A COMBINED FOURTH-ORDER COMPACT SCHEME WITH AN ACCELERATED MULTIGRID METHOD FOR THE ENERGY EQUATION IN SPHERICAL POLAR COORDINATES [*]

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Abstract. A higher-order compact scheme is combined with an accelerated multigrid method to solve the energy equation in a spherical polar coordinate system. The steady forced convective heat transfer from a sphere which is under the influence of an external magnetic field is simulated. The convection terms in the energy equation are handled in a comprehensive way avoiding complications in the calculations. The angular variation of the Nusselt number and mean Nusselt number are calculated and compared with recent experimental results. Upon applying the magnetic field, a slight degradation of the heat transfer is found for moderate values of the interaction parameter N, and for high values of N an increase in the heat transfer is observed leading to a nonlinear behavior. The speedy convergence of the solution using the multigrid method and accelerated multigrid method is illustrated.

Key words. higher-order compact scheme, accelerated multigrid method, forced convection heat transfer, external magnetic field

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