



Evaluation of the scale dependent dynamic SGS model in the open source code `caffa3d.MBRi` in wall-bounded flows

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The Scale Dependent Dynamic Model (SDDM) has been widely validated in large-eddy simulations using pseudo-spectral codes [1][2][3]. The scale dependency, particularly the potential law, has been proved also in a priori studies [4][5]. To the authors' knowledge there have been only few attempts to use the SDDM in finite difference (FD) and finite volume (FV) codes [6][7], finding some improvements with the dynamic procedures (scale independent or scale dependent approach), but not showing the behavior of the scale-dependence parameter when using the SDDM.

The aim of the present paper is to evaluate the SDDM in the open source code `caffa3d.MBRi`, an updated version of the code presented in [8]. `caffa3d.MBRi` is a FV code, second-order accurate, parallelized with MPI, in which the domain is divided in unstructured blocks of structured grids. To accomplish this, 2 cases are considered: flow between flat plates and flow over a rough surface with the presence of a model wind turbine, taking for this case the experimental data presented in [9]. In both cases the standard Smagorinsky Model (SM), the Scale Independent Dynamic Model (SIDM) and the SDDM are tested. As presented in [6][7] slight improvements are obtained with the SDDM. Nevertheless, the behavior of the scale-dependence parameter supports the generalization of the dynamic procedure proposed in the SDDM, particularly taking into account that no explicit filter is used (the implicit filter is unknown).

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