



9938 - A martian origin for olivine-dominated small bodies

Cycle: 5, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
A-Type Asteroids with MIRI MRS				
	6	Eureka MIRI MRS	MIRI Medium Resolution Spectroscopy	(6) Eureka
	2	Asporina MIRI MRS	MIRI Medium Resolution Spectroscopy	(2) ASPORINA
	3	Benkoela MIRI MRS	MIRI Medium Resolution Spectroscopy	(3) BENKOELA
	4	Lick MIRI MRS	MIRI Medium Resolution Spectroscopy	(5) LICK
	5	Bambery MIRI MRS	MIRI Medium Resolution Spectroscopy	(4) BAMBERY

ABSTRACT

The ‘missing mantle problem’ is a long-standing puzzle in studies of the asteroid belt: the prevalence of purported planetesimal mantle material is about an order of magnitude too small relative to the prevalence of core material. Mantles are composed of the mineral olivine, and the A-type asteroids, whose near-IR spectra are dominated by olivine, are the best candidates for this material. About 20% of these are on Mars- associated orbits (e.g. Mars Trojans, Hungarias), and it has been proposed that these objects are fragments of the Martian mantle itself. This raises the possibility that the entire A-type asteroid collection may represent only a few parent bodies, placing constraints on planet formation models. We propose to

JWST Proposal 9938 (Created: Friday, March 13, 2026, 1:01:39PM Eastern Standard Time) - Overview

observe a set of 5 olivine-dominated bodies, including 1 A-type target from each of the Mars-related orbital populations: Mars Trojans, Mars crossing orbits, and Hungarias; as well as 1 sample from each of two compositional sub-types of the A-type asteroids in the main belt. Observations will be made over 5-28 microns with MIRI/MRS to quantify the abundance and type of olivine and the presence of additional minerals. These characteristics will discriminate between candidate compositions, including the martian mantle, planetesimal mantles, and primitive olivine-dominated materials.

OBSERVING DESCRIPTION

We will obtain 5-28 micron spectra of 5 small bodies of olivine-dominated spectral type across Mars-related and main belt populations. The proposed observations use the MIRI/MRS instrument over all spectral channels, in order to determine the surface compositions of these objects, which sheds light on the prevalence and collision rate of large protoplanets in the early solar system.

Proposal 9938 - Targets - A martian origin for olivine-dominated small bodies

Solar System Targets	#	Name	Level 1	Level 2	Level 3	
	(2)	ASPORINA	TYPE=ASTEROID,A=2.693766192251659,E=0.1097 565577069635,I=15.62589985379005 .O=162.3480168220086,W=96.63599040892473,M=1 50.9961854316081,EQUINOX=J2000,EPOCH=26- APR-2016:00:00:00,EpochTimeScale=TDB			
	<i>Comments: Extended=NO</i>					
	(3)	BENKOELA	TYPE=ASTEROID,A=3.202015352476617,E=0.0293 8140890627141,I=25.41220826671265 .O=116.9389185571249,W=96.6008952288897,M=15 8.2281181188316,EQUINOX=J2000,EPOCH=09- APR-2018:00:00:00,EpochTimeScale=TDB			
	<i>Comments: Extended=NO</i>					
	(4)	BAMBERY	TYPE=ASTEROID,A=1.931046965597456,E=0.0924 4852314183208,I=26.11665277926721 .O=134.8057726961427,W=268.0154605061567,M=3 6.31786326643614,EQUINOX=J2000,EPOCH=31- DEC-2018:00:00:00,EpochTimeScale=TDB			
<i>Comments: Extended=NO</i>						
(5)	LICK	TYPE=ASTEROID,A=1.390460031897319,E=0.0615 3691379138989,I=39.09114500554258 .O=130.7463134324211,W=140.4843318569551,M=2 9.07219889460658,EQUINOX=J2000,EPOCH=10- JUN-2018:00:00:00,EpochTimeScale=TDB				
<i>Comments: Extended=NO</i>						
(6)	Eureka	TYPE=ASTEROID,A=1.523568736795099,E=0.0647 0484033684192,I=20.28286194150284 .O=245.0426617608532,W=95.56716385545607,M=7 8.23053280758745,EQUINOX=J2000,EPOCH=12- JUN-2019:00:00:00,EpochTimeScale=TDB				
<i>Comments: Extended=NO</i>						

Proposal 9938 - Observation 6 - A martian origin for olivine-dominated small bodies

