

PSEUDOLINE GENERATION FOR TRANS-2-BUTENE IN THE 7-15 μM REGION IN SUPPORT OF TITAN ATMOSPHERE STUDY

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Butene (C_4H_8) is one of many C_4 -hydrocarbons predicted to be up to 10 ppb in Titan's atmosphere by photochemical models, but yet to be detected most likely due to lack of reliable high-resolution spectroscopy, particularly at cold temperatures. As a continued work on high-resolution spectroscopy of trans-2-Butene (trans-2- C_4H_8 : $\text{CH}_3\text{-CH=CH-CH}_3$), we present the pseudoline generation made from the same spectrum data sets in the 7 - 15 μm region (See F09 in the ISMS 2022). In total, 28 pure and N_2 -mixture spectra were obtained at temperatures between 180 – 297 K using a Fourier transform spectrometer (Bruker IFS-125HR). All the spectra were fit together to derive a single set of pseudoline parameters, which includes line intensity and lower-state energy value at individual frequency bins that are considered as pseudoline positions. The pseudolines are found to reproduce the observed spectra via line-by-line radiative transfer calculations to within a few % across the spectral region. We have the pseudoline list compiled in a HITRAN database format to facilitate their implementation into existing radiative transfer codes, which use the HITRAN database for other molecules. We will present and discuss the results and performance of the pseudolines. It is anticipated that the results from this work will provide critical laboratory input toward a search for trans-2-Butene in Titan stratosphere that may be captured in the Cassini/CIRS spectra, or in future space-based (MIRI/JWST) and ground-based observations (e.g., TEXES/IRTF).^a

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