

Report on incorporation of CS spectral parameters

by Cameron Mackie (cameronmackie@gmail.com)

Carbon monosulfide is a new addition to the HITRAN database. CS detection has been a source of interest for the study of comets and planetary atmospheres. The abundance has been measured, for instance, in the Hyakutake and Hale-Bopp comets [1]. It has also been detected in the atmosphere of Jupiter after the collision with the Schumacher-Levy comet [2]. Data for four isotopologues is now included in the HITRAN database in the microwave region ($^{12}\text{C}^{32}\text{S}$, $^{12}\text{C}^{33}\text{S}$, $^{12}\text{C}^{34}\text{S}$, $^{13}\text{C}^{32}\text{S}$), while infrared data are provided only for the first two isotopologues. The line positions and lower state energies were obtained from the Cologne Database for Molecular Spectroscopy (CDMS) catalogue [3]. Intensities were calculated from theoretical Einstein A-coefficients that were provided in the paper by Chandra et.al. [4]. The conversion from Einstein A-coefficients to HITRAN intensities is described in the paper by Šimecková et.al. [5]. To the best of our knowledge, no experimental broadening parameters exist for carbon monosulfide, so crude estimates of their values had to be made. To make reasonable estimates of the behavior and values of the broadening parameters of carbon monosulfide, a comparison between carbon dioxide and carbon monoxide broadening parameters (found in the HITRAN database [7]) were made. Using the J-dependent scaling factors obtained for the carbon oxides, the experimental values for nitrogen [6] and self-broadening [8] of carbon disulfide were scaled to obtain broadening parameters for CS. The temperature-dependence exponent for the nitrogen-broadening was estimated to be a standard 0.75, as no experimental data exist.

References

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