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Solving Transient Conduction and Radiation using Finite Volume Method

Authors : Ashok K. Satapathy, Prerana Nashine

Abstract : Radiative heat transfer in participating medium was anticipated using the finite volume method. The radiative transfer equations are formulated for absorbing and anisotropically scattering and emitting medium. The solution strategy is discussed and the conditions for computational stability are conferred. The equations have been solved for transient radiative medium and transient radiation incorporated with transient conduction. Results have been obtained for irradiation and corresponding heat fluxes for both the cases. The solutions can be used to conclude incident energy and surface heat flux. Transient solutions were obtained for a slab of heat conducting in slab by thermal radiation. The effect of heat conduction during the transient phase is to partially equalize the internal temperature distribution. The solution procedure provides accurate temperature distributions in these regions. A finite volume procedure with variable space and time increments is used to solve the transient energy equation. The medium in the enclosure absorbs, emits, and anisotropically scatters radiative energy. The incident radiations and the radiative heat fluxes are presented in graphical forms. The phase function anisotropy plays a significant role in the radiation heat transfer when the boundary condition is non-symmetric.

Keywords : participating media, finite volume method, radiation coupled with conduction, heat transfer
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