LINE PARAMETERS OF CARBON DIOXIDE IN THE 4850 CM^{-1} REGION

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The spectral region near 4850 cm^{-1} is used to monitor atmospheric carbon dioxide, but current accuracies of the line intensities and line shape coefficients do not permit carbon dioxide mixing ratios to be obtained to 1 ppm (about one part in 400). To improve the line parameters, we are remeasuring the prominent CO_2 bands in this region specifically to characterize the non-Voigt effects of line mixing and speed dependence at room temperature.

The laboratory spectra of air- and self-broadened CO_2 have been recorded at a variety of pressures, path lengths, mixing ratios and resolutions (0.005 to 0.01 cm^{-1}) with two different Fourier transform spectrometers (the McMath-Pierce FTS at Kitt Peak and a Bruker 125 HR FTS at JPL). The line parameters of some 2000 transitions are being derived by simultaneous multispectrum fitting[a] using a few dozen spectra encompassing a 230 cm^{-1} wide spectral interval. The rovibrational constants for line positions and the band intensities and Herman-Wallis coefficients are being retrieved directly from the spectra, rather than floating positions and intensities individually.[b] Self and foreign Lorentz widths and pressure shifts are being determined for the stronger bands while non-Voigt coefficients describing line mixing and speed dependence are being obtained for at least one of the strongest bands.[c]

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[a] D. Chris Benner, C. P. Rinsland, V. M. Devi, M. A. H. Smith, and D. A. Atkins, JQSRT 1995;53:705-21.

[b] V. M. Devi, D. Chris Benner, L. R. Brown, C. E. Miller, and R. A. Toth, J. Mol. Spectrosc. 2007;245:52-80.

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