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Spatial Variable Thresholding for SCALES[1] ALIREZA NEJADMALAYERI, OLEG V. VASILYEV, ALEXEI VEZOLAINEN, University of Colorado at Boulder, GIULIANO DE STEFANO, Seconda Universita Napoli, Italy — The Stochastic Coherent Adaptive Large Eddy Simulation (SCALES) is a novel wavelet-based approach that resolves energy containing turbulent motions using wavelet multiresolution decomposition and self-adaptivity. The extraction of the most energetic structures is achieved using wavelet thresholding filter with a priori prescribed threshold level. This strategy, although successful, has a major drawback: the thresholding criterion is global and does not fully utilize the spatial/temporal intermittency of the turbulent flow. In the current numerical effort, for the first time (to the best of our knowledge), the concept of physics-based spatially variable thresholding in the context of wavelet-based numerical techniques for solving PDEs is introduced. The procedure consists of tracking the wavelet thresholding-factor within a Lagrangian frame by exploiting a Lagrangian Path-Line Diffusive Averaging approach that uses linear averaging along characteristics. The results for incompressible flow around NACA 0015 airfoil show a very robust and fast methodology for adjusting the thresholding-factor based on dynamically important flow characteristics, for instance, the magnitude of vorticity or strain rate.

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