16214 - Polarimetric Characterization of Oort Cloud Comet C/2017 K2 (PANSTARRS) Before Water Ice Sublimation

Cycle: 28, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) 2017K2-1 (2) 2017K2-2	ACS/WFC	2	04-Jun-2020 11:00:46.0	yes

2 Total Orbits Used

ABSTRACT

C/2017 K2 is intrinsically the brightest Oort cloud comet found in recent history, and presents a unique opportunity to efficiently characterize the constituent properties of a still primitive comet on its way in toward the inner solar system for the very first time. Its exceptional brightness in the outer solar system suggests it to be much larger than typical Oort cloud comets---normally too faint to observe at these distances---and makes it a particularly compelling target for early polarimetric characterization, which requires a high signal-to-noise ratio to usefully constrain its dust

properties. Imaging polarimetry of nearby comets has previously revealed varied polarized structures, such as halos and jets, that reflect spatial variation in grain size and structure. Jets are of particular interest as they entrain and expose fresh grains from beneath the surface, previously shielded from the space environment since the formation of the solar system, and are too small/narrow to be resolved in the outer solar system by ground-based imaging polarimetry. We propose to use high resolution HST/ACS polarimetry and color imaging of C/2017 K2 at a pre-perihelion epoch 6.5--7 au from the Sun, well before the onset of water ice sublimation, to constrain the properties of refractory grains in the jets and surrounding coma, and their physical evolution as they move outward from the nucleus. These observations, in concert with analogous results from more evolved comets in the inner solar system, will probe the formation environments and evolutionary histories of these assorted comets, and their implications on the formation and evolution of the solar system as a whole.

OBSERVING DESCRIPTION

We request one epoch of two orbits for polarimetry and color imaging of C/2017 K2, ideally scheduled on or within a few days of 2021 March 21. Each orbit will contain three polarized F775W exposures, one through each of the POL0V, POL60V, and POL120V polarizers, as well as one F775W and one F475W non-polarized exposure. Exposures will be distributed to approximately equalize the signal-to-noise of all individual exposures, and their order will be reversed between the orbits to mitigate the impact of any brightness variations linear on ~2 h timescales. Repeating each exposure across the two orbits provides redundancy against field stars, cosmic rays, and detector defects in the final polarization and color maps. Additionally, scheduling windows where the comet nucleus passes near bright stars or any extended background objects (e.g., galaxies, nebulae) should be avoided, if possible, and will be identified in early planning, and subsequently validated and possibly refined 1--2 months in advance of the target epoch when more reliable comet and HST ephemerides become available.

On 2021 March 21, the comet trails the Sun by ~80 deg in both R.A. and ecliptic longitude while at a solar elongation of ~85 deg. This position is broadly consistent with inclusion in the Reduced Gyro Mode (RGM) field of regard, suggesting that the observation likely remain schedulable if RGM is place. Furthermore, while the epoch is optimally scheduled on or near 2021 March 21, scheduling it elsewhere in 2021 March and April is still acceptable for achieving the science objectives, if necessary by a less flexible schedule. Finally, the comet will only be moving at ~13 arcsec/h, which is well within the RGM tracking limits. We therefore anticipate limited impacts to this program from entering RGM, beyond scheduling flexibility and acquisition overheads.

Visit

Proposal 16214, Visit 01, implementation Thu Jun 04 15:00:46 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: BETWEEN 19-MAR-2021:06:00:00 AND 19-MAR-2021:09:00:00; BETWEEN 19-MAR-2021:19:00:00 AND 20-MAR-2021:00:00:00; BETWEEN 20-MAR-2021:20:00:00 AND 21-MAR-2021:03:00:00; BETWEEN 21-MAR-2021:14:00:00 AND 22-MAR-2021:00:00:00; BETWEEN 22-MAR-2021:09:00:00 AND 22-MAR-2021:14:00:00; BETWEEN 23-MAR-2021:01:00:00 AND 23-MAR-2021:03:00:00; BETWEEN 23-MAR-2021:09:00:00 AND 23-MAR-2021:15:00:00

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	2017K2-1	TYPE=COMET,Q=1.8052923755151 7,E=1.000365195836125,I=87.543555 1941697 ,O=88.25971276371043,W=236.08249 69444859,T=20-DEC-2022:14:54:52,TTimeScale=TDB,EQ UINOX=J2000,EPOCH=20-DEC-2018:00:00:00,EpochTimeScale=TDB				EARTH
	Comments: Description=C/2017 K2 (PANSTARRS) Extended=YES					
(2)	2017K2-2	TYPE=COMET,Q=1.8052923755151 7,E=1.000365195836125,I=87.543555 1941697 ,O=88.25971276371043,W=236.08249 69444859,T=20-DEC-2022:14:54:52,TTimeScale=TDB,EQ UINOX=J2000,EPOCH=20-DEC-2018:00:00:00,EpochTimeScale=TDB	TYPE=POS_ANGLE,RAD=0.5,ANG =180,REF=SUN			EARTH
	Comments: Description=C/2017 K2 (PANSTARRS) - Offset (2nd Dither Position) Extended=YES					

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) 2017K2-1	ACS/WFC, ACCUM, WFC	F775W POL0V			Sequence 1-5 Non-Int in Visit 01	500 Secs (500 Secs) *[==>]*	*[1]*
2		(1) 2017K2-1	ACS/WFC, ACCUM, WFC	F775W POL60V			Sequence 1-5 Non-Int in Visit 01	500 Secs (500 Secs) *[==>]*	*[1]*
3		(1) 2017K2-1	ACS/WFC, ACCUM, WFC	F775W POL120V			Sequence 1-5 Non-Int in Visit 01	500 Secs (500 Secs) *[==>]*	*[1]*
4		(1) 2017K2-1	ACS/WFC, ACCUM, WFC1B-2K	F775W			Sequence 1-5 Non-Int in Visit 01	160 Secs (160 Secs) *[==>]*	*[1]*
5		(1) 2017K2-1	ACS/WFC, ACCUM, WFC1B-2K	F475W			Sequence 1-5 Non-Int in Visit 01	204 Secs (204 Secs) *[==>]*	*[1]*
6		(2) 2017K2-2	ACS/WFC, ACCUM, WFC1B-2K	F475W			Sequence 6-10 Non-Int in Visit 01	203 Secs (203 Secs) *[==>]*	*[2]*
7		(2) 2017K2-2	ACS/WFC, ACCUM, WFC1B-2K	F775W			Sequence 6-10 Non-Int in Visit 01	160 Secs (160 Secs) *[==>]*	*[2]*
8		(2) 2017K2-2	ACS/WFC, ACCUM, WFC	F775W POL120V			Sequence 6-10 Non-Int in Visit 01	500 Secs (500 Secs) *[==>]*	*[2]*
9		(2) 2017K2-2	ACS/WFC, ACCUM, WFC	F775W POL60V			Sequence 6-10 Non-Int in Visit 01	500 Secs (500 Secs) *[==>]*	*[2]*
10		(2) 2017K2-2	ACS/WFC, ACCUM, WFC	F775W POL0V			Sequence 6-10 Non-Int in Visit 01	500 Secs (500 Secs) *[==>]*	*[2]*

Orbit Structure