H_2 BROADENING IN THE ν_3 AND ν_4 BANDS OF CH_4 AT ROOM TEMPERATURE

EHSAN GHARIB-NEZHAD, *School of Molecular Sciences, Arizona State University, Tempe, AZ, USA*; ALAN HEAYS, JAMES R LYONS, MICHAEL R LINE, *School of Earth and Space Exploration, Arizona State University, Tempe, AZ, USA*; GLENN STARK, *Department of Physics, Wellesley College, Wellesley, MA, USA*; HANS A BECHTEL, *Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, CA, 94720, USA*.

Methane (CH_4) is the dominant carbon-bearing molecule in terrestrial and exoplanetary atmospheres where the temperature is below 1000 K. Therefore, knowing its pressure-induced H_2-broadened absorption cross section is fundamental for exoplanetary atmospheric modeling. In this study, the pressure-induced H_2-broadening coefficients of CH_4 are determined in the spectral regions 2800-3200 (ν_3) and 1200-1400 cm^{-1} (ν_4). The laboratory transmission spectra in this study were recorded at high resolution (i.e., 0.005 and 0.01 cm^{-1}) at room temperature with an FTIR 125HR Bruker spectrometer at Lawrence Berkeley National Laboratory. The CH_4 pressure was constant during the entire experiment (29 mtorr), and elevated H_2 pressures were used in the range 100-700 torr. The Lorentzian coefficients are determined by a nonlinear regression approach in order to model the relationship between the linewidth and its corresponding pressure. Our preliminary results show that the Lorentzian coefficients of different lines in these two bands fall in the range 0.06-0.09 cm^{-1}/atm, consistent with the previous available measurements. Atmospheric modeling will be employed using exoplanet forward transmission modeling to highlight the importance of H_2-broadening of CH_4 to exoplanetary observations.