Abstract Submitted
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A dynamic multi-scale approach for turbulent inflow generation in spatially-developing boundary layers with streamwise pressure gradients[1] GUILLERMO ARAYA, LUCIANO CASTILLO, KENNETH JANSEN, Rensselaer Polytechnic Institute, CHARLES MENEVEAU, Johns Hopkins University — A novel method for generating realistic turbulent velocity and thermal inlet boundary conditions is presented for simulations of evolving turbulent boundary layers. The approach is 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 "test plane", which is located between the inlet and recycle stations. This improvement, as well as the use of multiple velocity scales, permits the simulations of turbulent boundary layers subjected to arbitrary pressure gradients. DNS for zero (ZPG), adverse (APG) and favorable (FPG) pressure gradient flows are discussed. The agreement obtained by comparing present results with experimental and numerical data demonstrates the suitability of the present method as a turbulent inflow generator.

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