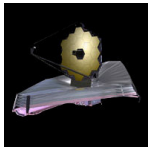

1741 - Solid-state water inside the snowline in planet-forming disks: exploring the origin of water on terrestrial planets

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRSpec IFU Spectroscopy	(1) S216-0939
	3		MIRI Medium Resolution Spectroscopy	(1) S216-0939
	4		NIRSpec IFU Spectroscopy	(2) 132-1832
	5		MIRI Medium Resolution Spectroscopy	(2) 132-1832
	6	Copy of Observation 1	NIRSpec IFU Spectroscopy	(1) S216-0939
	7	Copy of Observation 4	NIRSpec IFU Spectroscopy	(2) 132-1832

ABSTRACT

The importance of water in our everyday life as well as in biochemical processes on Earth is undeniable. Water is also one of the main molecular species in different astrophysical environments, such as prestellar cores, protostellar envelopes, planet-forming disks, and planetary atmospheres, and

it is evidently required for the formation of life as we know it. Understanding the role of water in planet formation and the chemistry of protoplanetary disks and its delivery to rocky planets is a key requirement to understand the atmospheric composition of planets and the origins of life on Earth and, potentially, extrasolar planets.

The main goal of our proposal is to understand if water can be present in the solid state inside the snowline in planet-forming disks. Very recent laboratory experiments indicate that water ice can be trapped as part of a silicate/ice compound and thus survive in solid form beyond the sublimation temperature. A detection of trapped water and an estimation of its abundance will reinforce the wet scenario of the origin of water on Earth and terrestrial planets. A detection of silicate spectral bands will allow us to determine the silicate/trapped water mass ratio and to estimate the possible amount of water in building blocks of the planets.

An associated goal of the proposal is to search for minor bands of complex organic molecules and organic compounds to reveal the chemical complexity of planet-forming disks. These complex species may be present together with trapped water in building blocks of rocky planets inside the snowline. Their detection will critically advance our understanding of the origin of prebiotic molecules and life on Earth.

OBSERVING DESCRIPTION

This proposal aims at observing 2 edge-on protoplanetary disks in Orion (S216-0939 and 132-1832) with the IFUs of NIRSPEC and MIRI. The NIRSPEC observations use the medium resolution settings G235M/F170LP and G395M/F290LP to cover the 2 to 5 micron wavelength range, and especially to seamlessly cover the full extent of the water ice feature between 2.7 and 3.5 micron. As the targets are expected to be slightly extended at the shortest wavelengths of NIRSPEC we use a 4-point dither. Given the IFU size we apply a target acquisition for the NIRSPEC observations on 2 nearby stars to make sure our targets are properly centered on the image slicer. We use nearby stars with good-quality GAIA information for the TA as the target itself is moderately extended. As the IFU size of MIRI is large enough, no TA is needed. The MIRI/MRS observations are done for all 3 grating settings so the entire wavelength range between 5 and 28 mircrons is continuously covered. In the MIRI range we are especially interested in the silicate absorption features at 10 and 18 microns, as well as several faint absorption signals of complex organic molecule ices, mainly in the 5-10 micron range. For the MIRI observations we apply a 4 point dither, to get a proper spatial and wavelength sampling. At the longer wavelengths the sources are expected to be compact, meaning the background can be estimated from the observations itself and no additional off-pointing is required.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	S216-0939	RA: 05 35 21.5763 (83.8399012d) Dec: -05 09 38.84 (-5.16079d) Equinox: J2000	Proper Motion RA: 3.306738217859502E-5 sec of time/yr Proper Motion Dec: -0.0011080000149377156 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the target selector and retrieved from the SIMBAD database. *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(2)	132-1832	RA: 05 35 13.2400 (83.8051667d) Dec: -05 18 32.95 (-5.30915d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the target selector and retrieved from the SIMBAD database. *Category=Star* *Description=[Protoplanetary disks]* *Extended=NO*				
(4)	OW94-139-1853	RA: 05 35 13.8937 (83.8078904d) Dec: -05 18 53.15 (-5.31476d) Equinox: J2000	Proper Motion RA: -1.146 mas/yr Proper Motion Dec: 2.461 mas/yr Parallax: 0.0028817" Epoch of Position: 2015.5	
Comments: This is the close-by reference star for target acquisition for the target 132-1832, around 22.5 arcsec away from the science target. *coordinates, proper motion and parallax taken from GAIA DR2 (source identifier 3017366777749532160)* *G = 17.1698 mag* *I = 15.883 mag* *J = 13.517 mag* *H = 12.053 mag* *Ks = 11.480 mag* *Category=Star* *Description=[M stars]* *Extended=NO*				
(5)	V357-ORI	RA: 05 35 21.5800 (83.8399167d) Dec: -05 09 49.69 (-5.16380d) Equinox: J2000	Proper Motion RA: 0.682 mas/yr Proper Motion Dec: -0.436 mas/yr Parallax: 0.0025974" Epoch of Position: 2015.5	
Comments: This is the close-by reference star for target acquisition for the target s216-0939, around 10.9 arcsec away from the science target. *coordinates, proper motion and parallax taken from GAIA DR2 (source identifier 3209527737731263232O)* *G = 16.0789 mag* *I = 14.590 mag* *J = 13.148 mag* *H = 12.27 mag* *Ks = 11.670 mag* *Category=Star* *Description=[M stars]* *Extended=NO*				

