Temperature dependence of CO_2-broadening coefficients of lines in the ν_4 band of CH_4

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Methane is a constituent of some planetary, like Mars, and Earth atmospheres [1]. This is the second most abundant greenhouse gas on our atmosphere [2-4]. In order to retrieve the abundance of methane in atmosphere, we need to have information about their spectral parameters like the collisional broadening coefficient.

Using a high resolution tunable diode-laser spectrometer [5], CO_2-broadening coefficients have been measured for lines in the ν_4 band of CH_4. The lines have been studied for 7 temperatures ranging from 350 to 650 K.

For each line, we have recorded spectra at 4 pressures of the perturber. The collisional halfwidths of line at each pressure and each temperature have been obtained by fitting on the experimental profile, the Voigt [6] lineshape, but also the models developed by Rautian and Sobel'man [7] and by Galatry [8] which take into account a supplementary physical effect (molecular confinement : Dicke effect [9]).

The collisional broadening coefficients of each line at each temperature have been deduced as the slope of the best straight line obtained from a linear regression when halfwidths are plotted in function of the perturber gas pressure. From these results, the temperature dependence parameters of each line have been determined.

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