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Direct Numerical Simulation of a Compressible Reacting Boundary Layer using a Temporal Slow Growth Homogenization VICTOR TOPALIAN, TODD OLIVER, RHYS ULERICH, ROBERT MOSER, The University of Texas at Austin — A DNS of a compressible, reacting boundary layer flow at $\mathrm{Re}_\theta \approx 430$ was performed using a temporal slow-growth homogenization, for a multispecies flow model of air at supersonic regime. The overall scenario parameters are related to those of the flow over an ablating surface of a space capsule upon Earth's atmospheric re-entry. The simulation algorithm features Fourier spatial discretization in the streamwise and spanwise directions, B-splines in the wall normal direction, and is marched semi-implicitly in time using the SMR91 scheme. Flow statistics will be presented for relevant flow quantities, in particular those related with RANS modeling. Since analogous slow growth computations can be performed using RANS to predict the flow mean profiles, the use of data gathered from this type of simulation as a vehicle for the calibration and uncertainty quantification of RANS models will be discussed. This work is supported by the Department of Energy [National Nuclear Security Administration] under Award Number [DE-FC52-08NA28615].

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