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Study of dealiasing schemes in pseudo-spectral methods for Large-Eddy Simulations of incompressible flows FABIEN MARGAIRAZ, University of Utah, MARCO GIOMETTO, Ecole Polytechnique Federale de Lausanne, MARC PARLANGE, University of British Columbia, MARC CALAF, University of Utah — The performance of dealiasing schemes and their computational cost on a pseudo-spectral code are analyzed. Dealiasing is required to limit the error that occurs when two discretized variables are multiplied, polluting the accuracy of the result. In this work three different dealiasing methods are explored: the 2/3 rule, the 3/2 rule, and a high order Fourier smoothing based method. We compare the cost of the traditionally accepted 3/2 rule (Canuto et al. 1988), where an expansion of the computational domain to a larger grid is required, to the cost of the other two techniques that do not require this expansion. This analysis is performed in the framework of Large-Eddy Simulations (LES) of incompressible flows using the constant Smagorinsky sub-grid model with a wall damping function and a wall model based on the log-law. A highly efficient LES code parallelized using a 2D pencil decomposition has been developed. The code employs the traditional pseudo-spectral approach to integrate the incompressible Navier-Stokes equations. Several simulations of a neutral atmospheric boundary layer using different degrees of numerical resolution are considered. Results show a net difference in computational cost between the different techniques without relevant changes in statistics.

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