LINE INTENSITIES IN SOME BANDS OF METHYL CHLORIDE IN THE 10μm REGION

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The halocarbons derivatives of methane CH_3Cl, CH_3I and CH_3F can contribute to the destruction of the ozone layer and the greenhouse effect[1]. The most abundant of these halocarbons is methyl chloride (CH_3Cl) with an estimated lifetime in the stratosphere of about 1 to 3 years[2]. These molecules were included in the atmospheric radiative transfer models to retrieve atmospheric compositions with high accuracy. Then, high-resolution spectroscopy studies are necessary to achieve accurate concentrations of these gases. The results of such studies are of great interest to atmospheric scientists. We performed systematic measurements of self-broadening coefficients and line intensities of some bands of these molecules in the spectral region between 900 and 1500 cm-1. The spectra were recorded at room temperature with a high-resolution Fourier transform spectrometer. A WSpectra and a multi-pressure fitting codes were used to fit a series of spectra at pressures of CH_3X (X=Cl, I end F) ranging from 0.1 to 15 mbar to retrieve line intensities and self-broadening coefficients of about 2000 transitions of each molecule with large ranges of J and K quantum numbers. The average accuracies have been estimated to be about 4 and 6% for line intensities and the broadening coefficients respectively. The rotational dependencies of these spectroscopic parameters have been clearly observed and modeled. We have derived the transition dipole moment squared for each line. The analysis of these moments using some theoretical models allows us to derive a consistent set of line intensity parameters such as vibrational transition moments, band intensities as well as Herman-Wallis coefficients. The results were compared with previous works and with HITRAN databases[3].

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