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Numerical Methods for Scalar Transport Equation[1] YASER KHALIGHI, VINCENT TERRAPON, PARVIZ MOIN, Center for Turbulence Research, Stanford University — Scalar transport phenomenon is known to generate small scale fluctuations. Consequently, in high Schmidt number regime it creates numerical difficulties in computer simulations. Besides that, the dissipative and dispersive nature of most numerical schemes aggravates the inaccuracy of such simulations. In the present work, two second order non-dissipative numerical schemes are implemented. These methods are optimized for the scalar transport equation and consider dispersion characteristics of numerical schemes, stability and computational efficiency. In addition, the advection of passive scalar is studied in Lagrangian framework. It is demonstrated that Lagrangian approach is very suitable for this problem when the Schmidt number is infinity. To ensure adequate resolution a particle destruction and creation algorithm is implemented. The effect this algorithm is studied in terms of overall accuracy and numerical dissipation. Passive scalar transport in a 2D Green-Taylor vortex is chosen as a benchmark problem where these new numerical techniques are applied. Results are compared in terms of dispersion, energy cascade and computational efficiency.

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