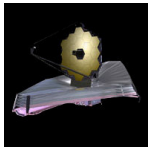

2084 - Is it raining lava in the evening on 55 Cancri e?

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	Even occultation	NIRCam Grism Time Series	(1) 55CNC
	2	Odd occultation	NIRCam Grism Time Series	(1) 55CNC
	3	Even occultation	NIRCam Grism Time Series	(1) 55CNC
	4	Odd occultation	NIRCam Grism Time Series	(1) 55CNC

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	5	Repeat Obs 4 - Odd occultation	NIRCam Grism Time Series	(1) 55CNC

ABSTRACT

The nearby hot super-Earth planet 55 Cancri e shows variable occultation depths, i.e. variable amounts of dayside emission. The origin of these variations could lie in several phenomena, intrinsically dependent on the planetary atmospheric properties or surface features. We aim to identify the origin of this variation, and specifically test whether it originates from different sides of the planet being visible due to a 3:2 spin-orbit resonance. Even for an atmosphereless ``bare rock", this asynchronous rotation would produce a magma pool and mineral vapors over the day side that depend on the local surface conditions, giving rise to variability. If the surface is dominated by silicates, as is likely for a hot rocky planet, the extreme temperatures of the day side would produce detectable amounts of SiO gas from the vaporization of SiO2 in the morning that subsequently rains out and recrystallizes back to SiO2 in the evening. If the planet is in a 3:2 spin-orbit resonance, every second occultation would show the same face of the planet with the emission highly correlated. The planet could also be covered by a massive atmosphere that provides the thermal inertia, even in the case that the variability is unrelated to asynchronous rotation, to explain the observed redistribution of heat. Spectral features, potentially variable, may then be detected. We thus aim to answer the following questions: 1) Is there a massive atmosphere or is it essentially a bare rock with vaporized SiO? 2) If a bare rock, can the variability be explained by asynchronous rotation? This will help us understand the origin and nature of hot super-Earths, of which 55 Cnc e is the best representative.

OBSERVING DESCRIPTION

We propose to observe four occultations of the hot super-Earth 55 Cancri e using a grism time series with NIRCam+F444W. This is the only mode that is not saturated by this very bright naked-eye star.

Since we want to test the hypothesis that the planet shows alternate sides between each occultation, we put time constraints to observe 2 ``even" occultations and 2 ``odd", so that both sides of the planet get observed. Moreover, since the surface features can be expected to only be semi-stable, we want to observe all occultations close in time, within two weeks to avoid the surface changing too much. Hence we put additional constraints on the time between the first and last visit. This should not be too difficult to schedule since the orbital period is only 0.74 days.

Proposal 2084 - Targets - Is it raining lava in the evening on 55 Cancri e?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	55CNC	RA: 08 52 35.2410 (133.1468375d) Dec: +28 19 47.34 (28.32982d) Equinox: J2000	Proper Motion RA: -0.03679884480833323 sec of time/yr Proper Motion Dec: -0.2336509999622649 arcsec/yr Parallax: 0.079" 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, G subdwarfs]
Extended=NO

Observation

Proposal 2084, Observation 1: Even occultation Tue Nov 29 23:01:59 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRCam Grism Time Series

Comments: Acquisition S/N ~ 350

The defined period for the phase constraint is twice the orbital period in order to distinguish between even and odd occultations (at phase 0.25 and 0.75, respectively, while transits happen at phases 0 and 0.5).

There is a bright nearby (4.2') star 53 Cnc, but it is separated enough to not contaminate our data.

Diagnostics

(Even occultation (Obs 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): Data Excess over lower threshold

(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)	55CNC	RA: 08 52 35.2410 (133.1468375d) Dec: +28 19 47.34 (28.32982d) Equinox: J2000	Proper Motion RA: -0.03679884480833323 sec of time/yr Proper Motion Dec: -0.2336509999622649 arcsec/yr Parallax: 0.079" 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, G subdwarfs]
Extended=NO

Acquisition

#	Target	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SUB32TATSGRISM	F405N+F444W	RAPID	3	1	1	0.062	63816

Template

Subarray	No. of Output Channels
SUBGRISM64	4

Spectral Elements

#	Short Pupil+Filter	Long Pupil+Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	CLEAR+WLP4	GRISMR+F444W	RAPID	2	16100	1	16100	16533.895	63429

Special Requirements	
	Phase 0.17041 to 0.19897 with period 1.47308920 Days and zero-phase 2458932.56274 HJD Time Series Observation No Parallel Attachments Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 2084, Observation 2: Odd occultation Tue Nov 29 23:01:59 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRCam Grism Time Series

Comments: Acquisition S/N ~ 350

The defined period for the phase constraint is twice the orbital period in order to distinguish between even and odd occultations (at phase 0.25 and 0.75, respectively, while transits happen at phases 0 and 0.5).

There is a bright nearby (4.2') star 53 Cnc, but it is separated enough to not contaminate our data.

