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Direct Numerical Simulation of a Quasilaminarized Boundary Layer LUCIANO CASTILLO, Rensselaer Polytechnic Institute, JUAN GUILLERMO ARAYA, Swansea University, RAUL BAYOAN CAL, Portland State University — Direct Numerical Simulations of spatially-evolving turbulent boundary layers with strong favorable pressure gradients are performed. The driven force behind this investigation is elucidate the mechanisms responsible for the quasilaminarization of the boundary layer. Budgets of the turbulent kinetic energy and the shear Reynolds stresses provide insight into the terms responsible for this phenomenon. The results also confirm the similarity analysis framework as develop by Cal and Castillo[1] including the redistribution of the Reynolds stresses, a significant reduction in skin friction and a pressure parameter value which falls in the quasilaminar quadrant. The prescription of stronger favorable pressure gradients is mainly manifested by a significant decrease of the production of the shear Reynolds stresses and attenuation of the velocity-pressure gradient correlation term. The latter evidence confirms the important role of pressure fluctuations on the energy exchange and transport phenomena of flow parameters.

[1]R. B. Cal and L. Castillo (2008), Phys. Fluids. vol 20, 105106, 2008.

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