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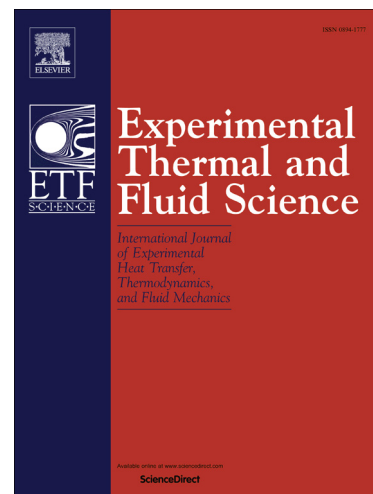
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Effect of aperture size on free convection and radiation heat transfer in isoflux upward-facing cylindrical cavities

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Abstract: Taking isoflux upward-facing cylindrical cavities as object, the effect of aperture size on free convection and radiation heat transfer was studied experimentally and numerically. Besides, the influences of tilt angle and heat flux under different aperture sizes were also tested by experiment. The reliability of experiment was confirmed by experimental uncertainty analysis and reproducibility. The results indicate that the larger the aperture size is, the lower the temperature of cavity surfaces is and the stronger the free convection and radiation heat transfer are. The effect of aperture size on free convection heat transfer is of more significance for the cavities with small aperture size, while the behavior is opposite to its effect on radiation heat transfer. Aperture size has no influence on the variation trends of free convection and radiation heat transfer Nusselt numbers (Nu_c and Nu_r) with tilt angle and heat flux. To facilitate engineering applications, some suggestions and empirical correlations with high prediction accuracy were proposed.

Keywords: upward-facing cylindrical cavity; aperture size; free convection; radiation; experimental study; numerical simulation

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