Observation

Proposal 1741, Observation 1 Sat Sep 23 00:00:32 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: Added a leakcal obserrvation to the NIRSPEC IFU observations. Dropped the PA constraint as we nnow have a leakcal observation to correct for possible contamination from bright nearby emisison sources. This also increases the scheduling window, making it possible to acoid scheduling this obsevation in the micro-meteorite avoidance zone.

Diagnostics

(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)	S216-0939	RA: 05 35 21.5763 (83.8399012d) Dec: -05 09 38.84 (-5.16079d) Equinox: J2000	Proper Motion RA: 3.306738217859502E-5 sec of time/yr Proper Motion Dec: -0.0011080000149377156 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	5 V357-ORI	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	58638

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G235M/F170LP	NRSIRS2RAPID	8	2	false	true	NONE	4	8	1050.4	58638
2	G235M/F170LP	NRSIRS2RAPID	8	2	true	true	NONE	4	8	1050.4	
3	G395M/F290LP	NRSIRS2RAPID	8	2	false	true	NONE	4	8	1050.4	58638
4	G395M/F290LP	NRSIRS2RAPID	8	2	true	true	NONE	4	8	1050.4	

Special Requirements

Aperture PA Range 330.97253418 to 70.97253418 Degrees (V3 192.0 to 292.0)

Observation

Proposal 1741, Observation 3 Sat Sep 23 00:00:32 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(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)	S216-0939	RA: 05 35 21.5763 (83.8399012d) Dec: -05 09 38.84 (-5.16079d) Equinox: J2000	Proper Motion RA: 3.306738217859502E-5 sec of time/yr Proper Motion Dec: -0.0011080000149377156 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
F1000W	All MRS	NO	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	LONG(C)	MRSLONG		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
1	LONG(C)	MRSSHORT		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
2	MEDIUM(B)	MRSLONG		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
2	MEDIUM(B)	MRSSHORT		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
3	SHORT(A)	MRSLONG		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638
3	SHORT(A)	MRSSHORT		FASTR1	100	1	1	Dither 1	4	4	1110.016	58638

Observation

Proposal 1741, Observation 4 Sat Sep 23 00:00:32 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: Added a leakcal obserrvation to the NIRSPEC IFU observations. Dropped the PA constraint as we nnow have a leakcal observation to correct for possible contamination from bright nearby emisison sources. This also increases the scheduling window, making it possible to acoid scheduling this obsevation in the micro-meteorite avoidance zone.

