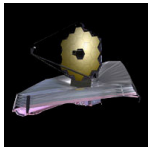

2662 - NGC 602 in the SMC, as seen by Webb – progressive star formation under extraordinary conditions?

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	NIRCam	NIRCam Imaging	(1) NGC-602
	4	MIRI	MIRI Imaging	(1) NGC-602
	6	MIRI-background	MIRI Imaging	(2) MIRI-background

ABSTRACT

NGC 602 is an extraordinarily interesting young star cluster, because it is located in a very low-density, low-metallicity region in the SMC Bridge, but still has formed a remarkable content of stars (10^3 Solar masses), and hosts multiple OB stars, similar to Orion. Spitzer observations have revealed a number of Young Stellar Objects (YSOs) embedded in the surrounding gas and dust ridges, but the Spitzer spatial resolution did not allow for a direct comparison with existing Hubble images. We are proposing to exploit NIRCam and MIRI's exquisite sensitivity and resolution to a) conduct a census of the YSOs in the cluster region, b) establish if the central OB stars are driving star formation (SF) into the surrounding HII region, and c) probe how the OB winds influence the disk-bearing population of pre-main-sequence (PMS) stars found by Hubble.

Only the unprecedented sensitivity and resolution of Webb will allow us, for the first time, to observe ALL YSOs down to 1 Solar mass and to characterize protoplanetary disks of PMS stars down to the hydrogen-burning limit, in a cluster outside the Milky Way (MW).
We will investigate how efficiently stars continue to form in the surrounding gas and dust cloud, which might lead to an extended period of SF even after the main cluster has started to disperse. We will study how protoplanetary disks around low-mass stars evolve in close proximity to the OB stars in a low-metallicity environment, where winds are less powerful than in our own Galaxy. By comparing the results with similar clusters in the MW, we will add crucial information to the current debate on how star and cluster formation is affected by local environmental conditions.

OBSERVING DESCRIPTION

The goal of this proposal is to discover and characterize the young stellar objects (YSOs) emerging in the gas and dust ridges surrounding the star cluster NGC 602 in the Small Magellanic Cloud (SMC). We will investigate, if the central OB stars are driving star formation into the surrounding HII region, and probe how the OB winds influence the disk-bearing pre-main-sequence stars found by Hubble. We are proposing to use NIRCam and MIRI's exquisite sensitivity and resolution to:
a) conduct a census of the YSOs in the cluster region
b) establish whether the central OB stars are driving star formation into the surrounding HII region, and
c) probe how the OB winds influence the disk-bearing population of pre-main-sequence stars found by Hubble.

We propose to observe the gas and dust ridges using NIRCam and MIRI to detect and characterize all YSOs down to one Solar mass and to probe the PMS stars down to the hydrogen-burning limit. The existing HST photometry and 8 NIRCam filters: F115W, F140M, F150W, F210M, F277W, F335M, F356W, F480M, and 5 MIRI filters: F770W, F1000W, F1130W, F1500W, F2550W will trace key features in the objects' spectral energy distribution like the stellar photosphere, PAHs, and silicate dust and water ice bands. This provides the necessary information to identify, characterize, and determine the evolutionary stage of the YSOs; it will also distinguish the reddest objects from background galaxies and evolved SMC field stars.

The NIRCam observations will be executed with MIRI in parallel to estimate the background contamination in our primary observations. No NIRCam parallels are need and the background contamination will be estimated from the primary observations due its larger field of view.

These observations will be taken with a 2x2 NIRCam mosaic with a 3-POINT-WITH-MIRI-F770W sub-pixel dither pattern. The mosaic substitutes the primary dithers. The MIRI observations will be executed with a 2x2 mosaic with a 4-POINT-SETS dither pattern to cover the full extent of the young star cluster NGC 602.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC-602	RA: 01 29 28.9630 (22.3706792d) Dec: -73 33 41.82 (-73.56162d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Stellar Cluster* *Description=[Young star clusters]*				
(2)	MIRI-background	RA: 01 31 33.7600 (22.8906667d) Dec: -73 35 15.80 (-73.58772d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: *Category=Stellar Cluster* *Description=[Young star clusters]*				

Observation

Proposal 2662, Observation 1: NIRCam Tue May 30 13:01:36 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Background Observations:[]

Comments: We request that the NIRCam observations will be observed within a position angle (PA) range of 150 – 220 degrees to properly cover the gas and dust cloud, where we expect the young stellar objects (YSOs) to emerge. To observe the pre-main sequence (PMS) stars of the cluster center down to the hydrogen-burning limit, the region with the highest number (9) of dither positions has to be centered on NGC 602. An offset of -75 arcsec in X and -1.9 arcsec in Y is needed.

