Inflow conditions for large-eddy simulations

Yusik Kim, Zheng-Tong Xie*, Ian P. Castro

Faculty of Engineering and the Environment, University of Southampton, SO17 1BJ, Southampton, UK

Abstract

A new turbulent inflow condition for LES is designed and compared with an existing model [1]. Both models are applied on a plane channel flow and validated with a periodic boundary condition. The two models show similar performance in terms of flow development distance, see Fig. 1. The imposing location of the inflow conditions and pressure-velocity coupling procedure are modified to satisfy the divergence free condition which leads to significant reduction of unphysical pressure fluctuations. Quasi-streamwise vortices are modelled in the near wall turbulence and are imposed at the inlet which enhances the flow developments.

Keywords: inflow condition, divergence free, pressure fluctuations, near wall turbulence

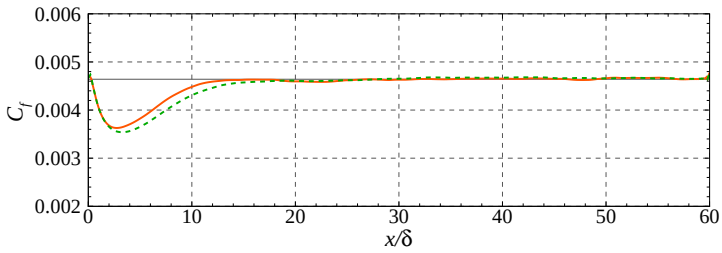

Figure 1: Effects of the inflow condition on developments of the skin-friction coefficient along the streamwise direction (x), the existing model [1] (thick-solid), new model (thick-dashed), periodic boundary condition (thin-sold).

References

[1] Xie ZT, Castro IP . Efficient generation of inflow conditions for large eddy simulation of street-scale flow. Flow Turb Comb 2008;81:449–70.

*+44 (0)23 8059 4493
Email address: zxie@soton.ac.uk (Zheng-Tong Xie)