Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Averaging-invariance of compressible Navier-Stokes equation
SAWAN SUMAN, SHARATH GIRIMAJI, Aerospace Engineering Department, Texas A&M University, College Station, TX 77840 — While the averaging-invariance property of incompressible Navier-Stokes (iNS) is well documented; there is a need to formally establish the property for the compressible Navier-Stokes (cNS) equations. We put forth two new weighted-moment definitions and derive the averaging-invariant form of the continuity, momentum and energy equations for a general compressible flow. The averaging-invariant equations have the form of the Favre-averaged Navier-Stokes (FANS) equations and reduce to it in the appropriate limit. Furthermore, we derive the average-invariant forms of the evolution equations of various turbulent fluxes encountered in compressible turbulence. This formalization of the averaging invariance property is expected to contribute towards developing mathematically rigorous RANS-LES hybrid and/or bridging models.

Sharath Girimaji
Aerospace Engineering Department, Texas A&M University, College Station, TX 77840.

Date submitted: 03 Aug 2008

Electronic form version 1.4