TEMPERATURE DEPENDENCE OF AIR-BROADENING AND SHIFT COEFFICIENTS IN THE $^{12}C^{16}O$ FUNDAMENTAL BAND

A. W. MANTZ, *Department of Physics, Astronomy and Geophysics, Connecticut College, New London, CT 06320*; M. A. H. SMITH, C. P. RINSLAND, *Atmospheric Sciences, NASA Langley Research Center, Mail Stop 401A, Hampton, VA 23681-2199*; F. C. DE LUCIA, *Department of Physics, The Ohio State University, 174 W. 18th Ave., Columbus, OH 43210-1106*; D. CHRIS BENNER and V. MALATHY DEVI, *Department of Physics, The College of William and Mary, Box 8795, Williamsburg, VA 23187-8795*.

High-resolution (0.005 cm^{-1}) infrared absorption spectra of natural isotopic samples of CO broadened by dry air and by other gases were recorded at various temperatures using the McMath-Pierce Fourier transform spectrometer of the National Solar Observatory on Kitt Peak, Arizona, and a coolable 40 cm long copper absorption cell. Two Laser Analytics L5700 series closed cycle helium refrigerators were used to cool the cell, and the temperature was controlled by two Model 5720 cryogenic temperature stabilizers, each of which utilized a 10 Ohm heater mounted on the cell and a set of silicon temperature sensors also mounted directly on the cell. Additional FTS spectra of self-broadened CO at room temperature were recorded using Pyrex absorption cells with pathlengths of 4.08 and 10 cm. Total sample pressures ranged from 0.2 to 507 Torr for the self-broadened CO spectra and from 150 to 622 Torr for the air-broadened spectra. The volume mixing ratios of CO in air were very small, of the order of 0.0007 to 0.002, and the air-broadened sample temperatures varied from room temperature down to -194°C. A total of 25 air- and self-broadened spectra were fit simultaneously to determine the air broadening and air-induced pressure shift coefficients as well as the temperature dependence of air broadening and air-induced pressure shift coefficients of the P(17) to R(10) CO transitions. A multispectrum nonlinear least-squares technique[a] was employed to fit two wide spectral intervals that covered the entire range of P- and R-branch transitions reported in this study. The variations of the measured parameters with the rotational quantum number of the transitions will be discussed, and the present results will be compared with previous measurements.

[a]D. Chris Benner, C. P. Rinsland, V. Malathy Devi, M. A. H. Smith and D. Atkins, *JQSRT* **53**, 705-721 (1995).