A FICTITIOUS-GAS BASED STATISTICAL NARROW-BAND MODEL FOR IR LONG-RANGE SENSING OF H_2O AT HIGH TEMPERATURE

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ABSTRACT. An original approximate model, similar to Ludwig's multigroup statistical narrow-band model, and to the fictitious gas CK model (CKFG) has been developed and validated to treat IR long-range sensing applications involving H_2O as emitting and absorbing species. The main idea is to split the lines of a gas into N classes depending on the values of E'', the energies of the lower levels of the transitions. The statistical narrow-band (SNB) model and the Curtis-Godson approximation are applied separately to each class. Parameters of the model have been extracted from an adjustment of the curves of growth obtained from line-by-line calculations. Relative errors of the model in typical conditions of atmospheric long-range sensing are about a few per cent by reference to line-by-line calculations, much smaller than errors due to a classical SNB approach in the same conditions.