To increase the scheduling flexibility, the symmetry of the NIRCam mosaic also allows to center NGC 602 with an offset of 99 arcsec in X and -2.3 arcsec in Y. To ensure again that the gas and dust cloud is properly covered a PA range of 330 – 40 degrees is needed. MIRI's PA need to be offset between -96 and -74 degrees relative to the NIRCam PA to allow for a proper overlap. All science goals will be reached.

Diagnostics

(NIRCam (Obs 1)) Warning (Form): Target requiring background exposure selected for template that doesn't require background exposure

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

(Visit 1:2) Warning (Form): Data Excess over lower threshold

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

(Visit 1:1) 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.

(Visit 1:2) 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)	NGC-602	RA: 01 29 28.9630 (22.3706792d) Dec: -73 33 41.82 (-73.56162d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Stellar Cluster
Description=[Young star clusters]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	2	60.0	84.0	5.0	5.0	DEFAULT

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		3

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F140M	F335M	BRIGHT2	5	1	3	3	322.103	
2	F210M	F480M	BRIGHT2	5	1	3	3	322.103	
3	F115W	F277W	BRIGHT2	5	1	3	3	322.103	
4	F150W	F356W	BRIGHT2	5	1	3	3	322.103	

Special Requirements	
	Group Visits within 53.0 Days Aperture PA Range 150 to 220 Degrees (V3 150.0713531 to 220.0713531) Visits Same PA Offset 63.6965176329404 arcsec, -0.9336057080339513 arcsec Aperture PA Offset 4 from 1 by 84 to 106 Degrees (V3 79.09319793 to 101.09319793)

Observation

Proposal 2662, Observation 4: MIRI Tue May 30 13:01:36 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Background Observations:[]

Comments: The PA of the MIRI and NIRCam observations need to be linked to, maximize the spatial overlap of both mosaics. Therefore, MIRI's PA need to be offset between 84 and 106 degrees relative to the NIRCam PA.

To increase the scheduling flexibility, the symmetry of the NIRCam mosaic also allows to center NGC 602 with an offset of 99 arcsec in X and -2.3 arcsec in Y. To ensure again that the gas and dust cloud is properly covered a NIRCam PA range of 330 – 40 degrees is needed. In this case MIRI's PA need to be offset between -96 and -74 degrees relative to the NIRCam PA to allow for a proper overlap.

Diagnostics

(MIRI (Obs 4)) Warning (Form): Target requiring background exposure selected for template that doesn't require background exposure

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

(Visit 4:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 4:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.

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

(MIRI (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC-602	RA: 01 29 28.9630 (22.3706792d) Dec: -73 33 41.82 (-73.56162d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Stellar Cluster
Description=[Young star clusters]

Template

Subarray
FULL

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	2	10.0	10.0	0.0	0.0	DEFAULT

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	4		5	1			DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	30	1	1	Dither 1	4	4	333.005	
2	F1000W	FASTR1	30	1	1	Dither 1	4	4	333.005	
3	F1130W	FASTR1	40	1	1	Dither 1	4	4	444.006	
4	F1500W	FASTR1	30	1	1	Dither 1	4	4	333.005	
5	F2550W	FASTR1	20	4	1	Dither 1	4	16	921.313	

Special Requirements	
	Group Visits within 53.0 Days Visits Same PA Offset -0.3769439347588941 arcsec, 2.4212274384340122 arcsec Group Observations 4, 6, Non-interruptible Aperture PA Offset 4 from 1 by 84 to 106 Degrees (V3 79.09319793 to 101.09319793)

Observation

Proposal 2662, Observation 6: MIRI-background Tue May 30 13:01:36 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Background Observation For: [MIRI (Obs 4)]

Comments: The PA of the MIRI and NIRCam observations need to be linked to, maximize the spatial overlap of both mosaics. Therefore, MIRI's PA need to be offset between 84 and 106 degrees relative to the NIRCam PA.

To increase the scheduling flexibility, the symmetry of the NIRCam mosaic also allows to center NGC 602 with an offset of 99 arcsec in X and -2.3 arcsec in Y. To ensure again that the gas and dust cloud is properly covered a NIRCam PA range of 330 – 40 degrees is needed. In this case MIRI's PA need to be offset between -96 and -74 degrees relative to the NIRCam PA to allow for a proper overlap.

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	MIRI-background	RA: 01 31 33.7600 (22.8906667d) Dec: -73 35 15.80 (-73.58772d) Equinox: J2000	Epoch of Position: 2015.5	

Comments:
Category=Stellar Cluster
Description=[Young star clusters]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	4		5	1			DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F770W	FASTR1	30	1	1	Dither 1	4	4	333.005	
2	F1000W	FASTR1	30	1	1	Dither 1	4	4	333.005	
3	F1130W	FASTR1	40	1	1	Dither 1	4	4	444.006	
4	F1500W	FASTR1	30	1	1	Dither 1	4	4	333.005	
5	F2550W	FASTR1	20	4	1	Dither 1	4	16	921.313	

Special Requirements

Group Observations 4, 6, Non-interruptible