

# **A MULTI-SCALE FULL-SPECTRUM CORRELATED- $k$ DISTRIBUTION FOR RADIATIVE HEAT TRANSFER IN INHOMOGENEOUS GAS MIXTURES**

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**ABSTRACT.** A multi-scale full-spectrum correlated- $k$  distribution (MSFSCK) model has been developed and tested for radiative transfer calculations in absorbing/emitting molecular gases. The gas or gas mixture is broken up into different groups by separating different absorbing species and, for each specie, by collecting them into spectral groups according to the lower level energy of their spectral lines. Like all  $k$ -distribution method as well as the full-spectrum correlated- $k$  (FSCK) model, the new model may be used with any arbitrary RTE solver. Results for one- and two-dimensional inhomogeneous gas mixtures with varying temperature and mole fraction fields are presented and compared with line-by-line benchmarks and the FSCK model, showing very good accuracy in situations with severe temperature gradients and/or sharp mole fraction ratio changes.