Fri Mar 13 18:01:39 GMT 2026

Observation	Proposal 9938, Observation 6: Eureka MIRI MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Eureka MIRI MRS (Obs 6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.												
Diagnosics													
Solar System Targets	#	Name	Level 1				Level 2				Level 3		
	(6)	Eureka	TYPE=ASTEROID,A=1.523568736795099,E=0.0647 0484033684192,I=20.28286194150284 ,O=245.0426617608532,W=95.56716385545607,M=7 8.23053280758745,EQUINOX=J2000,EPOCH=12- JUN-2019:00:00:00,EpochTimeScale=TDB <i>Comments: Extended=NO</i>										
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction		
	F1000W	All MRS				YES			SUB64		Allow Auto Reorder		
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	40	5	1	Dither 1	4	20	69.458	
	1	SHORT(A)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	
	1	SHORT(A)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	225941.1
	2		IMAGER	F560W	FASTR1	40	5	1	Dither 1	4	20	69.458	
	2	MEDIUM(B)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	
	2	MEDIUM(B)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	
	3		IMAGER	F560W	FASTR1	40	5	1	Dither 1	4	20	69.458	
	3	LONG(C)	MRSLONG		FASTR1	40	5	1	Dither 1	4	20	2264.433	225941.2
	3	LONG(C)	MRSSHORT		FASTR1	40	5	1	Dither 1	4	20	2264.433	

Proposal 9938 - Observation 6 - A martian origin for olivine-dominated small bodies

Special Requirements

DEFAULT WINDOW: ANGULAR RATE Eureka FROM JWST LESS THAN 0.075

Proposal 9938 - Observation 2 - A martian origin for olivine-dominated small bodies

Fri Mar 13 18:01:39 GMT 2026

Observation	Proposal 9938, Observation 2: Asporina MIRI MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Asporina MIRI MRS (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.												
Diagnosics													
Solar System Targets	#	Name	Level 1				Level 2				Level 3		
	(2)	ASPORINA	TYPE=ASTEROID,A=2.693766192251659,E=0.1097 565577069635,I=15.62589985379005 ,O=162.3480168220086,W=96.63599040892473,M=1 50.9961854316081,EQUINOX=J2000,EPOCH=26- APR-2016:00:00:00,EpochTimeScale=TDB Comments: Extended=NO										
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction		
	F1000W	All MRS				YES			FULL		Allow Auto Reorder		
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	5	5	1	Dither 1	4	20	321.905	
	1	SHORT(A)	MRSLONG		FASTR1	5	5	1	Dither 1	4	20	321.905	
	1	SHORT(A)	MRSSHORT		FASTR1	5	5	1	Dither 1	4	20	321.905	225941.15
	2		IMAGER	F560W	FASTR1	5	5	1	Dither 1	4	20	321.905	
	2	MEDIUM(B)	MRSLONG		FASTR1	5	5	1	Dither 1	4	20	321.905	
	2	MEDIUM(B)	MRSSHORT		FASTR1	5	5	1	Dither 1	4	20	321.905	
	3		IMAGER	F560W	FASTR1	5	5	1	Dither 1	4	20	321.905	
	3	LONG(C)	MRSLONG		FASTR1	5	5	1	Dither 1	4	20	321.905	225941.16
	3	LONG(C)	MRSSHORT		FASTR1	5	5	1	Dither 1	4	20	321.905	

Proposal 9938 - Observation 2 - A martian origin for olivine-dominated small bodies

Special Requirements

DEFAULT WINDOW: ANGULAR RATE ASPORINA FROM JWST LESS THAN 0.075

Proposal 9938 - Observation 3 - A martian origin for olivine-dominated small bodies

Fri Mar 13 18:01:39 GMT 2026

Observation	Proposal 9938, Observation 3: Benkoela MIRI MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Benkoela MIRI MRS (Obs 3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.												
Diagnosics													
Solar System Targets	#	Name	Level 1				Level 2				Level 3		
	(3)	BENKOELA	TYPE=ASTEROID,A=3.202015352476617,E=0.0293 8140890627141,I=25.41220826671265 ,O=116.9389185571249,W=96.6008952288897,M=15 8.2281181188316,EQUINOX=J2000,EPOCH=09- APR-2018:00:00:00,EpochTimeScale=TDB Comments: Extended=NO										
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction		
	F1000W	All MRS				YES			SUB64		Allow Auto Reorder		
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	40	2	1	Dither 1	4	8	27.579	
	1	SHORT(A)	MRSLONG		FASTR1	40	2	1	Dither 1	4	8	899.113	225941.17
	1	SHORT(A)	MRSSHORT		FASTR1	40	2	1	Dither 1	4	8	899.113	
	2		IMAGER	F560W	FASTR1	40	2	1	Dither 1	4	8	27.579	
	2	MEDIUM(B)	MRSLONG		FASTR1	40	2	1	Dither 1	4	8	899.113	
	2	MEDIUM(B)	MRSSHORT		FASTR1	40	2	1	Dither 1	4	8	899.113	
	3		IMAGER	F560W	FASTR1	40	2	1	Dither 1	4	8	27.579	
	3	LONG(C)	MRSLONG		FASTR1	40	2	1	Dither 1	4	8	899.113	225941.18
	3	LONG(C)	MRSSHORT		FASTR1	40	2	1	Dither 1	4	8	899.113	

