CONTINUUM ABSORPTION IN THE REGION OF THE O_2 VIBRATIONAL FUNDAMENTAL BAND IN O_2 AND CO_2 MIXTURES AT TEMPERATURES RANGING FROM 220 K TO 296 K

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Infrared spectra of O_2 and CO_2 mixtures were studied in the laboratory between 1100 cm^{-1} and 1800 cm^{-1} for temperatures from 220 K to 296 K and total pressures up to 500 kPa using a Fourier-transform infrared spectrometer and a 2-meter-long, multiple-pathlength, White cell operating at 84 m. The intensity of the O_2 continuum is strikingly enhanced by the addition of CO_2. This result contrasts with our observations on the CO_2 monomer and dimer lines, which show negligible enhancement upon the addition of O_2. The shape of the O_2 fundamental band sharpens with the addition of CO_2, and at lower temperatures apparent P, Q, and R-branch features appear, which are attributed to a CO_2–O_2 complex.

The observed CO_2 enhancement of the O_2 continuum absorption in the mid-infrared is consistent with our similar observations on the 1.27 μm near-infrared, magnetic-dipole band of O_2 [a]. Our observations agree with the theoretical calculations by Brown and Tipping [b] in which they predicted significant enhancements by H_2O vapor of the continuum absorption of N_2 and O_2 for the vibrational fundamentals, attributed to the large electric dipole moment of H_2O. We note that CO_2, like H_2O, has a large electrostatic moment, the electric quadrupole moment.

[a] G. T. Fraser and W. J. Lafferty, *J. Geophys.* **106** 31749 (2001).

[b] A. Brown and R. H. Tipping, private communication.