Abstract Submitted
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DNS of Turbulent Boundary Layers under Highenthalpy Conditions[1] LIAN DUAN, Princeton University, PINO MARTÍN, University of Maryland, College Park — To study real-gas effects and turbulence-chemistry interaction, direct numerical simulations (DNS) of hypersonic boundary layers are conducted under typical hypersonic conditions. We consider the boundary layer on a lifting-body consisting of a flat plate at an angle of attack, which flies at altitude 30km with a Mach number 21. Two different inclined angles, 35° and 8°, are considered,representing blunt and slender bodies. Both noncatalytic and supercatalytic wall conditions are considered. The DNS data are studied to assess the validity of Morkovin's hypothesis, the strong Reynolds analogy, as well as the behaviors of turbulence structures under high-enthalpy conditions.Relative to low-enthalpy conditions [1], significant differences in typical scalings are observed.

[1] L. Duan and I. Beekman and M. P. Martín, *Direct numerical simulation of hypersonic turbulent boundary layers. Part 2: Effect of temperature*, J. Fluid Mech. **655** (2010), 419-445.

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