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Effect of mass transfer on aeroheating in hypersonic chemically reacting boundary layers[1] MONA KARIMI, STC, NASA Ames Research Center, JOSEPH SCHULZ, AMA, NASA Ames Research Center, NAGI MANSOUR, NASA Ames Research Center — At atmospheric entry hypersonic speeds, ablation as well as surface catalycity will impact boundary layer aeroheating. Outgassing occurring from an ablative surface in planetary entry environment introduces a rich set of problems incorporating thermodynamic, fluid dynamic, and material pyrolysis. Although it is established that mass injection diminishes the wall heat transfer via convective blockage, understanding the underlying physical mechanism of the mass injection-induced boundary layer turbulence is still unresolved. To properly characterize the aerothermal environment and the required protection system, it is important to investigate gas-surface interaction models that inherently couple material response and boundary layer physics. The present study examines the aeroheating budget in hypersonic boundary layer with mass transfer produced material pyrolysis that reacts with the boundary layer environment. A coupled simulation of a chemically reacting viscous Navier-Stokes solver of the boundary layer over a pyrolyzing material is analyzed.

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