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A low-dissipation and dispersion finite volume method for large eddy simulation of compressible flow on arbitrary unstructured grids
FRANK HAM, Stanford University — One way to develop stable solvers for large eddy simulation with minimal numerical dissipation is to use so-called summation-by-parts (SBP) operators. These discrete operators mimic the integration-by-parts property of the continuous equations, leading to discrete stability by the energy method. Unfortunately, the application of large eddy simulation to compressible flows of engineering interest often involves complex geometries and consequently unstructured grids. In the present work, a method for constructing a fast, explicit compressible flow solver for large eddy simulation is presented that uses standard polynomial reconstruction techniques to build accurate finite volume operators, which are subsequently modified based on the extent to which they are not SBP. Because the SBP property is a property of the operators and not the solution, this can be performed as a pre-processing step in a large eddy simulation. Several examples will be presented demonstrating the robustness and accuracy of this compromise approach, including sound radiated from transonic and supersonic jets.

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