12900 - Mapping the Methane and Aerosol Distributions within Titan's Troposphere: Complementing The Cassini/VIMS T90 Flyby of Titan

Cycle: 20, Proposal Category: GO

(Availability Mode: AVAILABLE)

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) TITAN CCDFLAT WAVE	STIS/CCD	3	05-Feb-2013 02:31:40.0	yes

3 Total Orbits Used

ABSTRACT

Titan's atmosphere is mainly nitrogen gas with several trace constituents, including methane at the few percent level. The presence of methane has been a puzzle for decades, since the CH4 in Titan's atmosphere is expected to be destroyed by UV photolysis in ten million years or so. The source of Titan's atmospheric methane continues to be a major question.

We propose a set of three STIS image cubes with the G750M grating at 0.62, 0.72 and 0.89 |*|m methane bands. These bands probe altitudes from the surface to 70 km; unlike CH4 bands at 1.6 or 2.3 |*|m, these cubes will provide a 3-D picture of Titan's troposphere (below 40 km). The

Cassini/VIMS visible channel has not been useful for this purpose for two reasons: its spectral resolution (about R=100) is coarse and its inconsistent background subtraction scheme that can lead to "stripes." HST/STIS resolves Titan's 1" disk into over 80 spatially resolved spectra, each with a spectral resolution greater than R=5000. STIS is a unique tool for mapping the 3-D distributions of CH4 and aerosols in Titan's troposphere.

We request observations within a day of the Cassini flyby of Titan on April 5, 2013 around 21:40 UT in order to combine Cassini/VIMS and STIS mage cubes. Together, the visible (STIS) and IR (VIMS) image cubes will probe altitudes from the surface to the stratosphere (several hundred km). The proposed STIS image cubes will provide the best tropospheric map of CH4 to date, relevant to surface/atmospheric coupling of CH4, latitudinal inhomogeneity of CH4 or aerosols, or the presence of condensates at low altitudes.

OBSERVING DESCRIPTION

This proposal consists of three orbits to observe Titan with the G750M grating, each identical except for the wavelength setting. The schedule for each orbit consists of an initial acquisition followed by 20 spectra using the 52x0.05 arcsec slit, which we will step across Titan in 0.05 arcsec increments to produce image cubes. The three wavelength settings are centered at 6252, 7283 and 8825 Angstroms, respectively.

REAL TIME JUSTIFICATION

This proposal needs to be concident with Cassini/VIMS spacecraft observations, specifically, the Cassini T90 flyby of Titan. The window for these three orbits is between 1:00 to 6:00 UT on April 6, 2013.

CALIBRATION JUSTIFICATION

We are concerned about wavelength-dependent scattered light in the 8825 spectra. This was a huge issue for us in previous G750L spectra, and although the PSF is slightly smaller in the G750M spectra, we still think it will be a problem. In GO-8580 we had WFPC2 images of Titan at selected wavelengths that we could use to correct the red "anti-leak", but we do not have time to make similar calibration observations in this program.

Visit

Proposal 12900, Titan_Cubes (01), implementation Tue Feb 05 02:32:16 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: BETWEEN 05-APR-2013:21:45:00 AND 06-APR-2013:06:00:00

Comments: First image cube of Titan, consisting of 20 spectra obtained by stepping the 52x0.05 slit across Titan at 0.05 increments. This FIRST orbit includes the initial acquisition of Titan, and thus allocates less time to the spectra. The second and third orbits (at longer wavelengths) will avoid the main acquisition overhead.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-PERP-TO-SLIT	Coordinate Frame=POS-TARG		(2), (4), (8)
	Purpose=MOSAIC	Pattern Orientation=0.0		
	Number Of Points=20	Angle Between Sides=		
	Point Spacing=0.05	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

