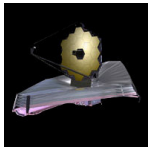

7068 - Surveying Stellar Shenanigans: Exploring M dwarf Flares for Exoplanetary Insights

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
M-dwarf Observations				
	1	3200K M-dwarf	NIRISS Single-Object Slitless Spectroscopy	(1) TIC_261560580
	2	3300K M-dwarf	NIRISS Single-Object Slitless Spectroscopy	(2) TIC_231020638
	3	3500K M-dwarf	NIRISS Single-Object Slitless Spectroscopy	(3) TIC_80427281
	6	3500K M-dwarf	NIRISS Single-Object Slitless Spectroscopy	(3) TIC_80427281
	4	3600K M-dwarf	NIRISS Single-Object Slitless Spectroscopy	(4) TIC_89502706
	5	3700K M-dwarf	NIRISS Single-Object Slitless Spectroscopy	(5) TIC_207140650

ABSTRACT

This proposal presents a legacy campaign to observe stellar flares on M dwarf stars in the near-infrared (NIR) using the James Webb Space Telescope's Near Infrared Imager and Slitless Spectrograph instrument. Exoplanetary transits, eclipses, and phase curves all rely on the stability of

the stellar spectrum over time. However, this stability is disrupted by stellar flares, which alter the star's spectrum in unpredictable ways. To date, there have only been a handful of published NIR spectra of M dwarf flares, despite their crucial role in understanding exoplanetary environments. Given that current models are insufficient for M dwarf stars, it is essential to directly study and model M dwarf stellar flares. By observing 5 active M dwarf stars for 5-10 hours each, our goal is to compile a comprehensive library of NIR stellar flares, totaling over 400 events with energies exceeding 10^{30} erg. This initiative will significantly advance our understanding of M dwarf stars, with implications for transit spectroscopy and stellar physics. Through detailed analysis of flare properties and behavior in the NIR regime, our proposal aims to address critical gaps in our understanding of stellar flare phenomena on M dwarfs, refining existing models and enhancing our ability to interpret exoplanetary spectra in the presence of stellar activity.

OBSERVING DESCRIPTION

We propose continuous observations of five target stars: TIC 261560580, TIC 231020638, TIC 80427281, TIC 89502706, and TIC 207140650. These observations will be done using NIRISS SOSS, each lasting approximately 5-10 hours, totaling 31.2 hours of science time and just under 50 hours of charged time. We employ the SUBSTRIP256 subarray to capture measurements for the Halpha line and utilize the NISRAPID readout pattern. To prevent saturation from potential stellar flares, we adjust the groups per integration to maintain a total well fraction below 0.8. Integration times of 30-60s ensure adequate data resolution during flares, typically lasting under 30 minutes. TIC 26156058 will be observed with 10 groups per integration for a total of 576 integrations. TIC 23102063 will be observed with 4 groups per integration for a total of 1243 integratins. TIC 80427281 will be observed with 5 groups per integrations for a total of 711 integrations. TIC 89502706 will be observed with 5 groups per integrations for a total of 575 integrations. TIC 207140650 will be with 6 groups per integration for a total of 542 integrations. Calculations with the Exoplanet Characterization Toolkit (ExoCTK) confirm no contamination during visibility windows for all five stars observed with NIRISS SOSS. Target acquisition for each star utilizes SOSSFAINT with the NISRAPID readout pattern, taking a negligible 0.56s with 11 groups per integration.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TIC_261560580	RA: 23 17 0.1185 (349.2504938d) Dec: -74 32 9.44 (-74.53596d) Equinox: J2000	Proper Motion RA: 72.999 mas/yr Proper Motion Dec: -70.43500006602699 mas/yr Parallax: 0.022482199999999997" Epoch of Position: 2000	
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[M dwarfs]*		
(2)	TIC_231020638	RA: 01 50 56.9007 (27.7370863d) Dec: -58 44 3.21 (-58.73422d) Equinox: J2000	Proper Motion RA: 93.589 mas/yr Proper Motion Dec: -27.077999925495533 mas/yr Parallax: 0.0220982" Epoch of Position: 2000	
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[M dwarfs]*		
(3)	TIC_80427281	RA: 00 42 10.9234 (10.5455142d) Dec: -42 52 54.55 (-42.88182d) Equinox: J2000	Proper Motion RA: 83.265 mas/yr Proper Motion Dec: -42.63599992100353 mas/yr Parallax: 0.0189205" Epoch of Position: 2000	
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[M dwarfs]*		
(4)	TIC_89502706	RA: 23 47 22.4705 (356.8436271d) Dec: -23 17 17.30 (-23.28814d) Equinox: J2000	Proper Motion RA: 107.272 mas/yr Proper Motion Dec: -13.781999950879253 mas/yr Parallax: 0.0180933" Epoch of Position: 2000	
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[M dwarfs]*		
(5)	TIC_207140650	RA: 02 56 57.6741 (44.2403088d) Dec: -58 21 45.39 (-58.36261d) Equinox: J2000	Proper Motion RA: 39.803 mas/yr Proper Motion Dec: 61.863 mas/yr Parallax: 0.0130957" Epoch of Position: 2000	
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[M dwarfs]*		

