A COMPARISON OF SPATIAL DISCRETIZATION SCHEMES FOR DIFFERENTIAL SOLUTION METHODS OF THE RADIATIVE TRANSFER EQUATION

P. J. Coelho
Mechanical Engineering Department
Instituto Superior Técnico, Technical University of Lisbon
Av. Rovisco Pais, 1049-001 Lisboa, Portugal

ABSTRACT. A comparison of discretization schemes required to evaluate the radiation intensity at the cell faces of a control volume in differential solution methods of the radiative transfer equation is presented. Several schemes developed using the normalized variable diagram and the total variation diminishing formalisms are compared along with essentially nonoscillatory schemes and genuinely multidimensional schemes. The calculations were carried out using the discrete ordinates method, but the analysis is equally valid for the finite volume method. It is shown that the S schemes of the genuinely multidimensional family perform quite well, particularly in problems with discontinuous radiation intensity fields. However, they are time consuming, and so they do not always become more attractive regarding the trade-off between accuracy and computational requirements, in comparison with other high-order schemes that, although being less accurate, are also more economical.