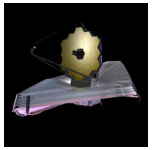

3496 - How Deep are the Winds in an Extrasolar World?

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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Dr. Peter K. G. Williams (CoI)	Harvard University

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRSpec Bright Object Time Series	(1) 2MASSW-J1047539+212423
	2		NIRSpec Bright Object Time Series	(2) 2MASSW-J1047539+212423-updated

ABSTRACT

The vertical structure of atmospheric winds is critical for understanding global-scale circulation on giant planets within our solar system and presumably beyond. Due to their fast rotation, brown dwarfs are in the same dynamical regime as Jupiter and Saturn. Fortunately, their complex atmospheres provide cloud features that allow us to trace the atmospheric dynamics. We propose for 15 hr of monitoring with JWST/NIRSpec to measure the first vertically-resolved atmospheric wind speeds in any extrasolar atmosphere. This program will revolutionize the study of giant extrasolar atmospheres by providing a new method of probing atmospheric dynamics through vertically-resolved wind speeds.

OBSERVING DESCRIPTION

We propose for 15 hr of JWST/NIRSpec monitoring of the brown dwarf 2MASS 1047. Following the recommended strategies for time series observations with NIRSpec, we will use the Bright Object Time Series (BOTS) mode with the Prism filter and S1600A1 slit. To avoid saturating the detector, we use the SUB2048 subarray, the NRS readout pattern and 3 groups per integration to achieve 12 s cadence. We add on a 30 minute settling time to the beginning of our observation, following the recommendations from the JWST User Documentation and after consultation with the JWST Helpdesk. According to the ETC we will reach SNR of ~190 in the J-band peak per 12 second exposure.

Proposal 3496 - Targets - How Deep are the Winds in an Extrasolar World?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	2MASSW-J1047539+212423	RA: 10 47 53.8546 (161.9743942d) Dec: +21 24 23.47 (21.40652d) Equinox: J2000	Proper Motion RA: -1714.0 mas/yr Proper Motion Dec: -488.99999999321153 mas/yr Parallax: 0.095" Epoch of Position: 2000	
Comments: 11 Sep 2023: updated by JV using SIMBAD coords. *Category=Star* *Description=[Brown dwarfs]*				
(2)	2MASSW-J1047539+212423-updated	RA: 10 47 51.7874 (161.9657808d) Dec: +21 24 14.92 (21.40414d) Equinox: J2000	Proper Motion RA: -1684.390396 mas/yr Proper Motion Dec: -495.854149 mas/yr Parallax: 0.09473" Epoch of Position: 2015.405	
Comments: 5 March 2025: *JV updated coordinates to the more recent and precise CatWISE2020 catalogue measurements for target CWISE J104751.75+212414.7* *"ra_pm", "dec_pm" values used for RA and Dec, these have epoch 2015.405* *Proper motions have been updated to account for systematic offset between WISE and Gaia DR2 following method in Marocco et al. (2021).* *Coordinates also cross-matched with another program (6474) with same.* *Category=Star* *Description=[Brown dwarfs]*				

Observation

Proposal 3496, Observation 1

Wed Mar 05 17:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Observation 1) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	2MASSW-J1047539+212423	RA: 10 47 53.8546 (161.9743942d) Dec: +21 24 23.47 (21.40652d) Equinox: J2000	Proper Motion RA: -1714.0 mas/yr Proper Motion Dec: -488.99999999321153 mas/yr Parallax: 0.095" Epoch of Position: 2000	

Comments: 11 Sep 2023: updated by JV using SIMBAD coords.
Category=Star
Description=[Brown dwarfs]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	133363.2

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	PRISM/CLEAR	NRSRAPID	12	4762	1	1	4762	55936.738	133363.1

Special Requirements

Time Series Observation
No Parallel Attachments

Observation

Proposal 3496, Observation 2

Wed Mar 05 17:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Observation 2) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	2MASSW-J1047539+212423-updated	RA: 10 47 51.7874 (161.9657808d) Dec: +21 24 14.92 (21.40414d) Equinox: J2000	Proper Motion RA: -1684.390396 mas/yr Proper Motion Dec: -495.854149 mas/yr Parallax: 0.09473" Epoch of Position: 2015.405	

Comments: 5 March 2025:

JV updated coordinates to the more recent and precise CatWISE2020 catalogue measurements for target CWISE J104751.75+212414.7

"ra_pm", "dec_pm" values used for RA and Dec, these have epoch 2015.405

Proper motions have been updated to account for systematic offset between WISE and Gaia DR2 following method in Marocco et al. (2021).

Coordinates also cross-matched with another program (6474) with same.
Category=Star
Description=[Brown dwarfs]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	133363.2

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	PRISM/CLEAR	NRSRAPID	12	4762	1	1	4762	55936.738	133363.1

Special Requirements	Time Series Observation No Parallel Attachments