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DNS of transitional hypersonic boundary layers at high enthalpies[1] MARIO DI RENZO, PARVIZ MOIN, JAVIER URZAY, Center for Turbulence Research, Stanford University — Aerospace vehicles flying at hypersonic speeds are subject to boundary-layer transition, which causes a strong localized increase in wall heat transfer and friction. The influences of air dissociation at high-Mach numbers on the full process, including the non-linear early stages of turbulence, remain mostly unknown, and cannot be easily accessed by linear stability analyses or parabolized stability equations. In this presentation, DNS results of a hypersonic transitional boundary layer of dissociating air at high-enthalpy conditions are discussed, with particular focus on thermochemical effects on peak values of heat and shear stress. These simulations employ a novel task-based high-order solver written in the programming language Regent that is designed for exploiting GPU-based supercomputers.

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