

## عنوان مقاله:

A Characteristic-based Finite-volume Solution of Natural Convection around a Horizontal Cylinder

## محل انتشار:

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## خلاصه مقاله:

In this paper, a newly developed characteristic-based finite-volume solution of incompressible viscous natural convection flow around a horizontal cylinder has been investigated. This method has been modified to take into account the artificial compressibility which couples the continuity and momentum equations. A fifth-order dual-time-step Runge-Kutta scheme with local time stepping and implicit residual smoothing as convergence acceleration techniques, because of its wide range of stability and fast convergence rate, has been used for marching in time. The convective fluxes have been calculated by a Roe-like high-order flux splitting scheme which is based on the virtual acoustic wave propagation. The viscous and thermal conduction terms were found by a second-order technique. This method admits high CFL numbers and has a good convergence rate and performance within a wide range of Rayleigh numbers from 1 to 10000. The results have been compared with available benchmark results in literature. A very good agreement exists between them.

## کلمات کلیدی:

Navier-Stokes Equations, Finite-volume Method, Natural Convection, Artificial Compressibility, Circular Cylinder, Characteristic Method, Runge-Kutta Scheme

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