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# Atomic carbon and sulfur in the HST spectra of comet 103P/Hartley 2

**Paul D. Feldman** (1) and Harold A. Weaver (2)
(1) Johns Hopkins University, Baltimore, MD, USA, (2) JHU Applied Physics Laboratory, Laurel, MD, USA
(pdf@pha.jhu.edu)

## Abstract

Comet 103P/Hartley 2 was observed by the Hubble Space Telescope (HST) on three dates surrounding the time of the EPOXI spacecraft fly-by on 4 November 2010. The primary objective was to measure the CO abundance in a Jupiter family comet and to this end the Cosmic Origins Spectrograph (COS), installed in HST in May 2009, was used to observe the CO Fourth Positive Band system in the spectral range of 1400 to 1700 Å. The result, showing an extremely low abundance of CO relative to water, has been reported by Weaver et al. [2]. The strongest features observed in the spectra, on all three dates, were multiplets of S I, centered at 1429 Å and 1479 Å (Figure 1), and multiplets of C I at 1561 Å and 1657 Å. In addition, the S I intercombination multiplet, $^5$D –$^3$ P, also at 1479 Å, is clearly resolved from the allowed $^3$D –$^3$ P transition, and is most likely excited by photoelectron impact in the inner coma.

On 28 November 2010 we obtained spectra with the Space Telescope Imaging Spectrograph that included emission from OH bands and weakly, the CS (0,0) band at 2576 Å. We derive column densities of C and S and discuss their abundances in terms of the potential parent molecules of these atomic species.

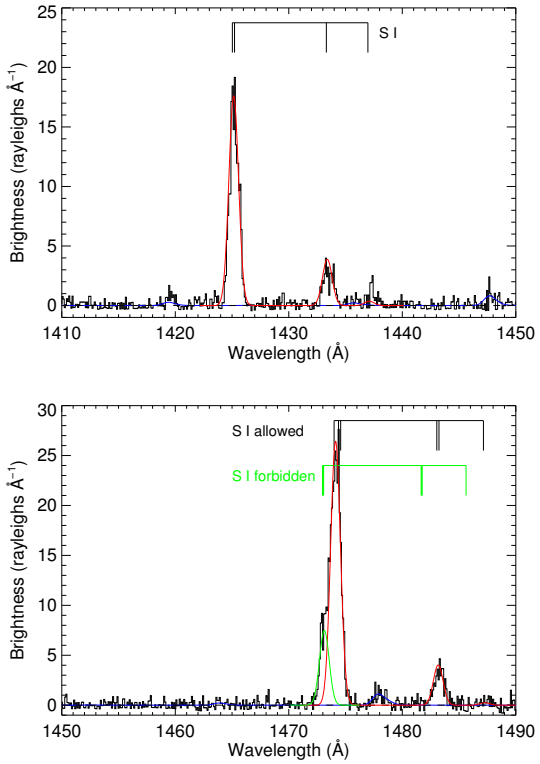


Figure 1: Section of the COS spectrum at 1.0 Å resolution of 103P/Hartley 2 from 4 November 2010 showing the two sulfur multiplets. The red lines are fits to the relative line intensities. The blue lines are model fits [1] to the CO Fourth Positive bands discussed by Weaver et al. [2]. At the spectral resolution of COS, the forbidden S I multiplet at 1479 Å is clearly resolved from the allowed transition (green line).

## References

[1] Lupu, R. E., Feldman, P. D., Weaver, H. A., & Tozzi, G.-P.: The Fourth Positive System of Carbon Monoxide in the Hubble Space Telescope Spectra of Comets, ApJ, Vol. 670, 1473, 2007.

[2] Weaver, H. A., Feldman, P. D., A'Hearn, M. F., Dello Russo, N., & Stern, S. A.: The Carbon Monoxide Abundance in Comet 103P/Hartley 2 During the EPOXI Flyby, ApJL, Vol. 734, L5, 2011.