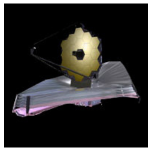

5866 - Oceans of Uncertainty: A Veritable Waterworld or a Desolate Wasteland?

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRISS Single-Object Slitless Spectroscopy	(1) WOLF-437
	2		NIRISS Single-Object Slitless Spectroscopy	(1) WOLF-437

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	3		NIRISS Single-Object Slitless Spectroscopy	(1) WOLF-437

ABSTRACT

Recent JWST transmission spectra observations of the M-dwarf rocky planet GJ 486b have detected a spectral signature attributed to water vapor at 3-sigma confidence. However, given the available wavelength coverage (NIRSpec G395H: 3-5 microns), the water signal could either originate from the planet's atmosphere or unocculted starspots. If an atmosphere is confirmed, this would be the first definitive detection of a secondary atmosphere from a rocky exoplanet and have major implications for JWST's search for atmospheres on potentially habitable planets. If the 700K super-Earth GJ 486b is proven to have a water-rich atmosphere, it would suggest that cooler, habitable-zone planets can also retain or replenish their water reservoirs in the face of significant stellar activity. Water is a crucial ingredient for life to have evolved on Earth and is expected to play a similar role for life on other worlds.

We request three transit observations of GJ 486b using the NIRISS/SOSS instrument mode to definitively resolve the atmosphere-starspot degeneracy for GJ 486b. With only 15.7 hours of charged time, these data could yield the first definitive detection of a water-rich secondary atmosphere. If, however, starspots turn out to be the preferred explanation, we will obtain unprecedented constraints on stellar inhomogeneities for an M-dwarf star. This alternate science outcome would represent a major advance in our knowledge of the physics of M-dwarfs and their surface features. The requested observations would therefore prove transformative for planetary science and/or stellar astrophysics.

OBSERVING DESCRIPTION

We will observe WOLF 437b (GJ 486b) in transit with NIRISS SOSS SUBSTRIP96 for a total of 3 visits covering 0.8 to 2.8 microns. Our observing strategy uses 3 groups per integration based on PandExo simulations. We also use the NIRISS contamination tool to check for nearby sources and select a position angle requirement such that there are no bright stars that could meaningfully degrade our observation.

Target acquisition was simulated with the JWST ETC. We will use the SOSSBRIGHT mode with 5 groups/integration, obtaining an SNR of approximately 130 to ensure the successful acquisition of the host star.

Each visit will be 5.2 hours, covering the transit and sufficient baseline to model the transit following observations as well as accounting for observing overhead. For each visit, we will have 3 groups per integration for 1431 integrations. We will also include a F277W exposure of 3 groups per integration for 10 integrations to identify zeroth order contaminants. Overall, the observations will require a total charged time of 15.7 hours.

Proposal 5866 - Targets - Oceans of Uncertainty: A Veritable Waterworld or a Desolate Wasteland?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	WOLF-437	RA: 12 47 55.5675 (191.9815313d) Dec: +09 44 57.91 (9.74942d) Equinox: J2000	Proper Motion RA: -0.06820279992207054 sec of time/yr Proper Motion Dec: -0.4600339999115022 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanet Systems, Exoplanets, M dwarfs]

Observation

Proposal 5866, Observation 1

Wed Jul 16 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

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)	WOLF-437	RA: 12 47 55.5675 (191.9815313d) Dec: +09 44 57.91 (9.74942d) Equinox: J2000	Proper Motion RA: -0.06820279992207054 sec of time/yr Proper Motion Dec: -0.4600339999115022 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanet Systems, Exoplanets, M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SOSSBRIGHT	F480M	NISRAPID	5	1	1	0.293	155863

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP96	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	NISRAPID	1	1	1	1	4.448	
2	NISRAPID	3	1431	1	1431	12702.243	155863
3	NISRAPID	3	10	1	10	88.765	

Special Requirements

Phase 0.9356 to 0.9640 with period 1.4671214 Days and zero-phase 2459670.58857 HJD
Aperture PA Range 110 to 140 Degrees (V3 109.43873283 to 139.43873283)
Time Series Observation
No Parallel Attachments

Observation

Proposal 5866, Observation 2

Wed Jul 16 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

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
(1)	WOLF-437	RA: 12 47 55.5675 (191.9815313d) Dec: +09 44 57.91 (9.74942d) Equinox: J2000	Proper Motion RA: -0.06820279992207054 sec of time/yr Proper Motion Dec: -0.4600339999115022 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanet Systems, Exoplanets, M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SOSSBRIGHT	F480M	NISRAPID	5	1	1	0.293	155863

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP96	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	NISRAPID	1	1	1	1	4.448	
2	NISRAPID	3	1431	1	1431	12702.243	155863
3	NISRAPID	3	10	1	10	88.765	

Special Requirements

Phase 0.9356 to 0.9640 with period 1.4671214 Days and zero-phase 2459670.58857 HJD
Aperture PA Range 110 to 140 Degrees (V3 109.43873283 to 139.43873283)
Time Series Observation
No Parallel Attachments

Observation

Proposal 5866, Observation 3

Wed Jul 16 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	WOLF-437	RA: 12 47 55.5675 (191.9815313d) Dec: +09 44 57.91 (9.74942d) Equinox: J2000	Proper Motion RA: -0.06820279992207054 sec of time/yr Proper Motion Dec: -0.4600339999115022 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanet Systems, Exoplanets, M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SOSSBRIGHT	F480M	NISRAPID	5	1	1	0.293	155863

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP96	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	NISRAPID	1	1	1	1	4.448	
2	NISRAPID	3	1431	1	1431	12702.243	155863
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Special Requirements

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Time Series Observation
No Parallel Attachments