



## 2092 - Unveiling stellar birth in a cosmologically common cradle

Cycle: 1, Proposal Category: GO

### INVESTIGATORS

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Dr. Christoph Federrath (CoI)	Australian National University

### OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Obs. Cloud E/F-Center				
	2	NIRCam Cloud E/F	NIRCam Imaging	(1) CLOUDEF-CENTER
	4	MIRI Cloud E/F	MIRI Imaging	(1) CLOUDEF-CENTER

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
	8	MIRI Cloud E/F Secondary	MIRI Imaging	(1) CLOUDEF-CENTER
Obs. Cloud E/F-Reference				
	5	NIRCam Cloud E/F - Reference	NIRCam Imaging	(2) CLOUDEF-REFERENCE
	6	MIRI Cloud E/F - Reference	MIRI Imaging	(2) CLOUDEF-REFERENCE

## ABSTRACT

We will use the unparalleled sensitivity, resolution and wavelength coverage of JWST to perform a complete census of the embedded protostellar population down to 0.1 Lsun in the most massive, dense and quiescent molecular gas cloud in the Galaxy with unambiguous signs of very early star formation. Lying in the Central Molecular Zone of the Galaxy with 1 to 2 orders of magnitude higher gas density, temperature and pressure than regions in the disk, the cloud's properties are similar to the global gas conditions in galaxies at the peak of the cosmic star formation rate density ( $z = 1 - 3$ ), so represent more cosmologically "typical" conditions for star and planet formation/evolution than Solar neighbourhood clouds. Combined with ALMA data, the JWST observations will enable us to determine how these initial conditions affect the formation and subsequent evolution of protostellar systems, and thereby answer fundamental open questions related to the universality of star formation laws/relations and the dependence on environment of protostellar formation and evolution.

## OBSERVING DESCRIPTION

Relatively straightforward mosaicing observations with NIRCam and MIRI, with dithers and other parameters optimized to deliver a relatively homogeneous coverage with limited overheads. The observations also target a separate "control field" that is used to characterize the populations of foreground and background stars onto which our targets are imposed.

Proposal 2092 - Targets - Unveiling stellar birth in a cosmologically common cradle

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	CLOUDEF-CENTER	RA: 17 46 44.6000 (266.6858333d) Dec: -28 31 3.00 (-28.51750d) Equinox: J2000  <i>Comments:</i> <i>Category=Stellar Cluster</i> <i>Description=[Protoclusters, Young star clusters]</i>		
(2)	CLOUDEF-REFERENCE	RA: 17 45 51.8123 (266.4658846d) Dec: -28 29 3.18 (-28.48422d) Equinox: J2000  <i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Telescope/sky background]</i>			

Proposal 2092 - Observation 2 - Unveiling stellar birth in a cosmologically common cradle

Wed Apr 19 18:01:05 GMT 2023

<b>Observation</b>	<b>Proposal 2092, Observation 2: NIRCam Cloud E/F</b> <b>Diagnostic Status: Warning</b> Observing Template: NIRCam Imaging									
	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 2:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Diagnosics</b>										
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>		<b>Miscellaneous</b>		
	(1)	CLOUDEF-CENTER	RA: 17 46 44.6000 (266.6858333d) Dec: -28 31 3.00 (-28.51750d) Equinox: J2000							
<i>Comments:</i> Category=Stellar Cluster Description=[Protoclusters, Young star clusters]										
<b>Template</b>	<b>Module</b>			<b>Subarray</b>			<b>Target Placement</b>			
	ALL			FULL			Module Gap			
<b>Mosaic</b>	<b>Rows</b>	<b>Columns</b>	<b>Row Overlap %</b>	<b>Column Overlap %</b>	<b>Row shift</b>	<b>Column shift</b>	<b>Tile Order</b>			
	2	1	10.0	10.0	0.0	0.0	DEFAULT			
<b>Dithers</b>	<b>#</b>	<b>Primary Dither Type</b>		<b>Primary Dithers</b>	<b>Subpixel Dither Type</b>		<b>Dither Size</b>	<b>Subpixel Positions</b>		
	1	FULLBOX		4TIGHT	SMALL-GRID-DITHER			2		
<b>Spectral Elements</b>	<b>#</b>	<b>Short Filter</b>	<b>Long Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Dithers</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F162M+F150W2	F360M	BRIGHT1	5	1	8	8	773.047	
	2	F210M	F480M	BRIGHT1	5	1	8	8	773.047	
<b>Special Requirements</b>	Group Visits within 53.0 Days Visits Same PA									
	V3 PA Offset 4 from 2 by 0 to 20 Degrees (Aperture 4.90680207 to 24.90680207)									

