数学与系统科学研究院

计算数学所网络学术报告

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报告题目：

Recent progress on the development of high-order TENO schemes

邀请人：　袁礼　研究员

报告时间：2021 年 4 月 23 日（周五）

上午 10:00-11:00

报告工具：腾讯会议（ID：950 772 319）

Abstract:

For compressible flow simulations involving both turbulence and shockwaves, the competing requirements render it challenging to develop high-order numerical methods capable of capturing the discontinuities sharply and resolving the turbulence with high spectral resolution. In particular when deployed with the advanced large-eddy simulation (LES) approach, for which the governing equations are solved with coarse mesh, the solution is extraordinarily sensitive to the numerical dissipation resulting in large uncertainties for cross-code comparisons. In this talk, the family of high-order targeted essentially non-oscillatory (TENO) schemes is reviewed for general hyperbolic conservation laws with an emphasis on the high-speed turbulent flows. As a novel variant of popular weighted ENO (WENO) scheme, the TENO scheme retains the sharp shock-capturing capability of WENO and is suitable for resolving turbulence with controllable low numerical dissipation. The key success of TENO relies on a strong scale-separation procedure and the tailored novel ENO-like stencil selection strategy. In addition, the built-in candidate stencils with incremental width facilitates the construction of arbitrarily high-order (both odd- and even-order) schemes featuring superior robustness. Detailed comparisons between WENO and TENO schemes are discussed. Examples of the applications of TENO schemes to challenging compressible fluids with broadband length scales are presented.

Bio:

Prof. Fu is an Assistant professor in Department of Mechanical and Aerospace Engineering and Department of Mathematics at the Hong Kong University of Science and Technology (HKUST). Before he joined HKUST, he was a postdoctoral fellow working with Prof. P. Moin at Center for Turbulence Research (CTR), Stanford University for more than 3 years and he also did postdoctoral research with Prof. N.A. Adams in Technical University of Munich (TUM), where he obtained his Ph.D. degree with a grade of Summa Cum Laude. His on-going and future research involves fundamental study of flow physics including turbulence, transitional flows, multi-phase flows, and aerodynamics. He is also focusing on numerical methods for solving PDEs and technologies for high-performance computing.

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