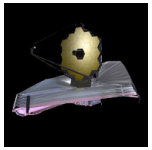

4566 - Elucidating Jupiter's auroral processes with HST and JWST

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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Dr. Chihiro Tao (CoI)	National Institute of Information and Com. Technology (NICT)

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation1				
	1		NIRCam Imaging	(1) JUPITERNORTH1
Observation2				
	2		NIRSpec IFU Spectroscopy	(2) JUPITERNORTH2

ABSTRACT

The unique partnership between HST and JWST available at this juncture presents an exciting new prospect to understand planetary auroral processes as never before, representing the most powerful remote sensing tool ever available to understand this phenomenon. We propose joint HST-JWST observations of Jupiter's prompt electron-excited far-ultraviolet (FUV) auroral emissions and near-infrared (NIR) H3+ thermal auroral emissions that will reveal the true nature and physics behind Jupiter's enigmatic and spectacular auroras. While the two observatories have observed Jupiter's auroras separately, they never observed them simultaneously. The next step in understanding the auroral processes is to compare simultaneous images of FUV and NIR emissions to address the following questions:

*How does the instantaneous FUV emission relate to the slower H3+ emission?

*How does the instantaneous energy input and temperature seen in FUV emission relate to H3+ thermal emissions?

*How do the H3+ thermal emissions relate to well-known FUV features, i.e. the main oval emission, polar emissions, satellite footprints, and dawn storms?

*What is the lifetime of H3+ ions in Jupiter's auroral ionosphere?

*What processes govern the energy balance in Jupiter's upper atmosphere?

Only HST can obtain the FUV high time- and spatial resolution auroral images and high-resolution spectra of Jupiter's FUV emissions, and only JWST can obtain the high time- and spatial resolution images and spectral images of Jupiter's polar H3+ emission required to address these science questions. These observations will yield high-profile discoveries and vital context for ongoing Juno observations of Jupiter's auroras.

OBSERVING DESCRIPTION

These observations will obtain two observations of Jupiter's northern auroras. The first will obtain images of the polar H3+ emission over 3.18-3.54 m using the long wavelength channel of NIRCam with the F335M filter and CLEAR pupil aperture stop. The observations will employ the SUB160 subarray and will target 67° lat, 175° lon. The observations will employ the RAPID readout mode and use 10 groups during each integration time of ~3 s, and the maximum 200 integrations per exposure. The second observaion will obtain NIRSpec IFU spectroscopy of the auroral region over 2.9-5.3 m with the G395H/F290LP disperser/filter setup. We will employ NRSRAPID readout with 2 groups per 32 s integration, and 33 integrations for each 1063 s exposure. The observations will mosaic 4 such exposures in a 2 2 grid also centred on 67° lat, 175° lon. Observations will be scheduled simultaneously with HST proposal 17471 and during the CML range 120-230, i.e. when the northern auroras are presented toward Earth.

Proposal 4566 - Targets - Elucidating Jupiter's auroral processes with HST and JWST

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	JUPITERNORTH1	STD=JUPITER	TYPE=PGRAPHIC,LONG=175,LAT=67	
Comments: Extended=YES				
(2)	JUPITERNORTH2	STD=JUPITER	TYPE=PGRAPHIC,LONG=175,LAT=67	
Comments: Extended=YES				

Observation

Proposal 4566, Observation 1

Thu Sep 14 14:00:54 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Comments: This observation should be scheduled to execute simultaneously with visits 01-03 of HST program GO 17471

Diagnostics

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

(Observation 1) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	JUPITERNORTH1	STD=JUPITER	TYPE=PGRAPHIC,LONG=175,LAT=67	

Comments: Extended=YES

Template

Module	Subarray	Target Placement
B	SUB160	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F212N	F335M	RAPID	10	200	200	1	614.032	167255
2	F212N	F335M	RAPID	10	200	200	1	614.032	167255
3	F212N	F335M	RAPID	10	200	200	1	614.032	167255
4	F212N	F335M	RAPID	10	200	200	1	614.032	167255
5	F212N	F335M	RAPID	10	200	200	1	614.032	167255
6	F212N	F335M	RAPID	10	200	200	1	614.032	167255
7	F212N	F335M	RAPID	10	200	200	1	614.032	167255
8	F212N	F335M	RAPID	10	200	200	1	614.032	167255
9	F212N	F335M	RAPID	10	86	86	1	264.034	167255

Special Requirements	
	CENTRAL MERIDIAN LONGITUDE OF JUPITER FROM JWST BETWEEN 120 230 DEFAULT WINDOW: NOT OCCULTATION OF JUPITERNORTH1 BY JUPITER FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH1 BY IO FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH1 BY EUROPA FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH1 BY GANYMEDE FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH1 BY CALLISTO FROM JWST DEFAULT WINDOW: SEPARATION OF JUPITERNORTH1 IO FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF JUPITERNORTH1 EUROPA FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF JUPITERNORTH1 GANYMEDE FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF JUPITERNORTH1 CALLISTO FROM JWST GREATER THAN 10" DEFAULT WINDOW: ANGULAR RATE JUPITERNORTH1 FROM JWST LESS THAN 0.075

Observation

Proposal 4566, Observation 2

Thu Sep 14 14:00:54 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: This observation should be scheduled to execute simultaneously with Visits 04-06 of HST program GO 17471

Diagnostics

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

(Observation 2) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(2)	JUPITERNORTH2	STD=JUPITER	TYPE=PGRAPHIC,LONG=175,LAT=67	

Comments: Extended=YES

Template

TA Method
NONE

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	2	0.0	0.0	0.0	0.0	DEFAULT

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	NONE				

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	33	false	false	NONE	1	33	1062.94	167255

Special Requirements	
	CENTRAL MERIDIAN LONGITUDE OF JUPITER FROM JWST BETWEEN 120 230 DEFAULT WINDOW: NOT OCCULTATION OF JUPITERNORTH2 BY JUPITER FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH2 BY IO FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH2 BY EUROPA FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH2 BY GANYMEDE FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF JUPITERNORTH2 BY CALLISTO FROM JWST DEFAULT WINDOW: SEPARATION OF JUPITERNORTH2 IO FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF JUPITERNORTH2 EUROPA FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF JUPITERNORTH2 GANYMEDE FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF JUPITERNORTH2 CALLISTO FROM JWST GREATER THAN 10" DEFAULT WINDOW: ANGULAR RATE JUPITERNORTH2 FROM JWST LESS THAN 0.075