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Direct numerical simulation of a turbulent flow over a curved ramp using FastRK3 ABHIRAM AITHAL, ANTONINO FERRANTE, University of Washington — Flow separation, resulting from an adverse pressure gradient (APG), is encountered in many engineering applications. However, the physical mechanisms of separated turbulent boundary layers over curved walls are not yet fully understood. In order to provide the necessary statistics for the validation of RANS and LES models, and explain the physical mechanisms of such flows, we have performed direct numerical simulations (DNS) of a spatially developing turbulent boundary layer over a curved ramp with APG using our new pressure-correction method called FastRK3 (Aithal & Ferrante, *J. Comput. Phy.*, 2020). FastRK3 is a three-stage, Runge-Kutta based pressure-correction method for the incompressible Navier-Stokes equations in orthogonal curvilinear coordinates, and requires solving the Poisson equation for pressure only once per time step without loss of accuracy with respect to the standard RK3. In the current work, we focus our study on the dynamics of the turbulence kinetic energy of the flow in curvilinear coordinates.

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