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STUDY OF COMBINED RADIATION AND CONDUCTION IN CYLINDRICAL MEDIA USING DISCRETE ORDINATES METHOD ASSOCIATED TO FINITE LEGENDRE TRANSFORM

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Abstract

A discrete ordinates method associated to Legendre transformtechnique is extended to study the coupled conduction-radiation problems in cylindrical enclosure. In this technique the angular derivative term of the discretized 1-D radiative transfer equation is derived from an expansion of the radiative intensity on the basis of associated Legendre polynomials and direction cosines. The mathematical treatment adopted gives rise to a simple expression of the angular derivative term. The set of resulting differential equations obtained by the application of the new technique, is numerically solved using the boundary value problem with the finite difference algorithm. The effects of various parameters, such as the extinction coefficient, the conduction-radiation parameter, the scattering albedo and the the radius ratio on the temperature and energy flow rates evolutions in the medium are studied.Results of the present work are compared with those given by a modified discretes ordinates method. In all cases, excellent agreement has been obtained.

Keywords: Cylindrical medium; Angular derivative term; Legendre Transform; Discrete ordinates method; Conduction and radiation.

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