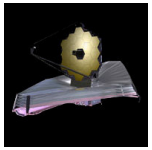

2060 - Unraveling the primordial constituents and exogenic processes that shaped Callisto's surface

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	NIRSpec: Valhalla impact basin	NIRSpec IFU Spectroscopy	(1) CALLISTO
	2	NIRSpec: Asgard impact basin	NIRSpec IFU Spectroscopy	(1) CALLISTO
	3	NIRSpec: Callisto trailing hemisphere	NIRSpec IFU Spectroscopy	(1) CALLISTO

ABSTRACT

We propose to observe the Galilean moon Callisto with NIRSpec IFU (G395H, 2.9 – 5.3 microns) to improve our understanding of the carbon and nitrogen chemical systems operating on this moon and gain insight into the formation conditions in the Jovian subnebula. We will investigate the

nature of CO2 by characterizing its spectral signature and distribution across Callisto and by determining whether primordial deposits of ‘pure’ CO2 ice are present in the Valhalla and Asgard impact basins. We will investigate whether a 4.57-micron band detected on Callisto results from nitrogen-rich organics, which might have been delivered in dust grains from Jupiter’s irregular satellites. By characterizing 13CO2, a heavy stable isotope of CO2, we will probe Callisto’s formation environment. Because Earth’s atmosphere is opaque between 4.2 and 4.5 microns, investigation of solid-state CO2 on planetary bodies like Callisto is impossible using ground-based facilities. Similarly, the 4.57-micron band is heavily contaminated by Earth's atmosphere, making assessment of this band highly challenging using ground-based facilities. JWST is therefore the only existing facility that can collect the high quality spectra required to complete this project's objectives. We require 0.07 hours of science time, and 3.39 hours of total charged time, to make our three required observations. Collected NIRSpec spectra will be highly valuable for developing the spectroscopic priorities of the NASA Europa Clipper and ESA JUICE spacecraft missions to the Jovian system, which will both make close passes of Callisto.

OBSERVING DESCRIPTION

We propose to make three observations of Callisto with NIRSpec IFU (G395H/F290LP), requiring 0.07 hours of science time and 3.39 hours of total charged time. By making these three observations, we can collect spectra over the center of Callisto’s trailing hemisphere (sub-observer longitude 270 degrees) and over the Valhalla and Asgard impact basins (centered near sub-observer longitudes 55 and 138 degrees, respectively). Each of these three observations requires 0.024 hours of science time and 1.13 hours of charged time.

The range of sub-observer longitudes that are suitable to achieve our science goals are as follows: Callisto's trailing hemisphere, sub-observer longitudes 210 to 330 degrees; Valhalla impact basin, sub-observer longitudes 20 to 90 degrees; Asgard impact basin, sub-observer longitudes 110 to 165 degrees. These sub-observer longitude requirements will be routinely met by JWST during Cycle 1. The angular separation between Callisto and Jupiter will be > 125 arcseconds for all three of our required observations, and scattered light from the disk of Jupiter will be negligible at these large angular distances. Additionally, our required observations must occur when the angular separation between Callisto and the three other Galilean moons Io, Europa, and Ganymede is > 10 arcseconds. These special requirements are included in the APT file.

Proposal 2060 - Targets - Unraveling the primordial constituents and exogenic processes that shaped Callisto's surface

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	CALLISTO	STD=JUPITER	STD=CALLISTO	

Comments: Extended=YES

Observation

Proposal 2060, Observation 1: NIRSpec: Valhalla impact basin Wed Jan 19 20:00:22 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	CALLISTO	STD=JUPITER	STD=CALLISTO	

Comments: Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	2	1	false	true	NONE	4	4	128.841	

Special Requirements

DEFAULT WINDOW: NOT OCCULTATION OF CALLISTO BY JUPITER FROM JWST
DEFAULT WINDOW: SEPARATION OF CALLISTO IO FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF CALLISTO EUROPA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF CALLISTO GANYMEDE FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE CALLISTO FROM JWST LESS THAN 0.03
CENTRAL MERIDIAN LONGITUDE OF CALLISTO FROM JWST BETWEEN 25 90

Observation

Proposal 2060, Observation 2: NIRSpec: Asgard impact basin Wed Jan 19 20:00:22 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	CALLISTO	STD=JUPITER	STD=CALLISTO	

Comments: Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	2	1	false	true	NONE	4	4	128.841	

Special Requirements

CENTRAL MERIDIAN LONGITUDE OF CALLISTO FROM JWST BETWEEN 110 155
DEFAULT WINDOW: NOT OCCULTATION OF CALLISTO BY JUPITER FROM JWST
DEFAULT WINDOW: SEPARATION OF CALLISTO IO FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF CALLISTO EUROPA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF CALLISTO GANYMEDE FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE CALLISTO FROM JWST LESS THAN 0.03

Observation

Proposal 2060, Observation 3: NIRSpec: Callisto trailing hemisphere Wed Jan 19 20:00:22 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	CALLISTO	STD=JUPITER	STD=CALLISTO	

Comments: Extended=YES

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	2	1	false	true	NONE	4	4	128.841	

Special Requirements

CENTRAL MERIDIAN LONGITUDE OF CALLISTO FROM JWST BETWEEN 210 330
DEFAULT WINDOW: NOT OCCULTATION OF CALLISTO BY JUPITER FROM JWST
DEFAULT WINDOW: SEPARATION OF CALLISTO IO FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF CALLISTO EUROPA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF CALLISTO GANYMEDE FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE CALLISTO FROM JWST LESS THAN 0.03