Mixed convection characteristics in lid-driven cavity containing heated triangular block

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ABSTRACT

This research work numerically analyzes 2D, steady state mixed convective heat transfer for Newtonian fluids in lid driven square enclosure with centered triangular block (blockage-10% or 30%) maintained either at the constant wall temperature or constant heat flux thermal conditions. The fluid flow in the enclosure is initiated by top moving wall in + *x*- direction, while all other walls are stationary. The top and bottom walls are thermally insulated. In particular, the governing field equations are solved for range of governing parameters such as, Reynolds number (1-1000), Prandtl number (1-100), and Grashof number (0-10^5). It is observed that the increase in inertial force enhances the heat transfer rate up to certain Reynolds number range (80-200), later deterioration of heat transfer rate is observed. Such behavior is found to be true for lower blockage (10%). Finally, functional dependence of average Nusselt number values with flow governing dimensionless parameters is developed and presented for its possible utilization in engineering and design purpose.

Keywords: Mixed convection; Lid-driven cavity; Reynolds number; Numerical Study; Grashof number

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