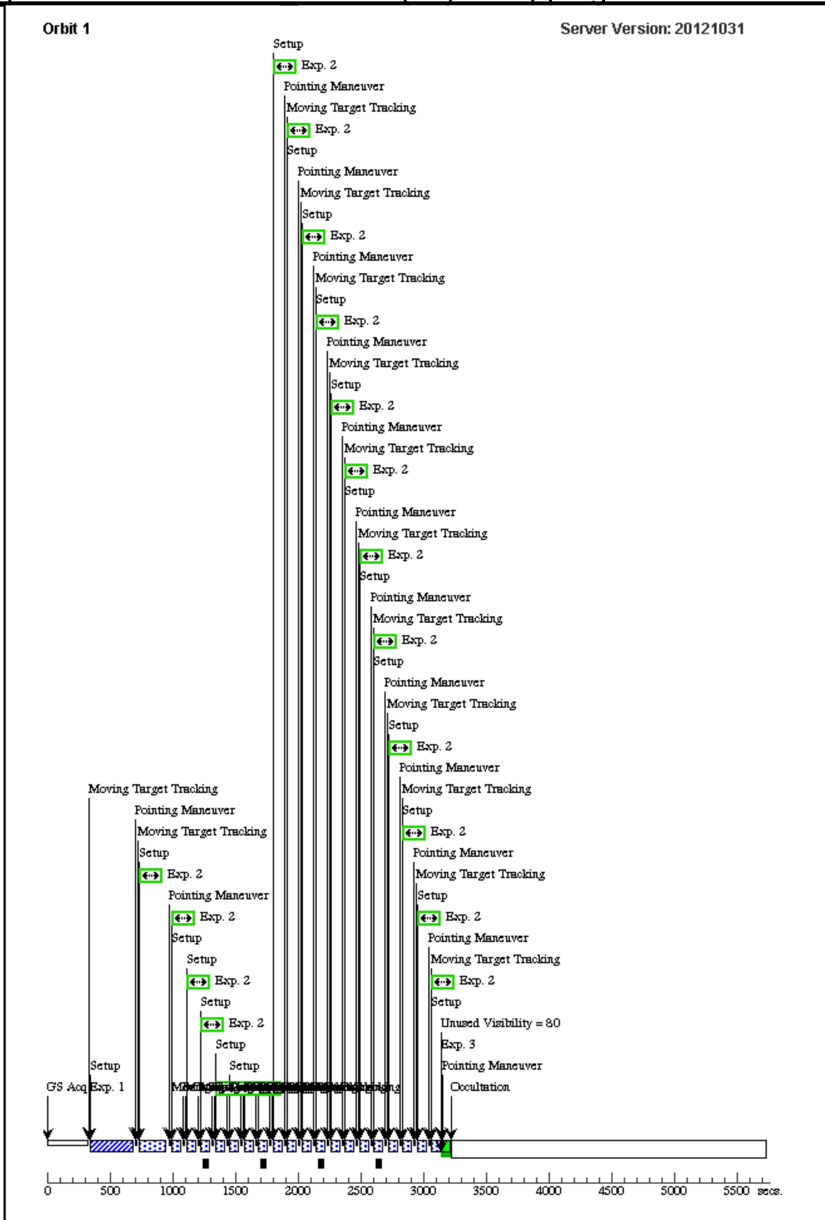
Exposures

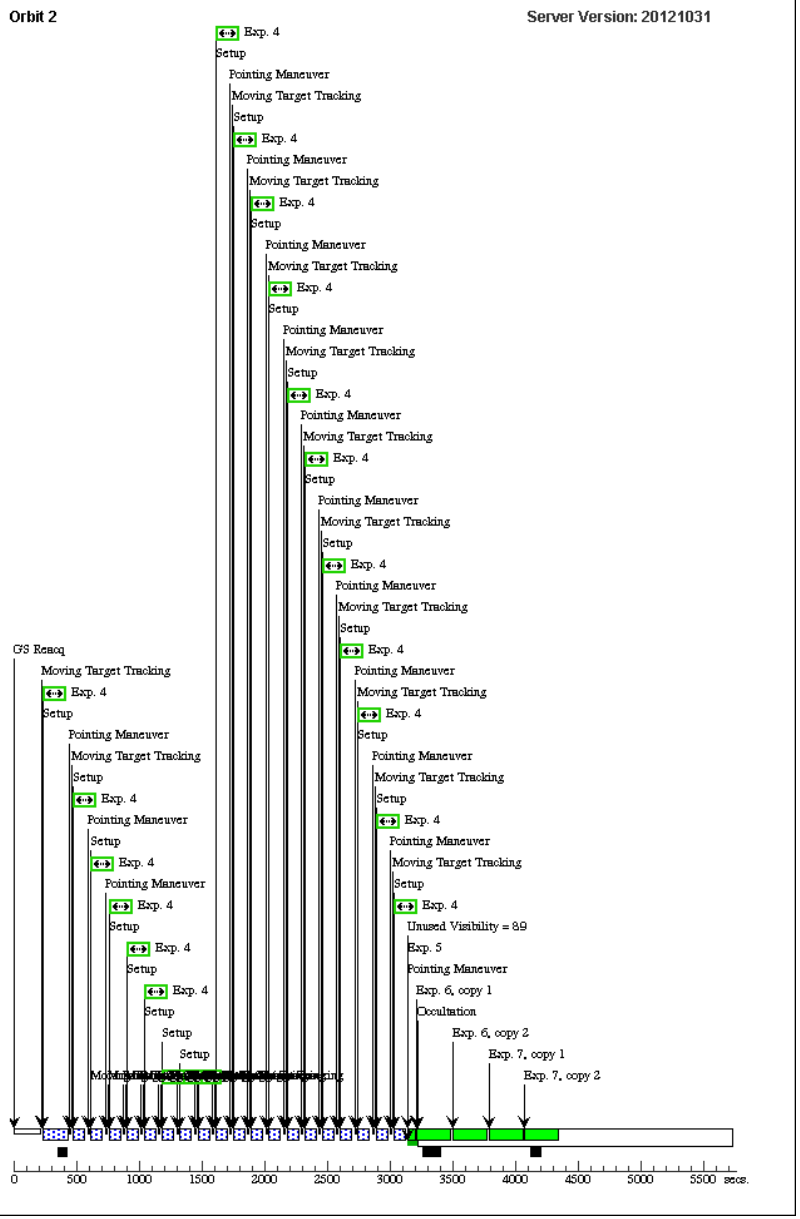
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Titan_Initial Acq	(1) TITAN	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; CHECKBOX=19; DIFFUSE-CENTER=GEOMETRIC-CENTER			0.1 Secs *[==>]*	***[1]***
2	Titan_Cube_6252A	(1) TITAN	STIS/CCD, ACCUM, 52X0.05E1	G750M 6252 A	SIZEAXIS2=248; CR-SPLIT=NO; WAVECAL=NO		Pattern 1, Exps 2-2 in Titan_Cubes (01) (1)	49 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)]* *[==>(Pattern 17)]* *[==>(Pattern 18)]* *[==>(Pattern 19)]* *[==>(Pattern 20)]*	***[1]***
3	WAVECAL_6252	WAVE	STIS/CCD, ACCUM, 52X0.05	G750M 6252 A		NEW ALIGNMENT		*[==>]*	***[1]***

