GLOBAL FIT ANALYSIS OF THE FOUR LOWEST VIBRATIONAL STATES OF ETHANE: THE $\nu_{12} - \nu_9$ BAND

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The ν_9 fundamental band of ethane occurs in the 12 μm region. It is the strongest band of ethane in a terrestrial window and is commonly used to determine ethane's abundance in the atmospheres of the Jovian planets and comets, and to determine their temperature. The $\nu_9 + \nu_4 - \nu_4$ band occurs in the same region; neither can be analysed as an isolated band, since both are embedded in the torsional bath of the ground vibrational state. Precise and accurate absolute intensities of these bands are crucial for correct interpretation of recent Cassini observations of ethane spectra in the atmospheres of Saturn and Titan. Although, our group has carried out a satisfactory frequency analysis of the ν_9 fundamental, a complete analysis of $\nu_9+\nu_4-\nu_4$ is hampered due to an interaction with the ν_{12} fundamental. This fundamental vibration is infrared inactive. It is also very weakly Raman active. To access this vibrational state, we have obtained a high resolution Fourier transform spectrum of the weak $\nu_{12} - \nu_9$ band using a Bruker IFS120HR. An absorption path length of 172 m was used. In this talk, I will describe a global frequency analysis of data including the four lowest vibrational states of ethane.