Diagnostics

(Odd occultation (Obs 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): Data Excess over lower threshold

(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)	55CNC	RA: 08 52 35.2410 (133.1468375d) Dec: +28 19 47.34 (28.32982d) Equinox: J2000	Proper Motion RA: -0.03679884480833323 sec of time/yr Proper Motion Dec: -0.2336509999622649 arcsec/yr Parallax: 0.079" 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, G subdwarfs]
Extended=NO

Acquisition

#	Target	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SUB32TATSGRISM	F405N+F444W	RAPID	3	1	1	0.062	63816

Template

Subarray	No. of Output Channels
SUBGRISM64	4

Spectral Elements

#	Short Pupil+Filter	Long Pupil+Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	CLEAR+WLP4	GRISMR+F444W	RAPID	2	16100	1	16100	16533.895	63429

Proposal 2084 - Observation 2 - Is it raining lava in the evening on 55 Cancri e?

Special Requirements	
	Phase 0.67041 to 0.69897 with period 1.47308920 Days and zero-phase 2458932.56274 HJD Time Series Observation No Parallel Attachments Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 2084, Observation 3: Even occultation Tue Nov 29 23:01:59 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRCam Grism Time Series

Comments: Acquisition S/N ~ 350

The defined period for the phase constraint is twice the orbital period in order to distinguish between even and odd occultations (at phase 0.25 and 0.75, respectively, while transits happen at phases 0 and 0.5).

There is a bright nearby (4.2') star 53 Cnc, but it is separated enough to not contaminate our data.

Diagnostics

(Even occultation (Obs 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): Data Excess over lower threshold

(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)	55CNC	RA: 08 52 35.2410 (133.1468375d) Dec: +28 19 47.34 (28.32982d) Equinox: J2000	Proper Motion RA: -0.03679884480833323 sec of time/yr Proper Motion Dec: -0.2336509999622649 arcsec/yr Parallax: 0.079" 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, G subdwarfs]
Extended=NO

Acquisition

#	Target	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SUB32TATSGRISM	F405N+F444W	RAPID	3	1	1	0.062	63816

Template

Subarray	No. of Output Channels
SUBGRISM64	4

Spectral Elements

#	Short Pupil+Filter	Long Pupil+Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	CLEAR+WLP4	GRISMR+F444W	RAPID	2	16100	1	16100	16533.895	63429

Special Requirements	
	Phase 0.17041 to 0.19897 with period 1.47308920 Days and zero-phase 2458932.56274 HJD Time Series Observation No Parallel Attachments Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 2084, Observation 4: Odd occultation Tue Nov 29 23:01:59 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRCam Grism Time Series

Comments: Acquisition S/N ~ 350

The defined period for the phase constraint is twice the orbital period in order to distinguish between even and odd occultations (at phase 0.25 and 0.75, respectively, while transits happen at phases 0 and 0.5).

There is a bright nearby (4.2') star 53 Cnc, but it is separated enough to not contaminate our data.

Diagnostics

(Odd occultation (Obs 4)) 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 4:1) Warning (Form): Data Excess over lower threshold

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	55CNC	RA: 08 52 35.2410 (133.1468375d) Dec: +28 19 47.34 (28.32982d) Equinox: J2000	Proper Motion RA: -0.03679884480833323 sec of time/yr Proper Motion Dec: -0.2336509999622649 arcsec/yr Parallax: 0.079" 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, G subdwarfs]
Extended=NO

Acquisition

#	Target	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SUB32TATSGRISM	F405N+F444W	RAPID	3	1	1	0.062	63816

Template

Subarray	No. of Output Channels
SUBGRISM64	4

Spectral Elements

#	Short Pupil+Filter	Long Pupil+Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	CLEAR+WLP4	GRISMR+F444W	RAPID	2	16100	1	16100	16533.895	63429

Proposal 2084 - Observation 4 - Is it raining lava in the evening on 55 Cancri e?

Special Requirements	
	Phase 0.67041 to 0.69897 with period 1.47308920 Days and zero-phase 2458932.56274 HJD Time Series Observation No Parallel Attachments Group Observations 1, 2, 3, 4 within 14 Days

Observation

Proposal 2084, Observation 5: Repeat Obs 4 - Odd occultation Tue Nov 29 23:01:59 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRCam Grism Time Series

Comments: Acquisition S/N ~ 350

The defined period for the phase constraint is twice the orbital period in order to distinguish between even and odd occultations (at phase 0.25 and 0.75, respectively, while transits happen at phases 0 and 0.5).

There is a bright nearby (4.2') star 53 Cnc, but it is separated enough to not contaminate our data.

Diagnostics

(Repeat Obs 4 - Odd occultation (Obs 5)) 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 5:1) Warning (Form): Data Excess over lower threshold

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	55CNC	RA: 08 52 35.2410 (133.1468375d) Dec: +28 19 47.34 (28.32982d) Equinox: J2000	Proper Motion RA: -0.03679884480833323 sec of time/yr Proper Motion Dec: -0.2336509999622649 arcsec/yr Parallax: 0.079" 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, G subdwarfs]
Extended=NO

Acquisition

#	Target	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	SUB32TATSGRISM	F405N+F444W	RAPID	3	1	1	0.062	63816

Template

Subarray	No. of Output Channels
SUBGRISM64	4

Spectral Elements

#	Short Pupil+Filter	Long Pupil+Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	CLEAR+WLP4	GRISMR+F444W	RAPID	2	16100	1	16100	16533.895	63429

Proposal 2084 - Observation 5 - Is it raining lava in the evening on 55 Cancri e?

Special Requirements	
	Phase 0.67041 to 0.69897 with period 1.47308920 Days and zero-phase 2458932.56274 HJD Time Series Observation No Parallel Attachments