Bridging Approach to variable-resolution turbulence simulations – Unification of PANS and PITM closures SHARATH GIRIMAJI, Texas A&M University, ROBERT RUBINSTEIN, NASA Langley Research Center — Variable-resolution turbulence simulation schemes can be classified into two general categories: hybrid methods and bridging approaches. Hybrid computations entail Reynolds averaged Navier-Stokes (RANS) calculations in some flow regions and large eddy simulations (LES) in others. There exists no clear consensus on the criterion for switching from RANS to LES. The bridging methods, on the other hand, seamlessly transition from one flow resolution to another. There are currently two major bridging approaches – Partially-Averaged Navier Stokes (PANS) and Partially Integrated Turbulence Model (PITM). While the two bridging closure expressions share many similarities, there are notable differences as well. In this work, we generalize the PITM derivation to include additional features and demonstrate complete consistency with PANS closure. The unification of the two methods confirms the mathematical rigor of the bridging approach and highlights its advantage over hybrid methods.

Sharath Girimaji
Texas A&M University