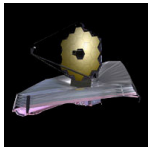

# 12484 - ISM Evolution and Star Formation in M83

Cycle: 4, Proposal Category: GO

**INVESTIGATORS**


| *Name* | *Institution* |
|---|---|
| **Dr. Jin Koda (PI)** | **State University of New York at Stony Brook** |
| Dr. Fumi Egusa (CoI) (CoPI) | University of Tokyo, Institute of Astronomy |
| Dr. Akihiko Hirota (CoI) | National Astronomical Observatory of Japan (NAOJ) |
| Ms. Amanda Lee (CoI) | State University of New York at Stony Brook |


**OBSERVATIONS**

| *Folder* | *Observation* | *Label* | *Observing Template* | *Science Target* |
|---|---|---|---|---|
| Observation Folder | | | | |
| | 1 | M83 | MIRI Imaging | (1) M-83 |
| | 2 | M83-bkg | MIRI Imaging | (2) M-83-BKG |


**ABSTRACT**

We propose a joint VLA HI-21cm (A config) and JWST 21micron imaging across the whole disk of the barred spiral galaxy M83, the closest MW analog. The proposed VLA data, combined with archival VLA+GBT, will achieve a high 4" (87 pc) resolution in HI over the galactic disk. This is needed to isolate HI gas around the individual molecular clouds traced by existing high-resolution CO data. Together with deep Halpha images which trace exposed star formation (SF), JWST 21micron will reveal early, embedded SF before their feedback destroys the natal gas environments. Thus, we can separate and analyze the ISM with and without SF, and the ISM before and after being impacted by stellar feedback. We will investigate the evolution of the ISM and SF with respect to galactic structures and dynamics: the cascade of ISM turbulence from large-scale galactic dynamics (10kpc) to cloud scales (100pc), the prerequisite gas conditions for triggering SF, and the impacts of stellar feedback, in different galactic environments (e.g., the center, bar, spiral arms, inner and outer disk).

**OBSERVING DESCRIPTION**

Mosaic field coverage: Figure 1a (cyan) shows the proposed JWST/MIRI/F2100W 36-point(tile) mosaic footprint on M83. This mosaic entirely covers the whole disk that ALMA will observe (a circular region with a diameter of 9.3 arcmin). One tile has been observed and is in the JWST archive (Fig 1a and 3f). We could use this to reduce the request from 36 to 35 pointings, but it requires a significant constraint on the instrumental position angle (orientation). We thus request the 36 pointings without any constraint (but we can reduce it to 35 if it is recommended). At any orientation, the full disk is within the F2100W coverage.

Filters: We propose observations in F2100W, which is around the wavelength that is proven to trace SF rate quantitatively with the previous studies with the Spitzer Space Telescope at 23micron.

Exposures: We aim at the total exposure of 644s in F2100W in each visit (tile). This is the same as that of the PHANGS-JWST survey, and hence, achieves about the same flux sensitivity and x4 higher luminosity sensitivity (due to the proximity of M83). The impact of the known level of MIRI detector degradation (<18%) is negligible for this program.

Sensitivity: With these exposures, MIRI/F2100W can detect SF down to a single B-type star formation. The Galactic clouds are instructive (Fig. 3a). In the Ophiuchus cloud, the heated clumps (red/yellow) are point sources (the most massive star is B2-type), which are surrounded by the diffuse emission (green). This diffuse emission presumably corresponds to the background in Figure 3f. If we subtract this background from the Ophiuchus clumps and adopt a 25-to-21micron flux conversion (through the total IR luminosity (Boquien et al. 2021, A&A, 653, 149), Ophiuchus would emit ~22 microJy in a F2100W aperture (15pc) at M83. The proposed integration would detect this at 3.5sigma (6.4sigma including the background). More massive SF (>B2-type) will be detected at higher significance. We cannot achieve this sensitivity in more distant galaxies. The above calculation is consistent with recent PHANGS-JWST results after taking into account their x2 farther distances and the decreases in stellar flux from O to B-type stars.

# Proposal 12484 - Targets - ISM Evolution and Star Formation in M83

**Fixed Targets**

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | M-83 | RA: 13 37 0.0337 (204.2501404d)<br>Dec: -29 52 18.13 (-29.87170d)<br>Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

*Please avoid June 18/19, 2026. According to the JWST Backgrounds Tool (JBT), the background level changes by a particularly large amount of ~1.58 MJy/str in 1-day interval, when the median change in the prospective plan window (June 13-July 13, 2026) is 0.45 MJy/str in 1-day.*
*Category=Galaxy*
*Description=[Barred spiral galaxies, Spiral arms, Spiral galaxies]*

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (2) | M-83-BKG | RA: 13 36 28.0222 (204.1167592d)<br>Dec: -29 40 33.15 (-29.67588d)<br>Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: Selected based on Spitzer 24micron, deep Halpha, and GALEX FUV images.*
*Category=Galaxy*
*Description=[Spiral galaxies]*

| | |
|---|---|
| **Observation** | **Proposal 12484, Observation 1: M83** Sat Apr 18 00:00:10 GMT 2026<br>**Diagnostic Status: Warning**<br>Observing Template: MIRI Imaging |
| **Diagnostics** | (Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:9) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:10) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:11) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:12) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:13) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:14) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:15) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:16) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:17) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:18) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:19) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:20) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:21) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:22) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:23) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:24) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:25) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:26) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:27) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:28) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:29) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:30) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:31) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:32) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:33) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:34) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:35) Warning (Form): Overheads are provisional until the Visit Planner has been run.<br>(Visit 1:36) Warning (Form): Overheads are provisional until the Visit Planner has been run. |

## Fixed Targets

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*Category=Galaxy*
*Description=[Barred spiral galaxies, Spiral arms, Spiral galaxies]*

## Template

| Subarray |
|---|
| FULL |

## Mosaic

| Rows | Columns | Row Overlap % | Column Overlap % | Row shift (deg) | Column shift (deg) | Tile Order |
|---|---|---|---|---|---|---|
| 5 | 8 | 10.0 | 10.0 | 0.0 | 0.0 | HILBERT_CURVE |

## Dithers

| # | Dither Type | Starting Point | Number of Points | Points | Starting Set | Number of Sets | Optimized For | Direction | Pattern Size |
|---|---|---|---|---|---|---|---|---|---|
| 1 | CYCLING | 1 | 8 | | 5 | 1 | | | DEFAULT |

## Spectral Elements

| # | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Dither | Total Dithers | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F2100W | FASTR1 | 14 | 2 | 1 | Dither 1 | 8 | 16 | 643.809 | |

## Special Requirements

Group Visits within 53.0 Days
Visits Same PA

Group Observations 1, 2, Non-interruptible

## Observation

**Proposal 12484, Observation 2: M83-bkg** Sat Apr 18 00:00:10 GMT 2026

**Diagnostic Status: Warning**

Observing Template: MIRI 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) | M-83-BKG | RA: 13 36 28.0222 (204.1167592d)<br>Dec: -29 40 33.15 (-29.67588d)<br>Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: Selected based on Spitzer 24micron, deep Halpha, and GALEX FUV images.*
*Category=Galaxy*
*Description=[Spiral galaxies]*

## 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 | 8 | | | | | | DEFAULT |

## Spectral Elements

| # | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Dither | Total Dithers | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F2100W | FASTR1 | 14 | 2 | 1 | Dither 1 | 8 | 16 | 643.809 | |

## Special Requirements

Group Observations 1, 2, Non-interruptible