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Challenges and progress in adaptation of RANS models for Scale Resolving Simulations (SRS) of Turbulence PEDRAM TAZRAEI, Mechanical Engineering, Texas AM University, SHARATH GIRIMAJI, Ocean Enginnering and Aerospace Engineering, Texas AM University — Even with the advent of exascale computing, many complex turbulent flows require some degree of modeling to enable predictive calculations of real-life applications. Scale resolving simulations (SRS) capable of yielding the best possible results at various and varying degrees of resolution are ideally suited for these computations. In general, SRS models can be broadly classified into zonal and bridging methods depending on the manner in which scale resolution is achieved. While the need for SRS approach is compelling, there is no clear consensus on closure model development thus far. In this presentation, we present a formal framework for adapting well-tested RANS (Reynolds-Averaged Navier-Stokes) models for SRS sub-grid stress computations. Various challenges such as commutation error, appropriate fixed-point behavior, near-wall closures are identified. Reasonably rigorous theoretical techniques to address the above issues in SRS modeling context are proposed. Asymptotic approach of SRS toward DNS (direct numerical simulations) in the limit of cut-off length scale approaching Kolmogorov length scale is also examined.

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