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Development of a turbulent boundary layer beneath finite-amplitude continuous freestream turbulence XIAOHUA WU, Royal Military College of Canada, PARVIZ MOIN, CTR, Stanford University — Following the earlier work of Wu & Moin (JFM 2009, PoF 2010) and Wu (JFM 2010), here we will present our third, most recent, direct numerical simulation of the incompressible, zero-pressure-gradient flat-plate boundary layer. Heat transfer between the constant-temperature plate and the free-stream is also simulated with unit molecular Prandtl number. The freestream of the present boundary layer has continuous isotropic turbulence whose inlet strength is 3% of the mean velocity. Its decay characteristics agree with existing water channel experiments. Despite the finite-level freestream perturbation, the boundary layer is clean in the sense that the deviation of skin-friction from Blasius prior to breakdown is less than 1%. Both the statistics and structures from this simulation will be compared with our previous DNS studies using periodically fed patches of isotropic turbulence. The associated bypass transition process will also be evaluated.

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