these new terms is investigated in flat-plate turbulent boundary layer simulations. Current results indicate that, the additional terms play a fundamental role modeling the turbulence that is neither modeled nor resolved when the hybrid model transits from RANS to LES. It is also indicated that when the additional terms are included, the calculations are not severely affected by the blending function implemented. However, if the new terms are not included, the hybrid calculations become dependent on the blending function. These results are important to hybrid RANS/LES models since they would indicate that the transition between formulations could be specified arbitrarily as long as the formal hybrid equations are solved. In contrast, current hybrid RANS/LES approaches rely on how this transition is specified.

Martin Sanchez-Rocha
Georgia Institute of Technology

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