CS ABSORPTION AT 140 NM IN SPECTRA ACQUIRED WITH THE HUBBLE SPACE TELESCOPE

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We reexamine the abundance of CS in diffuse molecular clouds from lines in the C–X (0, 0) band by including additional sight lines not available in previous work and by extracting information on molecular structure. The analysis incorporates results from our recent large-scale calculations on CS photodissociation and adopts the approach taken in our study of the F–X (0, 0) and (1, 0) bands in C_2. Syntheses of the high-resolution spectra with the best signal to noise yielded wavelengths for the R(0), R(1), and P(1) lines and their widths. Significant line broadening is seen, yielding a predissociation width of 23.7 ± 0.7 mÅ; this value is within a factor of 2 of the predictions from the calculations. The computations also revealed similar rotational constants for the X and C states. The differences in transition frequencies among the three lines then suggest that the P(1) line is shifted by 2.27 cm^{-1}. We also found evidence that the strengths for the R(1) and P(1) lines were affected by the perturbation. The fits to the data for the other directions in the sample adopted these refined line parameters to determine column densities. A comparison of the CS column densities with results for CH, CN, CO, and H_2 helped inform us of the chemical pathways leading to CS in diffuse molecular gas.