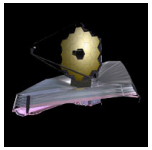

3322 - Determination of the Star-by-Star Elemental Abundance Trends in Nearby Galaxies: Are the Disks Bimodal?

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRCam Imaging	(2) ANDROMEDA-INNER
	3		NIRCam Imaging	(1) ANDROMEDA-OUTER
	5		NIRCam Imaging	(3) TRIANGULUM-INNER
	7		NIRCam Imaging	(4) TRIANGULUM-OUTER

ABSTRACT

The evolution of chemical abundances is driven by the nature of stellar populations and gas mixing processes. Abundances of elements therefore are primary tests of models of galaxy evolution and the operation of the baryon cycle. Cosmic chemical elements fall into two main groups, alpha

elements formed rapidly in core collapse supernovae and the Fe-peak group, primarily from more slowly evolving populations of type I supernovae. We propose to use the unique capabilities of JWST to measure [Fe/H] and [Alpha/Fe] ratios in millions of evolved stars in the galaxies M31 and M33, using a combination of six NIRCam filters. In the Milky Way the origin of the bimodal [Fe/H]-[Alpha/Fe] distribution has yet to be fully described and is not observed in our dwarf satellites. Bimodal [Fe/H]-[Alpha/H] distributions are challenging to simulate in Lambda-CDM models of galaxy evolution. Models require fine tuning, and different approaches do not agree and it is essential to understand if the Galactic situation is unusual. Alpha element abundance distributions in galaxies other than the Milky Way and its satellites are too limited to reliably reveal overall [Fe/H]-[Alpha/Fe] patterns. M31 and M33 are nearby with abundant pre-existing data. They are prime targets for pilot studies to validate our JWST methodology to measure both [Fe/H] and [Alpha/Fe] for individual stars while offering a test on the commonality of bimodal [Fe/H]- [Alpha/Fe] distributions. This novel project will fundamentally advance our ability to apply chemical evolution models to nearby galaxies and thereby also frame the results from detailed Milky Way studies.

OBSERVING DESCRIPTION

We propose to acquire deep JWST-NIRCam imaging in six filters (F070W, F162, F200W, F300M, F356W, F460M), two fields each in two nearby disk galaxies, Andromeda (M31) and Trianglum (M33). The aim would be to deconvolve the effects of [Fe/H], [Alpha/Fe], and age on the resolved stellar populations of these galaxies. The broad band filters are sensitive to age, total metallicity ([M/H] \approx [Fe/H] + 0.75[Alpha/Fe]), and reddening, whereas the medium-band filters are sensitive to the effects of molecular absorption from carbon monoxide and water, and thus of the alpha elements. The resulting data would thus yield information on the alpha enrichment for millions of stars in galaxies signifcantly different than our own Milky Way, the only galaxy for which an alpha bimodality has been measured.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	ANDROMEDA-OUTER	RA: 00 46 11.8000 (11.5491667d) Dec: +42 05 46.00 (42.09611d) Equinox: J2000		
Comments: BRICK19-2P4 *Category=Galaxy* *Description=[Galaxy disks]* *Extended=NO*				
(2)	ANDROMEDA-INNER	RA: 00 44 59.6380 (11.2484917d) Dec: +41 45 46.22 (41.76284d) Equinox: J2000		
Comments: BRICK13-1P5 *Category=Galaxy* *Description=[Galaxy disks]*				
(3)	TRIANGULUM-INNER	RA: 01 33 49.8800 (23.4578333d) Dec: +30 35 48.30 (30.59675d) Equinox: J2000		
Comments: 0p5 *Category=Galaxy* *Description=[Galaxy disks]*				
(4)	TRIANGULUM-OUTER	RA: 01 33 39.7140 (23.4154750d) Dec: +30 29 0.00 (30.48333d) Equinox: J2000		
Comments: 1p5 *Category=Galaxy* *Description=[Galaxy disks]*				

Observation

Proposal 3322, Observation 1

Fri Nov 03 17:04:33 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

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
(2)	ANDROMEDA-INNER	RA: 00 44 59.6380 (11.2484917d) Dec: +41 45 46.22 (41.76284d) Equinox: J2000		

Comments: BRICK13-1P5
Category=Galaxy
Description=[Galaxy disks]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F200W	F356W	BRIGHT2	10	1	4	4	858.942	145113
2	F162M+F150W2	F300M	SHALLOW4	8	1	4	4	1674.936	145113
3	F090W	F460M	DEEP8	8	1	4	4	6356.168	145113

Special Requirements

Aperture PA Range 101.9286469 to 109.9286469 Degrees (V3 102.0 to 110.0)
Aperture PA Range 115.9286469 to 192.9286469 Degrees (V3 116.0 to 193.0)
Aperture PA Range 206.9286469 to 208.9286469 Degrees (V3 207.0 to 209.0)
Aperture PA Range 211.9286469 to 320.9286469 Degrees (V3 212.0 to 321.0)
Aperture PA Range 323.9286469 to 91.9286469 Degrees (V3 324.0 to 92.0)