Observation

Proposal 7068, Observation 1: 3200K M-dwarf Fri Oct 17 19:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

(3200K M-dwarf (Obs 1)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TIC_261560580	RA: 23 17 0.1185 (349.2504938d) Dec: -74 32 9.44 (-74.53596d) Equinox: J2000	Proper Motion RA: 72.999 mas/yr Proper Motion Dec: -70.43500006602699 mas/yr Parallax: 0.022482199999999997" Epoch of Position: 2000	

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

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	SAME	SOSSFAINT	F480M	NISRAPID	11	1	1	0.566	245787.3

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP256	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	NISRAPID	1	1	1	1	1	11.008	
2	NISRAPID	8	697	1	1	697	34478.137	245787.1
3	NISRAPID	8	10	1	1	10	494.665	245787.16

Special Requirements	
	Aperture PA Range 0 to 53 Degrees (V3 359.43873283 to 52.43873283) Aperture PA Range 207 to 220 Degrees (V3 206.43873283 to 219.43873283) Aperture PA Range 225 to 255 Degrees (V3 224.43873283 to 254.43873283) Aperture PA Range 300 to 305 Degrees (V3 299.43873283 to 304.43873283) Aperture PA Range 313 to 359 Degrees (V3 312.43873283 to 358.43873283) Time Series Observation No Parallel Attachments

Observation

Proposal 7068, Observation 2: 3300K M-dwarf Fri Oct 17 19:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

(3300K M-dwarf (Obs 2)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(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)	TIC_231020638	RA: 01 50 56.9007 (27.7370863d) Dec: -58 44 3.21 (-58.73422d) Equinox: J2000	Proper Motion RA: 93.589 mas/yr Proper Motion Dec: -27.077999925495533 mas/yr Parallax: 0.0220982" Epoch of Position: 2000	

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

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	SAME	SOSSFAINT	F480M	NISRAPID	11	1	1	0.566	245787.6

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP256	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	NISRAPID	1	1	1	1	1	11.008	
2	NISRAPID	3	1553	1	1	1553	34160.533	245787.4
3	NISRAPID	3	10	1	1	10	219.965	245787.17

Special Requirements	
	Aperture PA Range 25 to 35 Degrees (V3 24.43873283 to 34.43873283) Aperture PA Range 208 to 215 Degrees (V3 207.43873283 to 214.43873283) Aperture PA Range 225 to 290 Degrees (V3 224.43873283 to 289.43873283) Aperture PA Range 297 to 310 Degrees (V3 296.43873283 to 309.43873283) Time Series Observation No Parallel Attachments

Observation

Proposal 7068, Observation 3: 3500K M-dwarf Fri Oct 17 19:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

(3500K M-dwarf (Obs 3)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	TIC_80427281	RA: 00 42 10.9234 (10.5455142d) Dec: -42 52 54.55 (-42.88182d) Equinox: J2000	Proper Motion RA: 83.265 mas/yr Proper Motion Dec: -42.63599992100353 mas/yr Parallax: 0.0189205" Epoch of Position: 2000	

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

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	SAME	SOSSFAINT	F480M	NISRAPID	11	1	1	0.566	245787.9

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP256	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	NISRAPID	1	1	1	1	1	11.008	
2	NISRAPID	4	854	1	1	854	23476.87	245787.11
3	NISRAPID	4	10	1	1	10	274.905	245787.18

