APPLICATION OF THEORETICAL CONSTRAINTS TO MODEL THE MEASURED TEMPERATURE AND WAVELENGTH DEPENDENCE OF COLLISION-INDUCED ABSORPTION IN THE 0.76 μm AND 1.27 μm O_2 BANDS

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Understanding collision-induced absorption (CIA) is a critical component to improving the O_2 spectroscopy for remote sensing applications. Traditionally in experimental spectra, CIA is defined as the remaining absorption after accounting for the baseline, Rayleigh scattering, and resonant absorption. This approach can present difficulties in systems, like the O_2 A-Band at 0.76 μm, where the CIA is relatively weak and is highly correlated with the line-mixing model. Theoretical constraints on the magnitude and shape of the CIA could aid in decoupling the resonant and broadband features ultimately leading to an improved spectroscopic model. The CIA model reported by Karman et al. [1] provides a theoretical basis for the CIA in the 1.27 μm and 0.76 μm O_2 bands [1]. In this work, we evaluate the theoretical model using cavity ring-down spectroscopy measurements collected at multiple temperatures in both the 1.27 μm [2-4] and 0.76 μm O_2 bands. In addition to a qualitative comparison between experiment and theory, this work explores parameterization of the CIA model reported by Karman et al. [1] for future inclusion in integrated multi-spectrum analyses incorporating advanced line shape models, line-mixing, and CIA.

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