

OPTICAL SPECTROSCOPY AND NARROWBAND IMAGING OF COMETS 252P/LINEAR AND P/2016 BA14 (PANSTARRS): A COMPOSITIONAL COMPARISON OF TWO POTENTIALLY LINKED COMETARY FRAGMENTS

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Introduction: The degree of compositional heterogeneity in cometary nuclei holds key clues to their formation and evolutionary history. Comets that have recently fragmented provide a unique opportunity to assess the compositional heterogeneity of cometary nuclei. The best case study obtained to date is that of 73P/Schwassman-Wachman 3, which showed a remarkable degree of homogeneity from fragment to fragment[1,2].

Comets 252P/LINEAR and P/2016 BA14 (PanSTARRS) have extremely similar orbital elements, suggesting that they may be the result of a fragmentation event involving a common parent body sometime in the past. As both comets had very close passages to the Earth (< 0.1 AU) in March 2016, this was a unique opportunity to obtain compositional information on two potential fragments of the same progenitor nucleus.

We present preliminary analysis of optical spectra obtained of 252P/LINEAR and P/2016 BA14 (PanSTARRS) with GMOS on Gemini, as well as narrowband imaging obtained using the 0.8-meter telescope at McDonald Observatory.

Observations: Observation details appear in Table 1.

UT Date	Telescope	Type	Comet
03/21/16	GMOS/ Gemini-N	Spectra	BA14
03/22/16	GMOS/ Gemini-S	Spectra	252P
03/23/16	McDonald	Imaging	BA14
03/24/16	McDonald	Imaging	BA14, 252P
3/30/16	McDonald	Imaging	252P
4/9- 4/10/16	McDonald	Imaging	252P
5/2- 5/4/16	McDonald	Imaging	252P

Table 1. Observation dates and types of data obtained for 252P/LINEAR and P/2016 BA14 (PanSTARRS) in Spring 2016.

The GMOS spectra span a wavelength range of 300-600 nm, covering emission from OH, NH, CN, C₃, C₂, CH, and NH₂. The McDonald narrowband imaging was obtained using the Hale-Bopp Filter set with the following filters: OH, UC, CN, BC, and C2. OH, CN, and C2 isolate emission features, while UC and BC serve as continuum color filters in the UV and blue wavelengths, respectively.

Preliminary Results: In the GMOS spectra of 252P/LINEAR CN and C₂ are easily detected, while for P/2016 BA14 (PanSTARRS) no obvious emission features are visible, displaying a spectrum mostly dominated by continuum. We will present a more detailed analysis of these spectra at the meeting. In the narrowband imaging, 252P/LINEAR is detected in all five filters, and is much brighter in the gas filters OH, CN, and C2 than in the continuum filters UC and BC, suggesting a gas-rich coma. However, while P/2016 BA14 (PanSTARRS) is detected in all filters except OH, its appearance is quasi-stellar in all images with no obvious difference in appearance between gas and continuum filters, suggesting that the coma is dust-rich or perhaps that the images are dominated by reflected sunlight from the nucleus surface.

References:

- [1] Dello Russo, N. et al. (2007) *Nature*, 448, 172-175. [2] Schleicher, D. G. and Bair, A. N. (2011) *Astronomical Journal*, 141, 177.