Proposal 2092 - Observation 4 - Unveiling stellar birth in a cosmologically common cradle

Wed Apr 19 18:01:05 GMT 2023

<b>Observation</b>	<b>Proposal 2092, Observation 4: MIRI Cloud E/F</b> <b>Diagnostic Status: Warning</b> Observing Template: MIRI Imaging									
	<b>Diagnostics</b>	(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.										
(Visit 4:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:9) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:10) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:11) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:12) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:13) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:14) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:15) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
(Visit 4:14) 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.										
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>			
	(1)	CLOUDEF-CENTER	RA: 17 46 44.6000 (266.6858333d) Dec: -28 31 3.00 (-28.51750d) Equinox: J2000							
<i>Comments:</i> Category=Stellar Cluster Description=[Protoclusters, Young star clusters]										
<b>Template</b>	<b>Subarray</b>									
	FULL									
<b>Mosaic</b>	<b>Rows</b>	<b>Columns</b>	<b>Row Overlap %</b>	<b>Column Overlap %</b>	<b>Row shift</b>	<b>Column shift</b>	<b>Tile Order</b>			
	3	5	10.0	17.0	0.0	0.0	DEFAULT			
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>	<b>Starting Point</b>	<b>Number of Points</b>	<b>Points</b>	<b>Starting Set</b>	<b>Number of Sets</b>	<b>Optimized For</b>	<b>Direction</b>	<b>Pattern Size</b>
	1	4-Point-Sets	1	4		5	1	POINT SOURCE	POSITIVE	DEFAULT

Proposal 2092 - Observation 4 - Unveiling stellar birth in a cosmologically common cradle

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	5	15	1	Dither 1	4	60	987.914
	2	F2100W	FASTR1	5	3	1	Dither 1	4	12	188.703	
Special Requirements	<p>Group Visits within 53.0 Days                      Visits Same PA                      Visit Splitting Distance 60 Arcsec</p> <p>V3 PA Offset 4 from 2 by 0 to 20 Degrees (Aperture 4.90680207 to 24.90680207)</p>										

Proposal 2092 - Observation 8 - Unveiling stellar birth in a cosmologically common cradle

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<b>Observation</b>	<p><b>Proposal 2092, Observation 8: MIRI Cloud E/F Secondary</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Imaging</p>										
<b>Diagnostics</b>	<p>(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 8:1) 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.</p>										
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>		<b>Miscellaneous</b>			
	(1)	CLOUDEF-CENTER	RA: 17 46 44.6000 (266.6858333d) Dec: -28 31 3.00 (-28.51750d) Equinox: J2000								
	<p><i>Comments:</i>  <i>Category=Stellar Cluster</i>  <i>Description=[Protoclusters, Young star clusters]</i></p>										
<b>Template</b>	<p><b>Subarray</b> FULL</p>										
<b>Mosaic</b>	<b>Rows</b>	<b>Columns</b>	<b>Row Overlap %</b>	<b>Column Overlap %</b>	<b>Row shift</b>	<b>Column shift</b>	<b>Tile Order</b>				
	3	5	10.0	17.0	0.0	0.0	HILBERT_CURVE				
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>	<b>Starting Point</b>	<b>Number of Points</b>	<b>Points</b>	<b>Starting Set</b>	<b>Number of Sets</b>	<b>Optimized For</b>	<b>Direction</b>	<b>Pattern Size</b>	
	1	4-Point-Sets	1	4	5	1	1	POINT SOURCE	POSITIVE	DEFAULT	
<b>Spectral Elements</b>	<b>#</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Dither</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F770W	FASTR1	5	15	1	Dither 1	4	60	987.914	
	2	F2100W	FASTR1	5	3	1	Dither 1	4	12	188.703	
<b>Special Requirements</b>	<p>Aperture PA Range 276.96870897 to 276.96870897 Degrees (V3 272.13326 to 272.13326)</p> <p>Visit Splitting Distance 60 Arcsec</p>										