Proposal 9938 - Observation 3 - A martian origin for olivine-dominated small bodies

Special Requirements

DEFAULT WINDOW: ANGULAR RATE BENKOELA FROM JWST LESS THAN 0.075

Proposal 9938 - Observation 4 - A martian origin for olivine-dominated small bodies

Fri Mar 13 18:01:39 GMT 2026

Observation	Proposal 9938, Observation 4: Lick MIRI MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Lick MIRI MRS (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.												
Diagnostics													
Solar System Targets	#	Name	Level 1				Level 2				Level 3		
	(5)	LICK	TYPE=ASTEROID,A=1.390460031897319,E=0.0615 3691379138989,I=39.09114500554258 .O=130.7463134324211,W=140.4843318569551,M=2 9.07219889460658,EQUINOX=J2000,EPOCH=10- JUN-2018:00:00:00,EpochTimeScale=TDB										
Comments: Extended=NO													
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging				Imager Subarray		Grating Wheel Direction	
	F1000W	All MRS				YES				FULL		Allow Auto Reorder	
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	10	3	1	Dither 1	4	12	355.205	
	1	SHORT(A)	MRSLONG		FASTR1	10	3	1	Dither 1	4	12	355.205	
	1	SHORT(A)	MRSSHORT		FASTR1	10	3	1	Dither 1	4	12	355.205	225941.7
	2		IMAGER	F560W	FASTR1	10	3	1	Dither 1	4	12	355.205	
	2	MEDIUM(B)	MRSLONG		FASTR1	10	3	1	Dither 1	4	12	355.205	
	2	MEDIUM(B)	MRSSHORT		FASTR1	10	3	1	Dither 1	4	12	355.205	
	3		IMAGER	F560W	FASTR1	10	3	1	Dither 1	4	12	355.205	
	3	LONG(C)	MRSLONG		FASTR1	10	3	1	Dither 1	4	12	355.205	225941.8
	3	LONG(C)	MRSSHORT		FASTR1	10	3	1	Dither 1	4	12	355.205	

Proposal 9938 - Observation 4 - A martian origin for olivine-dominated small bodies

Special Requirements

DEFAULT WINDOW: ANGULAR RATE LICK FROM JWST LESS THAN 0.075

Proposal 9938 - Observation 5 - A martian origin for olivine-dominated small bodies

Fri Mar 13 18:01:39 GMT 2026

Observation	Proposal 9938, Observation 5: Bambery MIRI MRS Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Bambery MIRI MRS (Obs 5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.												
Diagnosics													
Solar System Targets	#	Name	Level 1				Level 2				Level 3		
	(4)	BAMBERY	TYPE=ASTEROID,A=1.931046965597456,E=0.0924 4852314183208,I=26.11665277926721 ,O=134.8057726961427,W=268.0154605061567,M=3 6.31786326643614,EQUINOX=J2000,EPOCH=31- DEC-2018:00:00:00,EpochTimeScale=TDB Comments: Extended=NO										
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray		Grating Wheel Direction		
	F1000W	All MRS				YES			FULL		Allow Auto Reorder		
Dithers	#	Dither Type				Optimized For				Direction			
	1	4-Point				POINT SOURCE				NEGATIVE			
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	30	3	1	Dither 1	4	12	1021.215	
	1	SHORT(A)	MRSLONG		FASTR1	30	3	1	Dither 1	4	12	1021.215	
	1	SHORT(A)	MRSSHORT		FASTR1	30	3	1	Dither 1	4	12	1021.215	225941.11
	2		IMAGER	F560W	FASTR1	30	3	1	Dither 1	4	12	1021.215	
	2	MEDIUM(B)	MRSLONG		FASTR1	30	3	1	Dither 1	4	12	1021.215	
	2	MEDIUM(B)	MRSSHORT		FASTR1	30	3	1	Dither 1	4	12	1021.215	
	3		IMAGER	F560W	FASTR1	30	3	1	Dither 1	4	12	1021.215	
	3	LONG(C)	MRSLONG		FASTR1	30	3	1	Dither 1	4	12	1021.215	225941.12
	3	LONG(C)	MRSSHORT		FASTR1	30	3	1	Dither 1	4	12	1021.215	

Proposal 9938 - Observation 5 - A martian origin for olivine-dominated small bodies

Special Requirements

DEFAULT WINDOW: ANGULAR RATE BAMBERY FROM JWST LESS THAN 0.075