NEAR INFRARED SPECTROSCOPY OF CARBON DIOXIDE: $^{18}$O$^{12}$C$^{18}$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 $^{18}$O$^{12}$C$^{18}$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 ($\nu_1 + \nu_6$) combination band of C$_2$H$_2$ near 6500 cm$^{-1}$ provides absolute line position accuracies of $2 \times 10^{-5}$ cm$^{-1}$ (RMS) for strong, isolated transitions throughout the observed range. Fits with RMS errors less than $3.8 \times 10^{-5}$ cm$^{-1}$ have been obtained for the 20013 $\rightarrow$ 00001, 20012 $\rightarrow$ 00001, and 20011 $\rightarrow$ 00001 bands and RMS errors less than $6 \times 10^{-5}$ cm$^{-1}$ have been obtained for the 30014 $\rightarrow$ 00001, 30013 $\rightarrow$ 00001, 30012 $\rightarrow$ 00001, and 00031 $\rightarrow$ 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.\(^a\)

\(^a\)Part of the research described in this paper was carried out by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.