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Direct Numerical Simulation of Turbulent Boundary Layers on a Large Domains[1] YIN-CHIU KAN, CLARA HELM, IZAAK BEEKMAN, PINO MARTIN, University of Maryland — Direct numerical simulation data of spatially-developing subsonic, supersonic and hypersonic turbulent boundary layers with matching similarity parameters are presented. The simulations are performed on large computational domains, using the rescaling technique with large rescaling lengths to minimize numerical correlation of the inflow and recycling planes. The simulations are run for long times without forcing the artificial acoustic modes in the free stream. We investigate the evolution of the boundary layer parameters and basic statistics with streamwise distance through the computational box and examine the turbulence structure through spectral analysis and filtered instantaneous flow fields. We pay special attention to the largest structures, with turbulence modeling, especially aspects unique to compressible boundary layers, in mind.

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