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Cometary CN cyanogen jet observations using small telescopes with narrowband UV filter

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Abstract

CN cyanogen radical rotating gas jets was first found and directly imaged in comet P1/Halley during 1986 perihelion [1]. Development and pricing of high quantum efficiency CCD-cameras, filter technologies and image processing software's has made it possible to amateur astronomers with relatively small telescopes to image cyanogen jets, spirals and other features in medium bright comets at ultraviolet wavelengths. This presentation describes CN jet observations and used equipment of comets 21P/Giacobini-Zinner, 46P/Wirtanen and C/2018 Y1 (Iwamoto).

1. Introduction

Three comets were observed with 12inch telescope, CCD camera and commercial 387nm narrowband CN filter to get possible CN cyanogen gas jets visible. Observations were also part of 4*P Coma Morphology Campaign organized by the Planetary Science Institute and images have been verified by the campaign professionals.

2. Observations

2.1 Comet 21P/Giacobini-Zinner

21P/Giacobini-Zinner was observed several nights at September 2018. Images taken with 12inch telescope and commercial CN filter show two gas jets onwards of comets optocenter. 4*P Coma Morphology Campaign professionals compared the images taken at same time with Lowell Observatory 42inch RC John S. Hall Telescope and HB CN filter, and verified that the observed CN jets were practically identical with minor dust signal contamination on dust tail direction, [Figure 1].

2.2 Comet 46P/Wirtanen

46P/Wirtanen was observed with the 12inch equipment several nights at December 2018 and January 2019. At night 11/12.1.2019 continuous observing time was 11 hours and totally 120 images each 5 minutes exposures through CN filter was taken. Processed images and animation show CN jet full rotation and pinwheel effect around 46P/Wirtanen optocenter during 11 hours of observation period, [Figure 2]. 46P/Wirtanen was a main target of 4*P Coma Morphology Campaign during 2018/2019.

2.3 Comet C/2018 Y1 (Iwamoto)

C/2018 Y1 (Iwamoto) was observed several nights at February 2019. Processed images show CN jet movement around comet optocenter during 3 hours of observing time, [Figure 3].

3. Equipment and software

3.1 Equipment

Telescope was 305mm aperture and 1200mm focal length F4 Newton. Combined coma corrector and focal length reducer was used so that the effective focal length was 905mm/F2.9. Mount was iOptron CEM60 and autoguider was configured to track comet during each exposure. Telescope was placed in Helsinki, Finland under area of severe light pollution.

Narrowband ultraviolet filter was commercially available Semrock FF01-387/11-27. Center wavelength of the filter is 387nm and measured bandwidth is 15nm.

CCD-camera was cooled QSI690wsg. CCD-chip in the camera is Sony ICX814 and at 387nm wavelength absolute quantum efficiency is ~60%. Typically 300 second exposures were used through

Semrock 387nm filter with CCD binning 2x2, giving 1.68 arcsec/px resolution.

3.2 Software

Image processing software was PixInsight (PI) and images were registered and stacked with PI Comet Registration and PI Integration functions.

Image enhancing software was Cometary Coma Image Enhancement Facility [2].

4. Figures

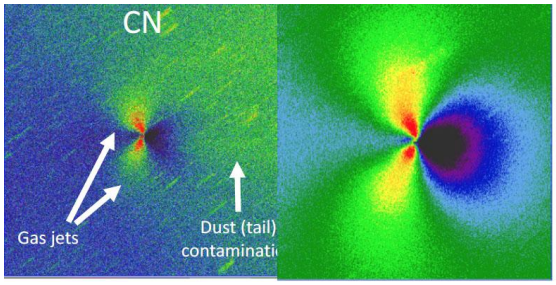

Figure 1: 21P/Giacobini-Zinner CN jets, left image 12inch/Ryske, right 42inch/Lowell. Processing by Knight. 21.9.2018.

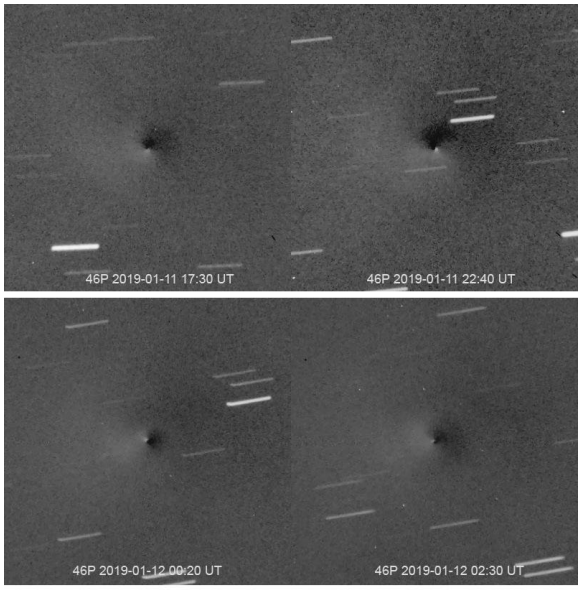

Figure 2: 46P/Wirtanen, CN jet rotation and pinwheel effect, 12inch/Ryske. 11/12.1.2019.

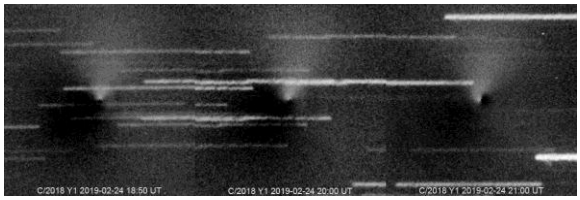

Figure 3: C/2018 Y1 (Iwamoto) CN jet movement, 12inch/Ryske. 24.2.2019.

5. Summary and Conclusions

Cometary narrowband UV imaging is possible with relatively small aperture amateur sized telescopes using modern CCD-camera technology. Fast changing and rotating CN cyanogen radical gas jets emitting at 3883Å can be resolved in comet coma morphology using commercially available narrowband filter giving useful research data by amateur astronomers.

Acknowledgements

Farnham, Tony, University of Maryland. Semrock 387nm CN filter analysis and tests.

Knight, Matthew, University of Maryland. Comets CN image verifications.

Samarasinha, Nalin, Planetary Science Institute. Comets CN morphology and image analysis.

References

[1] A'Hearn Michael F. et al.: Cyanogen jets in comet Halley, Nature vol. 324 18/25, pp 649-651, December 1986.

[2] Samarasinha, N. H., Martin, M. P., Larson, S. M. CometCIEF: A web-based image enhancement facility to digitally enhance images of cometary comae, Planetary and Space Science 118, July 2015.