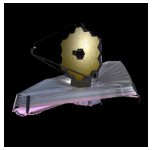

3436 - Unmixing the ISM: Identifying Dominant Physical Effects with JWST/MIRI Mapping of M33

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Erik Rosolowsky (PI) (CSA Member)	**University of Alberta**
Dr. Adam Leroy (CoI) (US Admin CoI)	The Ohio State University
Prof. Ralf Stephan Klessen (CoI) (ESA Member)	Universitat Heidelberg
Dr. Mattia Carlo Sormani (CoI) (ESA Member)	Universitat Heidelberg
Dr. Thomas Williams (CoI) (ESA Member)	University of Oxford
Dr. Simon Glover (CoI) (ESA Member)	Universitat Heidelberg
Dr. Eric Koch (CoI)	Smithsonian Institution Astrophysical Observatory
Mr. Joshua Caleb William Peltonen (CoI) (CSA Member)	University of Alberta
Dr. Jennifer Donovan Meyer (CoI)	Associated Universities, Inc.
Noe Brucy (CoI) (ESA Member)	Universitat Heidelberg

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	2		MIRI Imaging	(2) M33-Off
Observation 1 Mosaic Group				
	1		MIRI Imaging	(1) M-33
	11	Observation 1 Copy of Tile-7	MIRI Imaging	(3) M-33-Tile-7

ABSTRACT

We propose to use JWST/MIRI mapping of the nearby disk galaxy M33 to obtain a high resolution map of the neutral ISM as traced by PAH emission. The proposed map will yield a ~1 pc resolution top-down perspective on the neutral interstellar medium (ISM) spanning 4 scale lengths of the galaxy disk and three distinct galactic environments. We will compare these high quality JWST maps to mock observations from state-of-the-art high resolution simulations with a known range and variation of physical conditions. This comparison will use validated statistical measures that will allow us to determine the best matching physical conditions to different parts of the true ISM, thereby determining the dominant physical effects regulating ISM structure. Our data will also localize phases of molecular gas invisible in CO emission, make unbiased maps of the filamentary structures that regulate star formation, and connect feedback driven bubbles and shells to individual high mass stars and young clusters identified in archival HST data. The coordinated parallel observations will map out a different PAH transition at 3.35 μm to measure changes in PAH ionization and measure the brightest regions at even higher (0.2 pc) linear resolution.

OBSERVING DESCRIPTION

We will observe a radial strip in M33 in M33 consisting of 18 mosaic tiles in F770W to detect diffuse PAH emission with a linear resolution of ~1 pc. The mosaic is oriented at a PA between 70 and 80 degrees to avoid the micrometeoroid zone while allowing 1 month of schedulability. We also observe NIRCam Module B in a coordinated parallel. We configure the shift between mosaic tiles in the MIRI mosaic so that the NIRCam observations overlap with part of the MIRI mosaic yielding F200W and F335M imaging in the overlap.

Finally, we propose observations of a single MIRI field off the galaxy to establish the background level for the observations. This field is scheduled with the main observations as a non-interruptible sequence.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-33	RA: 01 33 49.9007 (23.4579196d) Dec: +30 48 24.30 (30.80675d) Equinox: J2000	Proper Motion RA: 5.479301949670298E-5 sec of time/yr Proper Motion Dec: 8.269999999999999E-4 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Disk galaxies]* *Extended=YES*				
(2)	M33-Off	RA: 01 32 23.0500 (23.0960417d) Dec: +30 40 44.10 (30.67892d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[Galaxy disks, Spiral galaxies]*				
(3)	M-33-Tile-7	RA: 01 33 48.9672 (23.4540300d) Dec: +30 51 14.36 (30.85399d) Equinox: J2000	Proper Motion RA: 5.479301949670298E-5 sec of time/yr Proper Motion Dec: 8.269999999999999E-4 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Disk galaxies]* *Extended=YES*				

Observation

Proposal 3436, Observation 2 Tue Jan 23 18:00:16 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Coordinated Parallel Template(s): NIRCam Imaging

Diagnostics

(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)	M33-Off	RA: 01 32 23.0500 (23.0960417d) Dec: +30 40 44.10 (30.67892d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Galaxy disks, Spiral galaxies]

Template

MIRI Imaging	NIRCam Imaging
Subarray: FULL	Module: B Subarray: FULL Target Placement: Module Gap

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-POINT-MIRI-F770W-WITH-NIRCam								DEFAULT

Spectral Elements

MIRI Imaging	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	25	2	1	Dither 1	4	8	566.108	140690

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F335M	MEDIUM2	2	1	4	4	515.365	

Special Requirements	
	Aperture PA Range 70 to 80 Degrees (V3 65.16455103 to 75.16455103) No Parallel Attachments Group Observations 1, 2, Non-interruptible

Observation

Proposal 3436, Observation 1 Tue Jan 23 18:00:16 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Coordinated Parallel Template(s): NIRCam Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:9) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:10) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:11) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:12) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:13) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:14) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:15) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:16) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:17) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 1:18) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-33	RA: 01 33 49.9007 (23.4579196d) Dec: +30 48 24.30 (30.80675d) Equinox: J2000	Proper Motion RA: 5.479301949670298E-5 sec of time/yr Proper Motion Dec: 8.269999999999999E-4 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Disk galaxies]
Extended=YES

Template

MIRI Imaging	NIRCam Imaging
Subarray: FULL	Module: B Subarray: FULL Target Placement: Module Gap

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
1	18	10.0	10.0	0.0	-12.0	DEFAULT

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-POINT-MIRI-F770W-WITH-NIRCam								DEFAULT

Spectral Elements

MIRI Imaging	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	25	2	1	Dither 1	4	8	566.108	140690

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F335M	BRIGHT1	7	1	4	4	558.312	

Special Requirements

Group Visits within 53.0 Days
Aperture PA Range 70 to 80 Degrees (V3 65.16455103 to 75.16455103)
Visits Same PA
No Parallel Attachments

Group Observations 1, 2, Non-interruptible

Observation

Proposal 3436, Observation 11: Observation 1 Copy of Tile-7 Tue Jan 23 18:00:16 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Coordinated Parallel Template(s): NIRCam Imaging

Diagnostics

(Visit 11:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	M-33-Tile-7	RA: 01 33 48.9672 (23.4540300d) Dec: +30 51 14.36 (30.85399d) Equinox: J2000	Proper Motion RA: 5.479301949670298E-5 sec of time/yr Proper Motion Dec: 8.269999999999999E-4 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Disk galaxies]
Extended=YES

Template

MIRI Imaging	NIRCam Imaging
Subarray: FULL	Module: B Subarray: FULL Target Placement: Module Gap

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-POINT-MIRI-F770W-WITH-NIRCam								DEFAULT

Spectral Elements

MIRI Imaging	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	25	2	1	Dither 1	4	8	566.108	140690

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F150W	F335M	BRIGHT1	7	1	4	4	558.312	

Special Requirements	
	Aperture PA Range 73.6353 to 73.6353 Degrees (V3 68.79985103 to 68.79985103) No Parallel Attachments