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A flexible framework of high-order shock-capturing schemes for convection-dominated problem YUE LI, Chair of Aerodynamics and Fluid Mechanics, Department of Mechanical Engineering,Technical University of Munich, LIN FU, Center for Turbulence Research, Stanford University, NIKOLAUS ADAMS, Chair of Aerodynamics and Fluid Mechanics, Department of Mechanical Engineering,Technical University of Munich — In this work, we further extend the TENO framework proposed by Fu [Fu et al., Journal of Computational Physics 305 (2016): 333-359] with flexibility to control the nonlinear dissipation property of TENO schemes in nonsmooth regions while maintaining the performance of TENO in smooth regions. While a set of candidate stencils of incremental width is constructed, each one is indicated as smooth or nonsmooth by the ENO-like stencil selection procedure proposed in TENO scheme. Rather than being discarded directly in TENO schemes, the nonsmooth candidates are filtered by an extra nonlinear limiter, e.g. monotonicity-preserving (MP) limiter. Consequently, the high-order reconstruction is achieved by assembling the candidate fluxes with the optimal linear weights since they are either smooth reconstructions or filtered ones which feature good non-oscillation property. Based on the proposed framework, several new six- and eight-points TENO schemes with controllable dissipation are developed. A set of critical benchmark cases reveal that the proposed new TENO schemes capture the discontinuities sharply and resolve the high-wavenumber fluctuations with low dissipation, while maintaining the desired accuracy order in smooth regions.

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