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LES of spatially developing turbulent boundary layer over a concave surface SUNIL AROLLA, Cornell University, PAUL DURBIN, Iowa State University — We revisit the problem of spatially developing turbulent boundary layer over a concave surface. Unlike previous investigations, we simulate the combined effects of curvature-induced pressure gradients as well as streamline curvature on the turbulence. Our focus is on investigating the response of the turbulent boundary layer to the sudden onset of curvature and the destabilizing influence of concave surface in the presence of pressure gradients. This is of interest for evaluating the turbulence closure models. Numerical simulations have been performed using the large eddy simulation framework in OpenFOAM. The dynamic Smagorinsky model is used to account for the sub-grid scale stresses. A variant of the recycling and rescaling method is used to generate the inflow turbulence. At the beginning of the curve, the momentum thickness Reynolds number is 1300 and the ratio of boundary layer thickness to the radius of curvature is $\delta_0/R = 0.055$. The radial profiles of the mean velocity and turbulence statistics at different locations along the concave surface are presented. In addition, the secondary flow structures observed are reported.

Sunil Arolla
Cornell University

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