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DNS of very strong adverse pressure gradient flows with eventual separation GUILLERMO ARAYA, LUCIANO CASTILLO, Dept. of Mechanical Eng., Texas Tech University, Lubbock, TX 79409 USA — Direct Numerical Simulations (DNS) of spatially-evolving turbulent boundary layers with prescribed very strong adverse pressure gradients with eventual separation are performed. The driven force behind this investigation is to analyze the interaction between the inner and outer layers in separated flows. Also, the outer peaks in velocity fluctuations are analized by means of the energy budget of the turbulent kinetic energy and shear Reynolds stresses. A method for prescribing realistic turbulent velocity inflow boundary conditions is employed and based on the rescaling-recycling method proposed by Lund et al. (1998). The standard rescaling process requires prior knowledge about how the appropriate velocity and length scales are related between the inlet and recycle stations (e.g. classic scaling laws). Here a dynamic approach is proposed in which such information is deduced dynamically by involving an additional plane, the so called "test plane" located between the inlet and recycle stations. The approach also distinguishes between the inner and outer regions of the boundary layer and enables the use of multiple velocity scales, Araya et al. (2009, 2011). This flexibility allows applications to boundary layer flows with arbitrary pressure gradients.

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