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SGS Modeling of the Internal Energy Equation in LES of Supersonic Channel Flow SRIRAM RAGHUNATH, GILES BRERETON, Michigan State University — DNS of fully-developed turbulent supersonic channel flows ($Re_\tau = 190$) at up to Mach 3 indicate that the turbulent heat fluxes depend only weakly on Mach number, while the viscous dissipation and pressure dilatation do so strongly. Moreover, pressure dilatation makes a significant contribution to the internal energy budget at Mach 3 and higher. The balance between these terms is critical to determining the temperature (and so molecular viscosity) from the internal energy equation and so, in LES of these flows, it is essential to use accurate SGS models for the viscous dissipation and the pressure dilatation. In this talk, we present LES results for supersonic channel flow, using SGS models for these terms that are based on the resolved-scale dilatation, an inverse timescale, and SGS momentum fluxes, which intrinsically represent this Mach number effect.

Giles Brereton
Michigan State University

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