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Wall-resolved adaptive simulation with spatially-anisotropic wavelet-based refinement[1] GIULIANO DE STEFANO, University of Naples (ITALY), ERIC BROWN-DYMKOSKI, OLEG V. VASILYEV, University of Colorado Boulder — In the wavelet-based adaptive multi-resolution approach to turbulence simulation, the separation between resolved energetic structures and unresolved flow is achieved through wavelet threshold filtering. Depending on the thresholding level, the effect of residual motions can be either neglected or modeled, leading to wavelet-based adaptive DNS or LES. Due to the ability to identify and efficiently represent energetic dynamically important flow structures, these methods have been proven reliable and effective for the computational modeling of wall-bounded turbulence. The wall-resolved adaptive approach however necessitates the use of high spatial resolution in the wall region, which practically limits the application to moderate Reynolds numbers. In order to address this issue, a new method that makes use of a spatially-anisotropic adaptive wavelet transform on curvilinear grids is introduced. In contrast to all known adaptive wavelet-based approaches that suffer from the "curse of anisotropy," i.e., isotropic wavelet refinement and inability to have spatially varying aspect ratio of the mesh elements, this approach utilizes spatially-anisotropic wavelet-based refinement. The method is tested for the turbulent flow past a rectangular cylinder at moderately high Reynolds number.

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