ELECTRONIC TRANSITIONS OF C_2 IN THE ULTRAVIOLET[a]

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The C_2 molecule is used as a probe of the chemistry and physical conditions in diffuse molecular clouds. Early analyses of the $F - X$ (0-0) band seen in spectra acquired with the *Hubble Space Telescope* (HST) revealed anomalous line strengths. We took advantage of the large database in the HST archive to study C_2 absorption in the most comprehensive UV survey to date. Spectra of the $D - X$ (0-0), $F - X$ (0-0), and $F - X$ (1-0) bands were analyzed. The $D - X$ (0-0) band, whose oscillator strength is well known from laboratory measurements and theoretical calculations, yielded C_2 column densities for several directions. The abundances were used to synthesize the $F - X$ bands as a check on the appropriate oscillator strengths for use with the Rydberg bands and on the presence of anomalous line strengths. While the oscillator strengths are consistent with earlier determinations, we found all the $F - X$ lines to be broadened and the $F - X$ (0-0) lines for $J < 20$ to show anomalies. Perturbations from nearby electronic states are the likely cause for this behavior. We also extended the number of sight lines with C_2 column densities through analysis of the $F - X$ (1-0) band for other directions.

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