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Slip wall modeling approaches for separated flows and heat transfer SANJEEB BOSE, Cascade Technologies, BRIAN PIERCE, PARVIZ MOIN, Center for Turbulence Research, Stanford Univ — Resolution of near-wall turbulent structures is computational prohibitive, necessitating the need for wall-modeled large-eddy simulation approaches. Standard wall models are often formulated to represent the wall stress assuming an equilibrium, attached boundary layer. This assumption is invalid in complex flows that include transition to turbulence or boundary layer separation. A dynamic slip wall boundary condition has been recently proposed (Bose & Moin, PoF, 2014) as an alternative for wall-modeled LES, where a slip wall boundary condition is derived from the differentially filtered LES governing equations with no assumption on the state of the local boundary layer. Results will be presented from the application of the dynamic slip wall model to flows with 3D separation (asymmetric stalled diffuser) and from the extension of the model to the prediction of wall heat transfer (turbine blade). The wall modeled LES predicts the primary quantity of interest in these flows: the pressure recovery in the diffuser and the heat transfer coefficient on the turbine blade.

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