Proposal 2092 - Observation 5 - Unveiling stellar birth in a cosmologically common cradle

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<b>Observation</b>	<p><b>Proposal 2092, Observation 5: NIRCam Cloud E/F - Reference</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: NIRCam Imaging</p>									
<b>Diagnostics</b>	(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>		<b>Targ. Coord. Corrections</b>			<b>Miscellaneous</b>		
	(2)	CLOUDEF-REFERENCE	RA: 17 45 51.8123 (266.4658846d) Dec: -28 29 3.18 (-28.48422d) Equinox: J2000							
	<p><i>Comments:</i>  <i>Category=Calibration</i>  <i>Description=[Telescope/sky background]</i></p>									
<b>Template</b>	<b>Module</b>		<b>Subarray</b>			<b>Target Placement</b>				
	ALL		FULL			Module Gap				
<b>Dithers</b>	<b>#</b>	<b>Primary Dither Type</b>		<b>Primary Dithers</b>	<b>Subpixel Dither Type</b>		<b>Dither Size</b>	<b>Subpixel Positions</b>		
	1	FULLBOX		4TIGHT	SMALL-GRID-DITHER			2		
<b>Spectral Elements</b>	<b>#</b>	<b>Short Filter</b>	<b>Long Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Total Integrations</b>	<b>Total Dithers</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F162M+F150W2	F360M	BRIGHT1	5	1	8	8	773.047	
	2	F210M	F480M	BRIGHT1	5	1	8	8	773.047	
<b>Special Requirements</b>	V3 PA Offset 6 from 5 by 0 to 20 Degrees (Aperture 4.90680207 to 24.90680207)									

Proposal 2092 - Observation 6 - Unveiling stellar birth in a cosmologically common cradle

Wed Apr 19 18:01:05 GMT 2023

<b>Observation</b>	<b>Proposal 2092, Observation 6: MIRI Cloud E/F - Reference</b> <b>Diagnostic Status: Warning</b> Observing Template: MIRI Imaging										
	(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 6:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
<b>Diagnosics</b>											
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>			<b>Targ. Coord. Corrections</b>		<b>Miscellaneous</b>			
	(2)	CLOUDEF-REFERENCE	RA: 17 45 51.8123 (266.4658846d) Dec: -28 29 3.18 (-28.48422d) Equinox: J2000								
<i>Comments:</i> <i>Category=Calibration</i> <i>Description=[Telescope/sky background]</i>											
<b>Template</b>	<b>Subarray</b>										
	FULL										
<b>Mosaic</b>	<b>Rows</b>	<b>Columns</b>	<b>Row Overlap %</b>	<b>Column Overlap %</b>	<b>Row shift</b>	<b>Column shift</b>	<b>Tile Order</b>				
	2	2	10.0	17.0	0.0	0.0	DEFAULT				
<b>Dithers</b>	<b>#</b>	<b>Dither Type</b>	<b>Starting Point</b>	<b>Number of Points</b>	<b>Points</b>	<b>Starting Set</b>	<b>Number of Sets</b>	<b>Optimized For</b>	<b>Direction</b>	<b>Pattern Size</b>	
	1	4-Point-Sets	1	4		5	1	POINT SOURCE	POSITIVE	DEFAULT	
<b>Spectral Elements</b>	<b>#</b>	<b>Filter</b>	<b>Readout Pattern</b>	<b>Groups/Int</b>	<b>Integrations/Exp</b>	<b>Exposures/Dith</b>	<b>Dither</b>	<b>Total Dithers</b>	<b>Total Integrations</b>	<b>Total Exposure Time</b>	<b>ETC Wkbk.Calc ID</b>
	1	F770W	FASTR1	5	15	1	Dither 1	4	60	987.914	
	2	F2100W	FASTR1	5	3	1	Dither 1	4	12	188.703	
<b>Special Requirements</b>	Group Visits within 53.0 Days Visits Same PA										
	V3 PA Offset 6 from 5 by 0 to 20 Degrees (Aperture 4.90680207 to 24.90680207)										