

## **A NEW CORRELATED K-DISTRIBUTION METHOD FOR NONGRAY GASEOUS ABSORPTION IN THE INHOMOGENEOUS SCATTERING ATMOSPHERE**

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Based on the similarities between k-distribution profile and a single absorption line, a new kind of method to calculate k-distribution function is presented. We found that although the similarities exist between both of them seemingly, there are natural differences in the center and the wing of them. After doing some special handling—we fitted the middle part of k-distribution profile by the Voigt function with a unconstrained simplex method to optimize the formal parameters in Voigt. In such way, for the homogeneous atmospheric path, four parameters are needed to compute k-distribution function for strong absorption bands, while only two parameters for the weak bands. The computation of the correlated k-distribution function can be simplified as the evaluation of the dependence of the parameters on the pressure. We find they can be fitted by a two order polynomial of pressure. Therefore, the correlated k-distribution function can be computed for any pressures.

The k-distribution models of Shi (1981) and Lacis and Oinas (1991) are typical works to simulate non-gray gas absorption in an inhomogeneous atmosphere. But they all need a relative large parameter table when using it in radiation calculations. The new k-distribution method could be comparable with band model in its simplicity since it only needs a very simple mathematical formula and a small table of parameters and keeps abreast of previous k-distribution models in its accuracy. Its results are even better than previous works in some cases and can be widely used in climate models.