Special Requirements	
	Aperture PA Range 0 to 7 Degrees (V3 359.43873283 to 6.43873283) Aperture PA Range 29 to 67 Degrees (V3 28.43873283 to 66.43873283) Aperture PA Range 230 to 242 Degrees (V3 229.43873283 to 241.43873283) Aperture PA Range 249 to 315 Degrees (V3 248.43873283 to 314.43873283) Time Series Observation No Parallel Attachments

Observation

Proposal 7068, Observation 6: 3500K M-dwarf Fri Oct 17 19:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

(3500K M-dwarf (Obs 6)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	TIC_80427281	RA: 00 42 10.9234 (10.5455142d) Dec: -42 52 54.55 (-42.88182d) Equinox: J2000	Proper Motion RA: 83.265 mas/yr Proper Motion Dec: -42.63599992100353 mas/yr Parallax: 0.0189205" Epoch of Position: 2000	

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

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	SAME	SOSSFAINT	F480M	NISRAPID	11	1	1	0.566	245787.9

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP256	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	NISRAPID	1	1	1	1	1	11.008	
2	NISRAPID	4	854	1	1	854	23476.87	245787.11
3	NISRAPID	4	10	1	1	10	274.905	245787.18

Special Requirements	
	Aperture PA Range 0 to 7 Degrees (V3 359.43873283 to 6.43873283) Aperture PA Range 29 to 67 Degrees (V3 28.43873283 to 66.43873283) Aperture PA Range 230 to 242 Degrees (V3 229.43873283 to 241.43873283) Aperture PA Range 249 to 315 Degrees (V3 248.43873283 to 314.43873283) Time Series Observation No Parallel Attachments

Observation

Proposal 7068, Observation 4: 3600K M-dwarf Fri Oct 17 19:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

(3600K M-dwarf (Obs 4)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	TIC_89502706	RA: 23 47 22.4705 (356.8436271d) Dec: -23 17 17.30 (-23.28814d) Equinox: J2000	Proper Motion RA: 107.272 mas/yr Proper Motion Dec: -13.781999950879253 mas/yr Parallax: 0.0180933" Epoch of Position: 2000	

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

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	SAME	SOSSFAINT	F480M	NISRAPID	11	1	1	0.566	245787.12

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP256	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	NISRAPID	1	1	1	1	1	11.008	
2	NISRAPID	4	690	1	1	690	18968.431	245787.10
3	NISRAPID	4	10	1	1	10	274.905	245787.19

Special Requirements	
	Aperture PA Range 35 to 75 Degrees (V3 34.43873283 to 74.43873283) Aperture PA Range 238 to 263 Degrees (V3 237.43873283 to 262.43873283) Aperture PA Range 270 to 275 Degrees (V3 269.43873283 to 274.43873283) Aperture PA Range 359 to 360 Degrees (V3 358.43873283 to 359.43873283) Time Series Observation No Parallel Attachments

Observation

Proposal 7068, Observation 5: 3700K M-dwarf Fri Oct 17 19:00:09 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRISS Single-Object Slitless Spectroscopy

Diagnostics

(3700K M-dwarf (Obs 5)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	TIC_207140650	RA: 02 56 57.6741 (44.2403088d) Dec: -58 21 45.39 (-58.36261d) Equinox: J2000	Proper Motion RA: 39.803 mas/yr Proper Motion Dec: 61.863 mas/yr Parallax: 0.0130957" Epoch of Position: 2000	

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

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[M dwarfs]

Acquisition

#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	SAME	SOSSFAINT	F480M	NISRAPID	11	1	1	0.566	245787.15

Template

Subarray	Include Short First Exposure and F277W Exposure?
SUBSTRIP256	true

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	NISRAPID	1	1	1	1	1	11.008	
2	NISRAPID	5	633	1	1	633	20879.176	245787.13
3	NISRAPID	5	10	1	1	10	329.845	245787.20

Special Requirements	
	Aperture PA Range 0 to 12 Degrees (V3 359.43873283 to 11.43873283) Aperture PA Range 20 to 30 Degrees (V3 19.43873283 to 29.43873283) Aperture PA Range 40 to 58 Degrees (V3 39.43873283 to 57.43873283) Aperture PA Range 200 to 257 Degrees (V3 199.43873283 to 256.43873283) Aperture PA Range 262 to 333 Degrees (V3 261.43873283 to 332.43873283) Aperture PA Range 339 to 359 Degrees (V3 338.43873283 to 358.43873283) Time Series Observation No Parallel Attachments