

## TRANSIENT RAYLEIGH-BÉNARD CONVECTION IN A CYLINDER WITH AN ASPECT RATIO OF 4

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**ABSTRACT** The time dependent natural convection in a vertical cylinder, which is heated from below and cooled from above, is computed using the vorticity-vector potential formulation. The vertical cylindrical side wall is adiabatic and the cylinder has an aspect ratio (radius to height) of 4. The fluid studied has a Prandtl number of 7. The range of Rayleigh number ( $Ra$ ) used in this study is  $1800 \leq Ra \leq 30000$ . Heat is initially transferred by conduction and the time at which motion starts is dependent on the Rayleigh number. For the range of  $Ra$  studied, the initial motion consists of semi-circular rolls. The initial number of cells in the vertical plane ranges from seven to eleven for the range  $Ra$  studied. The initial number of semi-circular rolls depends on  $Ra$ . The number of rolls changes as time is increased. At low Rayleigh numbers the flow pattern at steady state also consists of semi-circular rolls. At other Rayleigh numbers the flow pattern changes to non-semi-circular rolls, concentric rolls and complex roll patterns. The flow pattern also consists of parallel rolls and radial rolls. Maximum total kinetic energy and Nusselt number are reached within a short time after motion has started. At low Rayleigh numbers the total kinetic energy and the Nusselt number reach the maximum value without oscillating. At higher Rayleigh numbers both the total kinetic energy and Nusselt number oscillates after reaching their maximum values.