

MODERN RADIATIVE HEAT TRANSFER MODELS FOR TURBULENT REACTING FLOWS

Michael F. Modest*

Department of Mechanical Engineering, Pennsylvania State University, University Park, PA 16802, USA

ABSTRACT. In recent years it has been increasingly recognized that thermal radiation plays an important, if not dominant role in modern high-temperature environments, and that reliable prediction of combustion behavior is not possible without a sophisticated radiation model. Traditional models of radiative transfer in reacting flows have ignored turbulence–radiation interactions (TRI), due to difficulties caused by their inherent nonlinearities and their vast range of length scales and time scales. In this article a brief account is given of modern methods for the prediction of radiation in combustion environments. The state-of-the-art of modeling TRI is also reviewed, and some results are presented, in which TRI are calculated from basic principles from the composition PDF method, LES simulations and from DNS calculations, indicating the great importance of TRI in turbulent flames.

* Corresponding author. Fax: +1-814-863-4848
Email address: mfmolest@psu.edu (Michael F. Modest).