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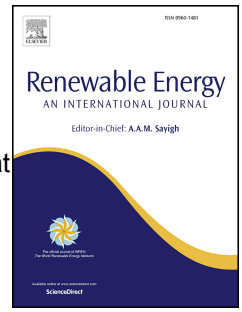

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Influence of Non-Uniform Heat Flux Distributions on the Secondary flow, Convective Heat Transfer and Friction Factors For a Parabolic Trough Solar Collector Type Absorber Tube

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Abstract

Non-uniform heat flux profiles on circular tubes are found in a number of heat transfer applications, including solar heating. In this numerical study the influence of the circumferential angle spans of non-uniform heat flux distributions are considered on the secondary buoyancy-driven flow, internal fluid heat transfer coefficients, and friction factors in horizontal absorber tubes in parabolic trough solar collector applications for water heating in the laminar flow regime. Inlet Reynolds numbers ranging from 130 to 2200 for 10 m long tubes with different inner diameters were considered. Sinusoidal type incident heat flux distributions, tube-wall heat conduction and heat losses were taken into account. It was found that due to buoyancy-driven secondary flow, overall and local internal heat transfer coefficients were increased significantly due to the non-uniformity of the incident heat flux.