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Dynamic slip wall model for compressible turbulent flows[1] KEVIN GRIFFIN, Center for Turbulence Research, Stanford University, SANJEEB BOSE, Cascade Technologies, Inc., PARVIZ MOIN, Center for Turbulence Research, Stanford University — The dynamic slip wall model (Bose and Park, ARFM, 2018) for LES is extended to compressible flows. Slip boundary conditions are used for velocity and temperature, and the slip lengths are computed dynamically. The slip wall boundary condition is a new paradigm for wall modeled LES that does not rely on RANS modeling used in traditional wall modeled LES. In this presentation, the slip wall model is applied to a transonic, transitional turbine inlet guide vane (Arts and de Rouvroit, ASME J. Turbomachinery, 1992), using unstructured CharLES code. The slip wall model is applied uniformly to the laminar, transitional, and turbulent sections of the flow. No a priori knowledge of the transition location is needed. The heat transfer on the blade is well predicted using the slip wall model. The use of a slip wall model in the under-resolved laminar section is motivated with an analysis of how slip improves the numerical prediction of the self-similar Falkner-Skan equation with limited resolution.

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