RECENT PROGRESS IN THE KNOWLEDGE OF C_2H_2 SPECTROSCOPIC PARAMETERS IN THE IR

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The acetylene molecule is important for atmospheric, planetary, and astrophysics applications. In order to improve the knowledge of C_2H_2 spectroscopic parameters, systematic measurements of line parameters have been performed. Two recent works in two different spectral regions will be presented: first, in the 3.8-μm region, where line intensities have been measured for the first time for the 5 strongest bands observed in this region, second, in the 2.5-μm region, where 9 perpendicular bands have been studied, and for which line intensities have been obtained for the first time too. In these two spectral regions, transition dipole moments squared values have been derived from the line intensity measurements, and, for each vibrational band, have been modelled using Herman-Wallis factors. A complete line list of positions and intensities has been generated for these two spectral regions, and will be proposed to be included in the HITRAN and GEISA databases.

A global theoretical treatment of these results is in progress. According to notations adapted to a global treatment, the 3.8-μm spectral domain concerns the series of vibrational transitions $\Delta P = 4$, with P the pseudo-quantum number $P = 5v_1 + 3v_2 + 5v_3 + v_4 + v_5$, where the v_i's are the usual vibrational quantum numbers. This series involved interacting vibrational states belonging to the polyads $\{4\nu_5\}$ through 2 cold bands, and $\{5\nu_5\}$ through 3 hot bands. In the 2.5-μm region, transitions belong to the series $\Delta P = 6$, involving the polyads $\{6\nu_5\}$ through 4 cold bands, and $\{7\nu_5\}$ through 5 hot bands.