INVESTIGATIONS OF THE COLLISION-INDUCED ABSORPTION OF O_2 NEAR 6.4 μm IN PURE O_2 AND O_2/N_2 MIXTURES

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Measurements of the collision-induced absorption of O_2 in the vicinity of the electric-dipole-forbidden vibrational fundamental have been made in pure O_2, O_2/N_2 and Ar/O_2 mixtures. The goal is to provide reliable absorption coefficients to allow accurate retrievals of stratospheric concentration profiles of H_2O vapor, NO_2, and sulfate aerosols from limb-viewing filter radiometers, such as those mounted on the UARS and future EOS platforms. Here, spectra were recorded at a resolution of 0.5 cm^{-1} using a Fourier-transform infrared spectrometer. Measurements were made using an optical pathlength of 84 m, sample densities up to approximately 8 amagats, and sample temperatures between 225 K and 300 K. The present results are in good agreement with the earlier less precise measurements of Orlando *et al.* on O_2 and O_2/N_2 mixtures and Thibault *et al.* on pure O_2. Studies of Ar/O_2 mixtures indicate that the observed structure on the high-frequency shoulder of the band, previously attributed to dimer bound states by Henderson and Ewing, is more likely due to line mixing of pure quadrupole transitions of O_2, as originally suggested by Vigasin.