NEAR INFRARED SPECTROSCOPY OF CARBON DIOXIDE: $^{16}O^{12}C^{16}O$ LINE POSITIONS

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High-resolution near infrared 4000 - 9000 cm^{-1} spectra of carbon dioxide have been recorded using the McMath-Pierce Fourier transform spectrometer at the Kitt Peak National Solar Observatory. Spectroscopic constants have been determined for 53 different vibrational states of the $^{16}O^{12}C^{16}O$ isotopologue, including 8 vibrational states for which laboratory spectra have not previously been reported. Calibration using the 2-0 band of CO near 4200 cm^{-1} and the $(\nu_1 + \nu_3)$ combination band of C_2H_2 near 6500 cm^{-1} provides absolute line position accuracies of 2×10^{-5} cm^{-1} (RMS) for strong, isolated transitions throughout the observed range. Fits with RMS errors less than 3.8×10^{-5} cm^{-1} have been obtained for the 20013 $\leftarrow$ 00001, 20012 $\leftarrow$ 00001, and 20011 $\leftarrow$ 00001 bands and RMS errors less than 6×10^{-5} cm^{-1} have been obtained for the 30014 $\leftarrow$ 00001, 30013 $\leftarrow$ 00001, 30012 $\leftarrow$ 00001, and 00031 $\leftarrow$ 00001 bands. The new line list satisfies the line position accuracies required for the next generation of CO_2 remote sensing instruments, improves the capability of solar-viewing spectrometers to retrieve precise column CO_2 measurements, and provides a secondary frequency standard in the NIR.[a]

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