

QUANTIFICATION OF MODEL-FORM UNCERTAINTY IN THE CORRELATED-K DISTRIBUTION METHOD FOR RADIATION HEAT TRANSFER

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ABSTRACT. The Full-Spectrum Correlated-k Distribution Method has been shown to be exact for thermal radiation in molecular gas-particulate mixtures which obey the "scaling approximation." Unfortunately, this assumption breaks down for molecular gases with strong temperature or concentration gradients. There has previously been no way to effectively quantify the model-form uncertainty introduced by the failure of the scaling approximation. This paper examines the effect of temperature gradients in CO₂ and proposes a technique to generate probability density functions for the gray-gas absorption coefficients used in the Full-Spectrum Correlated-k Distribution Method. The uncertainty in the absorption coefficients may then be propagated forward to ascertain confidence intervals for important quantities such as heat flux or intensity distributions.