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AN EXTENSION OF THE WIDE-BAND BASED WEIGHTED-SUM OF-GRAY-GASES MODEL TO HIGH PRESSURE CONDITIONS

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ABSTRACT. In this paper, an alternative method for the generation of correlations for the weighted-sum-of-gray gases (WSGG) model at high pressure conditions is tested. The proposed methodology, which is an extension of the wide-band based WSGG (WBW) model, consists of dividing the radiation spectrum into a set of bands and applying the standard WSGG model to each one of these regions, in order to solve the gray gas coefficients. The WBW model firstly determines the emittance of each band in which the spectrum was segmented using line-by-line (LBL) calculations, and then the pressure-absorption and temperature-dependent coefficients are obtained through polynomial temperature fittings. The overall radiative transfer equation (RTE), the radiative heat flux and the radiative heat source are obtained by summing up the individual contributions from each spectral band. The results show that the WBW model provides accurate solutions of the radiative problem even for high pressures, with maximum deviations regarding the LBL integration less than 4 %, which is compatible with other WSGG approaches in the literature.

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