

Numerical Simulation of Vortical Flows Using a Highly Accurate Finite Difference Scheme

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A combined compact finite difference (CCD) scheme with high accuracy and high resolution is proposed for numerical simulation of incompressible vortical flow fields. The CCD scheme has eighth-order accuracy and spectral-like resolution for the first derivative except for the boundary. The Poisson equation is also solved accurately by using the CCD scheme and the ADI method. The vortical flows in the three-dimensional lid-driven square cavities with different spanwise aspect ratios are studied using this new scheme. The numerical results clearly show the bifurcation of flow structures in a lid-driven cavity with different spanwise aspect ratios.

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