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PDS archive of wide-field UV-vis observations of comets: What products do *you* wish to see?

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Abstract

Our team is archiving space- and ground-based wide-field UV-visible observations of over two dozen comet apparitions (Table 1) with NASA's Planetary Data System (PDS). The space-based observations were recorded by the Midcourse Space eXperiment (*MSX*), the Galaxy Evolution Explorer (*GALEX*) and the Swift Ultraviolet/Optical Telescope (*Swift*/UVOT); the ground-based observations were recorded by standard imagers and spectrometers, as well as wide-field Fabry-Pérot imaging spectrometers. Table 2 provides a key to the spectroscopic features studied.

The creation of this archive is motivated by results from the growing number of *in situ* comet studies that are changing our understanding of the structure of cometary nuclei and the physical processes that drive outgassing. For instance, CO and CO_2 are now understood to be much more important at driving comet activity at large heliocentric distances. This is driving a paradigm shift in comet studies that calls for the reanalysis of past remote-sensing observations. By archiving with the PDS a significant collection of wide-field ground- and space-based comet observations, our effort provides data critical to answering this call. In particular, our space-based UV observations cover FOVs up to 6°, which uniquely capture the atomic end-members of the major volatiles H_2O, CO_2, and CO.

In this presentation, we show samples of the archive products that we are planning to provide and ask for community feedback to determine if there are any additional products that would be useful to derive.

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Table 1: Comet observations to be archived; multiple apparitions highlighted in bold

Target	UT Start	r_{Helio}[1]
C/1996 B2 (Hyakutake)[2,3]	1996-06-17	1.25
125P/Spacewatch[3]	1996-07-24	1.54
22P/Kopff[3]	1996-08-02	1.61 – 1.73
22P/Kopff	2009-07-22	1.68 – 2.0
C/1995 O1 (Hale-Bopp)[2,3]	1996-10-08	-2.80 – 2.74
C/1996 Q1 (Tabur)[3]	1996-10-09	0.96
126P/IRAS[3]	1996-10-13	1.71
46P/Wirtanen[3]	1996-12-07	1.62
107P/Wilson-Harrington	1997-01-10	1.10
81P/Wild 2	1997-02-28	1.72
81P/Wild 2	2010-03-24	1.6 – 1.7
2P/Encke	1997-07-16	1.19
2P/Encke	2013-09	1
55P/Tempel-Tuttle	1997-11-28	1.72
C/2004 Q2 (Machholz)[4]	2005-03-01	1.32
9P/Tempel 1	2005-06-08	1.5 – 1.7
9P/Tempel 1	2011-03-25	1.67 – 1.72
73P/SW3 Frag. B	2006-05-02	1.08
73P/SW3 Frag. C	2006-04-23	-1.13 – 0.94
17P/Holmes	2007-11-07	1.6
8P/Tuttle[4]	2007-11-18	-1.45 – 1.55
C/2007 N3 (Lulin)[6]	2009-01-28	1.24 – 1.48
29P/SW 1	2010-02-12	6.2
103P/Hartley 2	2010-09-14	1.11 – 1.21
2009 P1 (Garradd)	2011-04	-3.4 – 4.0
C/2011 L4 (PanSTARRS)	2012-09-06	-3.57
C/2012 S1 (ISON)	2013-01	-5.0 – -0.8
C/2012 K1 (PanSTARRS)	2013-06	-5.0 – 2.5

[1] AU, negative pre-perihelion; [2] Supporting ground-based observations to be archived; [3] *MSX* SPIRIT III infrared data have been archived for these observations [4]; [4] *GALEX* FUV data available for CO and C measurements;

Table 2: List of emission features

Instrument	Features in addition to continuum
MSX/UVISI[1]	C, CO, OH, CN, C_3, C_2, Na, H_2O^+, CO^+, CO_2^+
GALEX[1]	C, CO, S, CS, OH
Swift/UVOT[1]	CS, OH, CN, C_3, C_2, CO_2^+
Burrell Schmidt[2]	OH, CN, C_3, C_2
WIYN MOS[2]	H_2O^+, NH_2, O, C_2
WIYN sk2b[3]	OH, CN
WHAM[4] FP[2,3]	O
MMPM[5] FP[2]	O, H, C (velocity resolved)
MMPW[6] FP[2]	H_2O^+ (data cubes)

[1] Comets in Table 1; [2] Hale-Bopp; [3] Hyakutake; [4] Wisconsin Hα Mapper 0.6 m tel. & Fabry-Pérot; [5] McMath-Pierce (MMP) 1.6 m Main tel.; [6] MMP 0.9 m West Aux tel.

Table 3: Data products • please add your favorite!

Product	Notes
Time	UT
Coordinates	Heliographic, ecliptic, etc.
Production rates	See Table 2 for species and [5, 6, 7, 8] for results from select comets
Measured lifetimes	e.g., [5]
Spectral extractions	Calibrated (e.g., [2])
Reduced images	Calibrated (e.g., [1, 2, 3])
Grism extraction code	[1]
Instrument descriptions	PDS Standard
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•

[1] Grism observations of comets spread emission from several species across one image. Full extraction of the emission from each species requires forward modeling techniques. The code we will archive in NASA's GitHub site conducts this forward modeling with user-supplied model coma images.