

# Molecular gas production rates of Comet C/2023 A3 (Tsuchinshan - ATLAS)

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on 4 Jun 2024; 16:36 UT

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Subjects: Optical, Comet

We obtained optical spectra of comet C/2023 A3 (Tsuchinshan - ATLAS) on 31st May 2024 at 16.834 UT using the Hanle Faint Object Spectrograph and Camera (HFOSC) instrument mounted on the 2m Himalayan Chandra Telescope, Hanle, India. We have used Grism 7, which covers the effective wavelength of (3800 - 6840 Å). Comet C/2023 A3 was at 2.33 AU from the Sun at the time of observations. The spectrum was extracted for a rectangular aperture of  $15 \times 1.92$  arcseconds, representing approximately 20000 km  $\times$  2483 km on the cometary coma. We detected a strong CN feature, while for the other molecules, such as C2, C3, and NH2, we could derive only the upper limit of the production rate. The production rates are as follows:

$$Q(\text{CN}) = (4.73 \pm 0.23) \text{ E}+25 \text{ s}^{-1}$$

$$Q(\text{C2}(\Delta v=0)) < 1.49 \text{ E}+25 \text{ s}^{-1}$$

$$Q(\text{C3}) < 3.36 \text{ E}+24 \text{ s}^{-1}$$

$$Q(\text{NH2}) < 2.95 \text{ E}+25 \text{ s}^{-1}$$

$$Q(\text{H2O}) = (1.50 \pm 0.37) \text{ E}+28 \text{ s}^{-1}$$

We have calculated the logarithmic ratio of production rates of C2 and CN,  $\log(\text{C2}/\text{CN}) < -0.50$ . According to the criteria of A'Hearn et al. (1995), the comet C/2023 A3 appears to be carbon-depleted. Further continuous observations are required to monitor the activity of the comet.

Acknowledgments: This work is a result of the BIPASS collaboration, an Indo-Belgium project funded by the Department of Science and Technology(DST), India, and the Belgian Science Policy Office(BelSPO), Belgium. The Himalayan Chandra Telescope is operated by the Indian Institute of Astrophysics, Bengaluru. Work at the Physical Research Laboratory is funded by the Department of Space, Govt. of India.