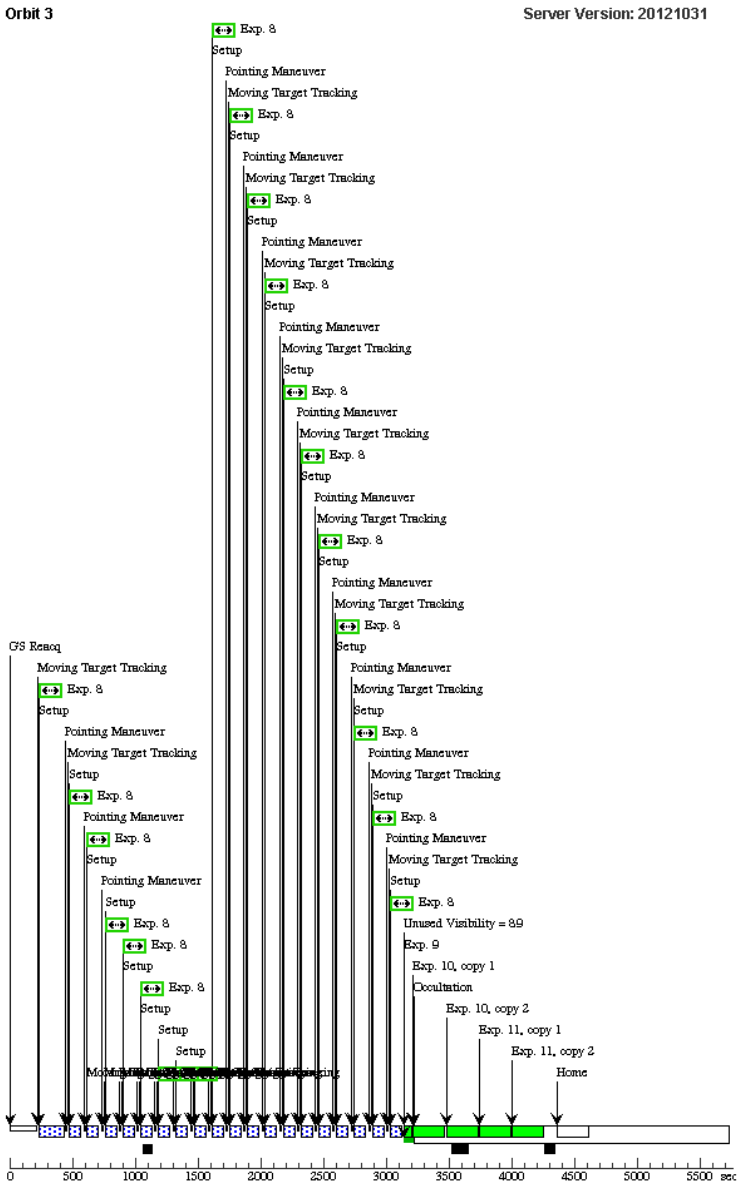
4	Titan_Cube_7283A	(1) TITAN	STIS/CCD, ACCUM, 52X0.05E1	G750M 7283 A	SIZEAXIS2=248; CR-SPLIT=NO; WAVECAL=NO	Pattern 1, Exps 4-4 in Titan_Cubes (01) (1)	76 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]* *[==>(Pattern 5)]* *[==>(Pattern 6)]* *[==>(Pattern 7)]* *[==>(Pattern 8)]* *[==>(Pattern 9)]* *[==>(Pattern 10)]* *[==>(Pattern 11)]* *[==>(Pattern 12)]* *[==>(Pattern 13)]* *[==>(Pattern 14)]* *[==>(Pattern 15)]* *[==>(Pattern 16)]* *[==>(Pattern 17)]* *[==>(Pattern 18)]* *[==>(Pattern 19)]* *[==>(Pattern 20)]*	***[2]***
5	WAVECAL_7283	WAVE	STIS/CCD, ACCUM, 52X0.05	G750M 7283 A		NEW ALIGNMENT	*[==>]*	***[2]***
6	CCDFLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.05	G750M 7283 A			*[==>(Copy 1)]* *[==>(Copy 2)]*	***[2]***
7	CCDFLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.05	G750M 7283 A			*[==>(Copy 1)]* *[==>(Copy 2)]*	***[2]***

	8	Titan_Cube_8825A	(1) TITAN	STIS/CCD, ACCUM, 52X0.05E1	G750M 8825 A	SIZEAXIS2=248; CR-SPLIT=NO; WAVECAL=NO	Pattern 1, Exps 8-8 in Titan_Cubes (01) (1)	76 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)]* *[==>(Pattern 17)]* *[==>(Pattern 18)]* *[==>(Pattern 19)]* *[==>(Pattern 20)]*	***[3]***
	9	WAVECAL_8825	WAVE	STIS/CCD, ACCUM, 52X0.05	G750M 8825 A		NEW ALIGNMENT	*[==>]*	***[3]***
	10	CCDFLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.05	G750M 8825 A			*[==>(Copy 1)]* *[==>(Copy 2)]*	***[3]***
	11	CCDFLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.05	G750M 8825 A			*[==>(Copy 1)]* *[==>(Copy 2)]*	***[3]***

Orbit Structure




Orbit 2
Server Version: 20121031
Exp. 4
Setup
Pointing Maneuver
Moving Target Tracking
GS Reacq
Unused Visibility = 8.9
Exp. 5
Occultation
Exp. 6, copy 1
Exp. 6, copy 2
Exp. 7, copy 1
Exp. 7, copy 2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20121031
Exp. 8
Setup
Pointing Maneuver
Moving Target Tracking
GS Reacq
Unused Visibility = 8.9
Exp. 9
Exp. 10, copy 1
Occultation
Exp. 10, copy 2
Exp. 11, copy 1
Exp. 11, copy 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500 sec