Abstract Submitted for the DFD10 Meeting of The American Physical Society

Combined Compact Difference Numerical Method for Simulation of Boundary Layer Turbulence Transition in the Non-Linear Stage JIM CHEN, WEIJIA CHEN, Nanyang Technological University — The non-linear stage of boundary layer turbulence transition is investigated by solving the Vorticity Transport Equation using a 12th-order discretization of the spatial derivatives in uniform grids and a 4th-order 5-6 alternating stages Runge-Kutta method for temporal integration. The spatial and temporal schemes are optimized together for the downstream convective term to achieve better spectral resolution. In this method, the downstream wave number spectrum is divided into two parts: the first part preserves low dispersion and dissipation errors for accurate simulations of the physical waves; the second part generates strong numerical dissipation to suppress numerical grid-mesh oscillations. In addition, a multigrid method is used to accelerate the convergence of solving the velocity Poisson's equation. Results of the simulations show that nonlinear wave interactions, generation, and amplification can be realized.

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Date submitted: 02 Aug 2010

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