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Wavelet-based Simulations of Unsteady Compressible Flows[1]
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— In this talk we present an extension of adaptive wavelet-based methodologies for unsteady compressible fluid simulations. This approach takes advantage of spatio-temporal intermittency of unsteady flows through a dynamically adaptive grid. It is built upon the adaptive wavelet collocation method, which allows for efficient mesh refinement at each time step with the error well-bounded by a prescribed threshold. Several benchmark simulations have been performed for compressible subsonic flows, including turbulent channel flow and flow around a bluff body. Atypically for channel flow simulations, a dyadic adaptive grid was used instead of the usual stretched mesh. While the external flow simulations are at a subcritical Reynolds number, spanwise instabilities create vortex loops that lead to a complex, three-dimensional wake. This work provides the basis for continuing development of adaptive, compressible turbulence models, including wavelet-based adaptive LES where the filter threshold is dynamically prescribed by global or local criteria.

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