FT-IR MEASUREMENTS OF COLLISION-INDUCED ABSORPTION OF O2(A) BAND USING A HIGH-PRESSURE GAS ABSORPTION CELL

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In support of the precision atmospheric remote sensing (e.g., OCO-2, GOSAT missions), the collision-induced absorptions (CIA) of O2-O2, O2-Air, and O2-H2O have been measured in the O2(A) band region centered at 760 nm. For this, a newly developed 1 m pathlength high-pressure cell (rated up to 150 bars at an operating temperature of 315 Celcius) was configured to a Fourier transform spectrometer, Bruker 125HR, at the Jet Propulsion Laboratory, along with a superluminant Laser-Driven Light Source (LDLS). A series of spectra of pure O2 and dry air were obtained at various pressures up to 116 bars at room temperature. For the O2-H2O CIA measurement, we collected the spectra at elevated temperatures, 500 K, to secure sufficiently high pressure of water vapor. The CIA of the O2 A-band was derived from multiple spectra in two steps; (i) First, their monomer absorptions have been simulated by using a speed-dependent Voigt line shape profile at the experimental conditions of individual observed spectra. The line mixing effects have been taken into account through both the Rosenkranz first-order approximation and the full-line mixing matrix operation, respectively. (ii) The simulated monomer absorption contribution has been subtracted from their corresponding observed spectra. The remaining absorption component was interpreted as the CIA component in the region. The results will be presented for O2-O2 and O2-Air, respectively, at the room temperatures along with the comparison with the existing data sets and discussion. The O2(A) band CIA by hot water will also be presented at 500 K for the first time.