14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19–24, 2019, Paris, France

DISCRETE CONSERVATION PROPERTIES IN CFD TRACK 600

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Key words: Energy/enstrophy conservation, nonlinear stability, compressible turbulence, entropy stability, summation by parts, high-order methods, structured/unstructured grids, mimetic methods

ABSTRACT

Numerical methods with discrete conservation properties have found enormous application in computational fluid dynamics (CFD). The main reason for their success lies in a powerful combination of physical fidelity and numerical robustness, making them ideal candidates for the simulation of complex multi-scale problems, such as shock-free turbulence. Most CFD techniques possess inherent conservation properties for primary unknowns, while so-called *secondary* conservation statements are typically harder to achieve, and consist into the discrete reproduction of evolution equations for derived quantities that can be deduced from the continuous formulation. A prominent example is kinetic energy in both incompressible and compressible flow models [1, 2], but other variables such as enstrophy, vorticity or entropy have proved to be no less important. As the key ingredients to achieve these properties are more clearly identified, the CFD community is heading towards a unified approach that encompasses a wide range of techniques, from classical finite-differencing methods to emerging high-order approaches, with remarkable repercussions on the viability of complex simulations and on turbulence modeling.

This minisymposium will gather researchers from different CFD-related disciplines working on the development of cutting-edge numerical methods with discrete conservation properties, as well as on the application of such methods to complex engineering or biological systems. Topics include, but are not limited to: invariant-preserving algorithms for high-order methods (e.g., discontinuous Galerkin, spectral element), mimetic methods, geometric time integration, boundary conditions, implicit and explicit large-eddy simulation modeling, unstructured and moving grids, high performance computing.

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