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Investigating the Temperature Distribution of Diatomic Carbon in Comets using the Swan bands

Tyler Nelson (1), Anita Cochran (2)
(1) Astronomy Department, University of Texas at Austin, USA, (tyler.nelson@utexas.edu) (2) McDonald Observatory, University of Texas at Austin, USA

Abstract

We analyze optical spectra of 122P/de Vico and 2002C1/Ikeya-Zhang. The observational data for this analysis were obtained at McDonald Observatory using the 2.7m Harlen J. Smith telescope with the Tull Coudé spectrograph [1]. The observation log is shown in Table 1. These spectra had a resolution ($\lambda/\Delta\lambda$) of 60,000. Ikeya-Zhang and de Vico have been used for testing our methods. We intend to apply this to a larger data set over the summer.

A bimodal rotational temperature has been found for the C_2 (0,0) Swan band in [3] and [2]. Several models have been proposed to explain this. Distinguishing these hypotheses requires an extensive data set of high resolution ($\lambda/\Delta\lambda \geq 45,000$) optical spectra with good spectral grasp. With such a data set, we improve the analysis of C_2 by 1) expanding the sample size, 2) increasing the number of bands examined from one to ∼ten per comet, 3) observing the same comet with different environmental conditions.

We quantify these rotational temperatures using two models. The first is a Boltzmann plot, an example is shown in Figure 1. This method is able to find an approximate temperature distribution for the molecule. We use these populations as an input for PGOPHER ([4]). PGOPHER is a general purpose modeling software. We use known models for the Swan bands to fit the temperatures.

1. Tables

Table 1: This is the example of an included table.

Comet	Date (UT)	r_h (AU)	Δ (AU)
122P	03 Oct 1995	0.66	1.00
122P	04 Oct 1995	0.66	0.99
2002C1	22 Apr 2002	0.92	0.42

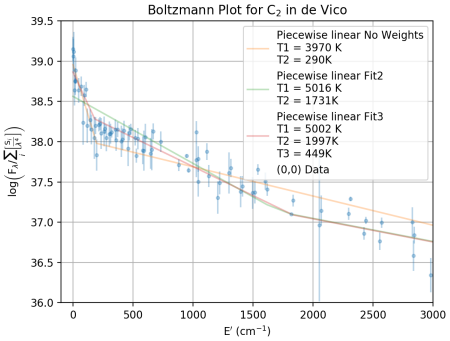

Figure 1: This is the Boltzmann plot for the (0,0) C_2 Swan band. These error bars are preliminary.

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References

[1] Tull, R. G., MacQueen, P. J., Sneden, C., & Lambert, D. L. 1995, Pub. Astron. Soc. Pac., 107, 251,

[2] Nelson, T., Cochran, A. L., & Western, C. 2018, The Journal of Physical Chemistry A, 122, 8020,

[3] Lambert, D. L., Sheffer, Y., Danks, A. C., Arpigny, C., & Magain, P. 1990, Astrophys. J., 353, 640,

[4] Western, C. M. 2017, J. Quant. Spectrosc. Radiat. Transfer, 186, 221 ,