15122 - Titan at Opposite Seasons Using STIS Image Cubes

Cycle: 25, Proposal Category: GO

(Availability Mode: AVAILABLE)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) TITAN CCDFLAT WAVE	STIS/CCD	1	07-Jul-2017 21:01:55.0	yes

1 Total Orbits Used

ABSTRACT

This proposal seeks to use STIS with one orbit each in 2017, 2018, and 2019 to map the full disk of Titan at 1024 wavelengths between 530 and 1000 nm and at 0.05 arc-sec sampling in both spatial dimensions. These observations repeat similar STIS observations between 1997 and 2004 in order to create data sets at opposite seasons. The comparison of the old and new data sets will characterize seasonal asymmetries as function of latitude and wavelength. STIS probes many altitude levels from the surface to the stratosphere eight scale heights higher. Radiative transfer models using previous STIS image cubes resulted in a seasonal model of Titan's haze based on the assumption that Titan is symmetric at opposite seasons. This is probably an approximation, and the proposed data are needed to characterize asymmetries. Cassini's mission is too short to observe Titan at opposite seasons. Ground-based adaptive optics systems do not provide a stable point spread function required to create a suitable data cube. HST is the only telescope that can achieve the goal until the next opportunity around 2047. Characterization of seasonal asymmetries provides one of the most sensitive tests for global circulation models. Titan's seasonal cycle is a vibrant current research topic due to 12 years of Cassini data. This proposal will expand STIS data to a range of 22 years. The opportunity is unique, and the required HST time is minimal.

OBSERVING DESCRIPTION

The observations in Cycle 25 will use one orbit providing a full image cube of Titan. The orbit will be similar to the STIS/CCD orbit of GO 14612 taken in 2017. The orbit consist of 16 exposures with the grating G750L for wavelengths 530-1000 nm at 0.5 nm/pixel. Each successive exposure is offset by 0.051 arc-sec perpendicular to the slit orientation from the previous one. The aperture is 52X0.05E1. The saved part of the image is 140 spatial rows and all 1024 spectral columns. This avoids buffer dumps during the observation, but still provides plenty of background sky.
Calibration exposures are a CCDFLAT and WAVECAL taken at start of Earth occultation. Acquisition is accomplished with a 1 sec exposure with the MIRROR and a F28X50LP aperture using ACQTYPE=DIFFUSE, CHECKBOX=19, DIFFUSE-CENTER=FLUX-CENTRIOD.
Exposure times will be the longest possible to fit all Titan exposures into the orbit before occultation starts, about 86 sec each.
Signal-to-noise levels will be about 50 per pixel in the red continuum.
Titan's apparent diameter varies by 20 percent during each year. To optimize spatial resolution I request observations to be scheduled within about one month of opposition that occurs June 27, 2018, and July 9, 2019. This gives phase angles of Titan below 3 degrees , as was the case for previous STIS observations.
I request to schedule observations during the optimal phase within Titan's 16-day orbit, which is within two days of Titan's western elongation, when mostly dark terrain faces Earth, and when a STIS image cube was taken in every of the five years of observations. This request is not critical since other orbital longitudes give only a minor degradation of results. This is implemented in the timing requirements of Orbit 1.

Visit

Proposal 15122, Orbit1 (01), implementation Sat Jul 08 01:01:57 GMT 2017

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 30%; BETWEEN 19-MAY-2018:21 AND 24-MAY-2018:01; BETWEEN 04-JUN-2018:19 AND 08-JUN-2018:23; BETWEEN 20-JUN-2018:16 AND 24-JUN-2018:20; BETWEEN 06-JUL-2018:13 AND 10-JUL-2018:17; BETWEEN 22-JUL-2018:10 AND 26-JUL-2018:14; BETWEEN 07-AUG-2018:08 AND 11-AUG-2018:12

Diagnostics

(Orbit1 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-PERP-TO-SLIT	Coordinate Frame=POS-TARG		(2)
	Purpose=MOSAIC	Pattern Orientation=0.0		
	Number Of Points=16	Angle Between Sides=		
	Point Spacing=0.051	Center Pattern=true		
	Line Spacing=			

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	TITAN	STD=SATURN	STD=TITAN		SEP OF TITAN SATURN FROM EARTH GT 45", SEP OF TITAN RHEA FROM EARTH GT 10"	EARTH

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acquisition	(1) TITAN	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; CHECKBOX=19; DIFFUSE-CENTER=FLUX-CENTROID			1 Secs (1 Secs) *[==>]*	***[1]***
2	Mosaic	(1) TITAN	STIS/CCD, ACCUM, 52X0.05E1	G750L 7751 A	CR-SPLIT=NO; GAIN=1; SIZEAXIS2=140; WAVECAL=NO		Pattern 1, Exps 2-2 in Orbit1 (01) (1)	86 Secs (1376 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]* *[==>(Pattern 5)]* *[==>(Pattern 6)]* *[==>(Pattern 7)]* *[==>(Pattern 8)]* *[==>(Pattern 9)]* *[==>(Pattern 10)]* *[==>(Pattern 11)]* *[==>(Pattern 12)]* *[==>(Pattern 13)]* *[==>(Pattern 14)]* *[==>(Pattern 15)]* *[==>(Pattern 16)]*	***[1]***
3	Wavecal	WAVE	STIS/CCD, ACCUM, 52X0.05	G750L 7751 A				*[==>]*	***[1]***
4	Flatfield	CCDFLAT	STIS/CCD, ACCUM, 52X0.05	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***

Orbit Structure