replacing DFD16-2016-001467

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Wall-layer model for LES with massive separation[1] AHMAD FAKHARI, VINCENZO ARMENIO, University of Trieste - Trieste, FEDERICO ROMAN, IEFLUIDS s. r. l. - Trieste — Currently, Wall Functions (WF) work well under specific conditions, mostly exhibit drawbacks specially in flows with separation beyond curvatures. In this work, we propose a more general WF which works well in attached and detached flows, in presence and absence of Immersed Boundaries (IB). First we modified an equilibrium stress WF for boundary-fitted geometry making dynamic the computation of the k (von Karman constant) of the log-law; the model was first applied to a periodic open channel flow, and then to the flow over a 2D single hill using uniform coarse grids; the model captured separation with reasonable accuracy. Thereafter IB Method by Roman et al. (Phys. Fluids, 2009) was improved to avoid momentum loss at the interface between the fluid-solid regions. This required calibration of interfacial eddy viscosity; also a random stochastic forcing was used in wall-normal direction to increase Reynolds stresses and improve mean velocity profile. Finally, to reproduce flow separation, a simplified boundary layer equation was applied to construct velocity at near wall computational nodes. The new scheme was tested on the 2D single hill and periodic hills applying Cartesian and curvilinear grids; good agreement with references was obtained with reduction in cost and complexity.

[1]Financial support from project COSMO "CFD open source per opera morta" PAR FSC 2007-2013, Friuli Venezia Giulia.

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Date submitted: 01 Aug 2016 Electronic form version 1.4