THE SLW-1 MODEL FOR EFFICIENT PREDICTION OF RADIATIVE TRANSFER IN HIGH TEMPERATURE GASES

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ABSTRACT. The minimal SLW model consisting only of a single gray gas and of one clear gas is developed as an efficient spectral method for modeling radiation transfer in the non-isothermal and non-homogeneous emitting and absorbing gaseous medium. The SLW-1 model is not just a reduction of the SLW method to one gray gas case. Good accuracy can be achieved by the optimal choice of the model's gray gas absorption coefficient and its weight by application of the Absorption-Line Blackbody Distribution Function (ALBDF) which is calculated with a high-resolution spectral database. Different approaches to construction of the SLW-1 model are shown. The SLW-1 model absorption spectrum still has the line structure corresponding to the real gas absorption spectrum which is maintained with the fixed spectral intervals in non-uniform medium with the help of the reference approach. The validation of the SLW-1 model is performed by comparison with the benchmark solutions obtained by the Line-by-Line method and the SLW method with the large number of gray gases. Formulation of the SLW-1 method is also shown with the Two-Flux method and P-1 differential approximation.