Observation

Proposal 3322, Observation 3

Fri Nov 03 17:04:33 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

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)	ANDROMEDA-OUTER	RA: 00 46 11.8000 (11.5491667d) Dec: +42 05 46.00 (42.09611d) Equinox: J2000		

Comments: BRICK19-2P4
Category=Galaxy
Description=[Galaxy disks]
Extended=NO

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F200W	F356W	BRIGHT2	9	1	4	4	773.047	61286
2	F162M+F150W2	F300M	SHALLOW4	8	1	4	4	1674.936	61286
3	F090W	F460M	DEEP8	8	1	4	4	6356.168	

Special Requirements

Aperture PA Range 104.9286469 to 108.9286469 Degrees (V3 105.0 to 109.0)
Aperture PA Range 109.9286469 to 195.9286469 Degrees (V3 110.0 to 196.0)
Aperture PA Range 204.9286469 to 213.9286469 Degrees (V3 205.0 to 214.0)
Aperture PA Range 221.9286469 to 257.9286469 Degrees (V3 222.0 to 258.0)
Aperture PA Range 264.9286469 to 318.9286469 Degrees (V3 265.0 to 319.0)
Aperture PA Range 320.9286469 to 94.9286469 Degrees (V3 321.0 to 95.0)

Observation

Proposal 3322, Observation 5

Fri Nov 03 17:04:33 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

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
(3)	TRIANGULUM-INNER	RA: 01 33 49.8800 (23.4578333d) Dec: +30 35 48.30 (30.59675d) Equinox: J2000		

Comments: 0p5
Category=Galaxy
Description=[Galaxy disks]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F200W	F356W	BRIGHT2	10	1	4	4	858.942	61286
2	F162M+F150W2	F300M	SHALLOW4	8	1	4	4	1674.936	61286
3	F090W	F460M	DEEP8	8	1	4	4	6356.168	

Special Requirements

Aperture PA Range 144.9286469 to 178.9286469 Degrees (V3 145.0 to 179.0)
Aperture PA Range 188.9286469 to 196.9286469 Degrees (V3 189.0 to 197.0)
Aperture PA Range 204.9286469 to 221.9286469 Degrees (V3 205.0 to 222.0)
Aperture PA Range 232.9286469 to 233.9286469 Degrees (V3 233.0 to 234.0)
Aperture PA Range 235.9286469 to 238.9286469 Degrees (V3 236.0 to 239.0)
Aperture PA Range 248.9286469 to 270.9286469 Degrees (V3 249.0 to 271.0)
Aperture PA Range 281.9286469 to 284.9286469 Degrees (V3 282.0 to 285.0)
Aperture PA Range 286.9286469 to 290.9286469 Degrees (V3 287.0 to 291.0)
Aperture PA Range 291.9286469 to 311.9286469 Degrees (V3 292.0 to 312.0)
Aperture PA Range 320.9286469 to 114.9286469 Degrees (V3 321.0 to 115.0)

Observation

Proposal 3322, Observation 7

Fri Nov 03 17:04:33 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	TRIANGULUM-OUTER	RA: 01 33 39.7140 (23.4154750d) Dec: +30 29 0.00 (30.48333d) Equinox: J2000		

Comments: 1p5
Category=Galaxy
Description=[Galaxy disks]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		STANDARD		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F200W	F356W	BRIGHT2	10	1	4	4	858.942	61286
2	F162M+F150W2	F300M	SHALLOW4	8	1	4	4	1674.936	61286
3	F090W	F460M	DEEP8	8	1	4	4	6356.168	

Special Requirements

Aperture PA Range 143.9286469 to 178.9286469 Degrees (V3 144.0 to 179.0)
Aperture PA Range 189.9286469 to 193.9286469 Degrees (V3 190.0 to 194.0)
Aperture PA Range 195.9286469 to 196.9286469 Degrees (V3 196.0 to 197.0)
Aperture PA Range 203.9286469 to 221.9286469 Degrees (V3 204.0 to 222.0)
Aperture PA Range 236.9286469 to 237.9286469 Degrees (V3 237.0 to 238.0)
Aperture PA Range 248.9286469 to 271.9286469 Degrees (V3 249.0 to 272.0)
Aperture PA Range 281.9286469 to 284.9286469 Degrees (V3 282.0 to 285.0)
Aperture PA Range 286.9286469 to 311.9286469 Degrees (V3 287.0 to 312.0)
Aperture PA Range 320.9286469 to 331.9286469 Degrees (V3 321.0 to 332.0)
Aperture PA Range 332.9286469 to 114.9286469 Degrees (V3 333.0 to 115.0)