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	132-1832	RA: 05 35 13.2400 (83.8051667d) Dec: -05 18 32.95 (-5.30915d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4 OW94-139-1853	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	58638

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G235M/F170LP	NRSIRS2RAPID	25	2	false	true	NONE	4	8	3034.489	58638
2	G235M/F170LP	NRSIRS2RAPID	25	2	true	true	NONE	4	8	3034.489	
3	G395M/F290LP	NRSIRS2RAPID	16	2	false	true	NONE	4	8	1984.089	58638
4	G395M/F290LP	NRSIRS2RAPID	16	2	true	true	NONE	4	8	1984.089	

Special Requirements

Aperture PA Range 323.97253418 to 200.97253418 Degrees (V3 185.0 to 62.0)

Observation

Proposal 1741, Observation 5 Sat Sep 23 00:00:32 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	132-1832	RA: 05 35 13.2400 (83.8051667d) Dec: -05 18 32.95 (-5.30915d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
F1000W	All MRS	NO	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	LONG(C)	MRSLONG		SLOWR1	23	2	1	Dither 1	4	8	4491.305	82442
1	LONG(C)	MRSSHORT		SLOWR1	23	2	1	Dither 1	4	8	4491.305	82442
2	MEDIUM(B)	MRSLONG		SLOWR1	23	2	1	Dither 1	4	8	4491.305	82442
2	MEDIUM(B)	MRSSHORT		SLOWR1	23	2	1	Dither 1	4	8	4491.305	82442
3	SHORT(A)	MRSLONG		SLOWR1	23	2	1	Dither 1	4	8	4491.305	82442
3	SHORT(A)	MRSSHORT		SLOWR1	23	2	1	Dither 1	4	8	4491.305	82442

Observation

Proposal 1741, Observation 6: Copy of Observation 1 Sat Sep 23 00:00:32 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: Added a leakcal obserrvation to the NIRSPEC IFU observations. Dropped the PA constraint as we nnow have a leakcal observation to correct for possible contamination from bright nearby emisison sources. This also increases the scheduling window, making it possible to acoid scheduling this obsevation in the micro-meteorite avoidance zone.

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 6:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	S216-0939	RA: 05 35 21.5763 (83.8399012d) Dec: -05 09 38.84 (-5.16079d) Equinox: J2000	Proper Motion RA: 3.306738217859502E-5 sec of time/yr Proper Motion Dec: -0.0011080000149377156 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	5 V357-ORI	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	58638

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G235M/F170LP	NRSIRS2RAPID	8	2	false	true	NONE	4	8	1050.4	58638
2	G235M/F170LP	NRSIRS2RAPID	8	2	true	true	NONE	4	8	1050.4	
3	G395M/F290LP	NRSIRS2RAPID	8	2	false	true	NONE	4	8	1050.4	58638
4	G395M/F290LP	NRSIRS2RAPID	8	2	true	true	NONE	4	8	1050.4	

Special Requirements

Aperture PA Range 330.97253418 to 70.97253418 Degrees (V3 192.0 to 292.0)

Observation

Proposal 1741, Observation 7: Copy of Observation 4 Sat Sep 23 00:00:32 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: Added a leakcal obserrvation to the NIRSPEC IFU observations. Dropped the PA constraint as we nnow have a leakcal observation to correct for possible contamination from bright nearby emisison sources. This also increases the scheduling window, making it possible to acoid scheduling this obsevation in the micro-meteorite avoidance zone.

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 7:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	132-1832	RA: 05 35 13.2400 (83.8051667d) Dec: -05 18 32.95 (-5.30915d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the target selector and retrieved from the SIMBAD database.
Category=Star
Description=[Protoplanetary disks]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4 OW94-139-1853	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	58638

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G235M/F170LP	NRSIRS2RAPID	25	2	false	true	NONE	4	8	3034.489	58638
2	G235M/F170LP	NRSIRS2RAPID	25	2	true	true	NONE	4	8	3034.489	
3	G395M/F290LP	NRSIRS2RAPID	16	2	false	true	NONE	4	8	1984.089	58638
4	G395M/F290LP	NRSIRS2RAPID	16	2	true	true	NONE	4	8	1984.089	

Special Requirements

Aperture PA Range 323.97253418 to 200.97253418 Degrees (V3 185.0 to 62.0)