

HIGH SENSITIVITY CRDS OF CO₂ IN THE 1.74 μM TRANSPARENCY WINDOW. A VALIDATION TEST FOR THE SPECTROSCOPIC DATABASES

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The very weak absorption spectrum of natural CO₂ near 1.74 μm (5702 - 5879 cm⁻¹) is studied at high sensitivity. The investigated region corresponds to a transparency window of very weak opacity which is of particular interest for Venus. Very weak lines with intensity value as low as 10⁻³⁰ cm/molecule at 296 K are detected by Cavity Ring Down Spectroscopy. On the basis of the predictions of effective Hamiltonian models, 1135 lines of six carbon dioxide isotopologues - ¹²C¹⁶O₂, ¹³C¹⁶O₂, ¹⁶O¹²C¹⁸O, ¹⁶O¹²C¹⁷O, ¹⁶O¹³C¹⁸O and ¹⁶O¹³C¹⁷O - were rovibrationally assigned to 26 bands. The accurate spectroscopic parameters of 16 bands are determined from standard band-by-band analysis (typical rms deviations of the line positions are 8 × 10⁻⁴ cm⁻¹). These newly observed bands include perturbed bands, weak hot bands and bands of minor isotopologues (in particular ¹⁶O¹²C¹⁸O in natural abundance) and provide critical validation tests for the most recent spectroscopic databases. The comparison to the Carbon Dioxide Spectroscopic Databank (CSD), HITRAN2016 database and recent *ab initio* line lists will be presented. Deficiencies are evidenced for some weak perpendicular bands of the HITRAN2016 list and identified as due to inaccurate CSD intensities which were preferred to *ab initio* intensities. New results based on ¹⁸O enriched CO₂ spectra will also be detailed.