



Pressure broadening, shifts, and line mixing in methane

M. A. H. Smith (1), V. Malathy Devi (2), D. Chris Benner (2)

(1) NASA Langley Research Center, Hampton, Virginia, USA, (2) The College of William and Mary, Williamsburg, Virginia, USA (mary.ann.h.smith@nasa.gov / Phone: +1-757-864-2701)

Self- and air-broadened halfwidth and pressure-induced shift coefficients and their temperature dependences have been determined for numerous transitions of CH₄ in the 7-9 μm region from laboratory absorption spectra recorded with the McMath-Pierce Fourier transform spectrometer of the National Solar Observatory. In addition, line center positions and absolute intensities were determined. The results were obtained by using a multispectrum nonlinear least squares technique to fit simultaneously 20 or more high-resolution spectra recorded at temperatures ranging from 210 to 314 K and broadening gas pressures between 0.06 and 0.72 atm. In the Q branch and in the J-manifolds of the P and R branches of the ν₄ band, we observed line mixing between certain transitions. In these cases the mixing parameters (off-diagonal relaxation matrix elements) were determined in the fits of the spectra.