EFFECT OF HEATING LOCATION ON STABILITY OF NATURAL CONVECTION IN A SQUARE ENCLOSURE

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ABSTRACT A numerical study was conducted to investigate steady natural convection phenomena of air in a square cavity with different locations of the heating portion. The heat sources parts in the left, right and bottom walls of the cavity are maintained at a higher temperature Th, whereas the other parts of this side walls are kept at a lower temperature Tc. The enclosure's top wall is kept insulated.

The coupled equations of continuity, momentum and energy are solved by a finite volume method. The SIMPLE algorithm is used to solve iteratively the pressure-velocities coupling. The numerical investigations in this analysis is made over a wide range of parameters, Rayleigh number ($10^3 \leq Ra \leq 10^6$) dimensionless heater lengths and Prandtl number, ($0.01 \leq Pr \leq 1$).The effect of three different heating locations on the vertical walls (bottom, Centre, and top) and the local heat source on the bottom wall was evaluated. Results are presented graphically in the form of streamlines, isotherms and also with a velocity profiles and average Nusselt numbers.

The results show the average Nusselt number is increase with the increasing of the Rayleigh number, the dimensionless heater length and Prandtl number. On the other hand, the Prandtl number has significant effect on the Nusselt number to the value of Pr = 0.71 .The results were compared with previous results and good agreement was found.