FAR LINE WINGS STUDY OF THE 15 μm CO_2 BAND: LABORATORY AND ATMOSPHERIC SPECTRA

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While a number of studies have been devoted to the analysis of the far wings of the ν_3 band lines of CO_2 near 4 μm those of the ν_2 band have never been investigated although precise modeling of absorption in the 10–15 μm region is essential due to its importance for atmospheric sounding. Starting from the successful results obtained in the modeling of Q branch line mixing,[a] the ECS (Energy Corrected Sudden) approach is extended in order to predict all line-mixing between P, Q, and R lines. The relaxation matrix is then constructed without use of any adjustable parameter for all CO_2 bands and with proper accounting of the coupling of angular momenta and of the symmetry of the vibrational transition. High pressure laboratory spectra have been recorded in the 600–1200 cm^{-1} region for temperature condition spanning the typical atmospheric range (200–300 K). Comparisons with calculated values demonstrate the quality of the model which gives much better results than purely Lorentzian profiles. This result is confirmed when comparisons are made in the 4 μm region of the ν_3 band wings. A compilation of first order coefficients derived from the relaxation matrix has then been used to compute atmospheric spectra. The comparison of calculated values with high-resolution ground based solar occultation spectra gives a further validation of our approach.

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[a]R. Rodriguez, K. W. Jucks, N. Lacome, Gh. Blanquet, J. Walrand, W. A. Traub, B. Khalil, R. Le Doucen, A. Valentin, C. Camy-Peyret, L. Bonamy, and J.-M. Hartmann, *J. Quant. Spectrosc. Radiat. Transfer* **61,** 153–184 (1999).