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WALL-MODELLED LARGE EDDY SIMULATION OF FLOW OVER A BACKWARD-FACING STEP

Timofey Mukha[1,*], **Saleh Rezaeiravesh**[1] **and Mattias Liefvendahl**[1,2]

[1] Uppsala University, Sweden, PO Box 256, SE-751 05 Uppsala, Sweden,
timofey.mukha@it.uu.se, saleh.rezaeiravesh@it.uu.se, www.uu.se.
[3] Swedish Defense Research Agency (FOI), SE-164 90 Stockholm, Sweden,
mattias.liefvendahl@foi.se, www.foi.se.

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Here, wall-modelled large eddy simulation is applied to computing the flow over a backward-facing step at $Re_h = 37\,000$, where h is the step height. Two types of wall models, based on different mathematical formulations, are considered: an algebraic model based on a law-of-the-wall and an ODE model derived from boundary layer equations. These models are implemented within the framework of a general-purpose second-order accurate finite volume-based code, see [3]. Besides comparing the predictive accuracy of the two approaches, the study investigates the influence of the wall-normal distance to the wall models' sampling point, which was first high-lighted in [2].

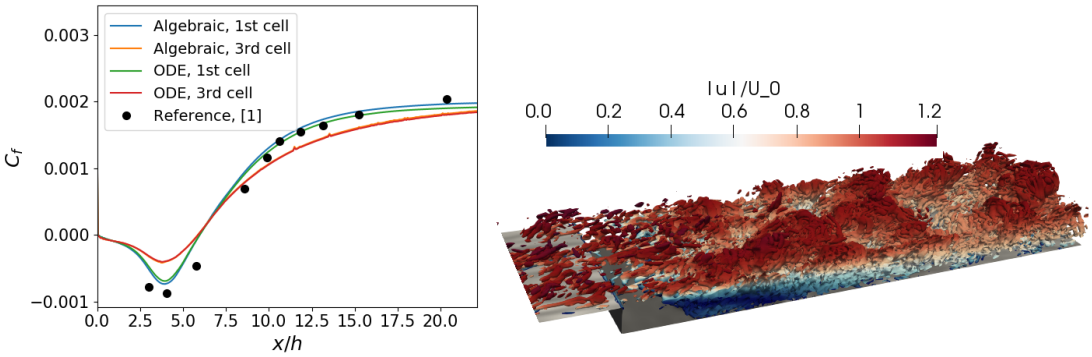

Figure 1: Skin friction coefficient for different wall modelling approaches (left), iso-surfaces of the Q-criterion coloured by normalised velocity magnitude (right).

Figure 1 illustrates the resolved turbulent structures and shows the behaviour of the skin-friction coefficient, c_f, downstream of the step. Both wall modelling approaches yield similar and overall satisfactory results. The effect of the location of the sampling point is found to be significant. In particular, moving the sampling point further away from the wall (from the first to the third consecutive off-the-wall cell centre) does not appear to benefit the accuracy, contrary to what is suggested in previous studies on attached flows [2]. Further analysis of the wall modelling approaches with respect to the parameters of the models and the resolution of the grid will be conducted.

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