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The decay of forced rescaling modes in a Mach 3 turbulent boundary layer[1] YIN-CHIU KAN, IZAAK BEEKMAN, STEPHAN PRIEBE, PINO MARTIN, University of Maryland — We introduce a new, Mach 3, compressible, turbulent boundary layer (TBL) spatial direct numerical simulation (SDNS), with a streamwise length of $50\delta_{inlet}$. The simulation has an inlet Re_θ of 2500, increasing to 4000 at the outlet, with the boundary layer thickness, δ, nearly doubling from the inlet to the outlet. The inflow is computed using an auxiliary DNS with a rescaling length of 8δ. We examine the evolution of turbulence statistics as the boundary layer grows. In particular, we scrutinize the effects of rescaling and the non-stationarity of the flow. We wish to determine how far downstream the flow must travel to sufficiently "forget" the effects of rescaling. The effect of rescaling is of particular interest when investigating low frequency and large scale phenomena, such as coherent flow structures. These large coherent structures are on the order of 10δ in streamwise extent, and have been found at similar conditions to the present study.[2] With this data set we will address and quantify the role of rescaling and the rate at which the flow will forget this artificial forcing.

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[2]Ringuette, Wu & Martín *J. Fluid Mech.*, 594:59-69, 2008.

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