

# 2869 - The interiors of Jupiter Trojans as tracers of Solar System evolution

Cycle: 2, Proposal Category: GO

## **INVESTIGATORS**

Name	Institution
Dr. Michael E Brown (PI)	California Institute of Technology
Dr. Ian Wong (CoI)	NASA Goddard Space Flight Center
Matthew Belyakov (CoI)	California Institute of Technology

#### **OBSERVATIONS**

Folder	Observation	Label	Observing Template	Science Target						
1998SU	52									
	1	1998SU52	NIRSpec IFU Spectroscopy	(1) 1998SU52						
Anchial	Anchialos									
	2	Anchialos	NIRSpec IFU Spectroscopy	(2) ANCHIALOS						
1998RN	<b>1</b> 11									
	3	1998RM11	NIRSpec IFU Spectroscopy	(3) 1988RM11						
2001 C	Γ13									
	4		NIRSpec IFU Spectroscopy	(4) 2001CT13						

## **ABSTRACT**

The Nice models of solar system-wide dynamical instability predict that the Jupiter Trojans should be derived from the same region and thus have the same icy composition as the objects in the Kuiper belt. Spectra have shown no relationship between the surface compositions of these objects (and Cycle 1 spectra have made the differences even more dramatic), but it is plausible that the higher temperatures of the Jupiter Trojans would sufficiently modify Kuiper belt surfaces to make them unrecognizable. We have identified 4 ~20km Jupiter Trojans with albedos elevated above the typical Trojan values. Statistically, this is approximately the number of objects of this size which are expected to have had catastrophic collisions in the past ~100 Myr. These objects are plausibly the largest recent impacts in the Jupiter Trojan population and could retain the spectroscopic

JWST Proposal 2869 (Created: Wednesday, May 10, 2023 at 6:00:54 PM Eastern Standard Time) - Overview signatures of fresh interior materials. We propose a short reconnaissance program designed to measure the surface composition of these objects. Such a program could quickly and definitively establish the connection between the Jupiter Trojans and the Kuiper belt objects, confirming an early dynamical instability in our solar system.

## **OBSERVING DESCRIPTION**

We propose to observe 4 high albedo albedo Jupiter Trojans using NIRSPEC IFU PRISM mode. These objects could be fragments of recent catastrophic impacts in the Trojan clouds and thus retain pristine signatures of interior materials (perhaps explaining their unusal albedos).

All targets have well known position so we use the IFU with no target centering. We target a S/N to allow robust detection of water ice Fresnel features, CO2 ice, and hydrate silicates, if present. The high signal-to-noise across the entire wavelength range will allow us to detect ices, silicates, organics, and other materials that could plausibly be exposed in recent impacts.

Proposal 2869 - Targets - The interiors of Jupiter Trojans as tracers of Solar System evolution

	#	Name	Level 1	Level 2	Level 3
	(1)	1998SU52	TYPE=ASTEROID,A=5.077579803258887,E=0.1077 271763004729,I=2.294929726163167 ,O=284.7866009590653,W=149.2068964473947,M=1 86.4018862942164,EQUINOX=J2000,EPOCH=15- MAY-2017:00:00:00,EpochTimeScale=TDB		
۱.,	Comments:	· Extended=NO			
m Targets	(2)	ANCHIALOS	TYPE=ASTEROID,A=5.181122544230447,E=0.0394 5570479469644,I=10.61603602785205 ,O=311.4104099568912,W=147.35055240962,M=176. 6376357578446,EQUINOX=J2000,EPOCH=30-OCT- 2016:00:00:00,EpochTimeScale=TDB		
stei	Comments:	Extended=NO			
Solar Sys	(3)	1988RM11	TYPE=ASTEROID,A=5.156557320233074,E=0.0379 8565135126015,I=3.353432579701592 ,O=140.7011585401921,W=237.0578118710311,M=9 4.78911585902534,EQUINOX=J2000,EPOCH=21- JAN-2016:00:00:00,EpochTimeScale=TDB		
	Comments:	Extended=Unknown			
	(4)	2001CT13	TYPE=ASTEROID,A=5.162165783085905,E=0.0583 317611017318,I=13.99540048133923 ,O=120.1085246895411,W=182.9163546779045,M=3 37.900385600269,EQUINOX=J2000,EPOCH=04-JUN-2017:00:00:00,EpochTimeScale=TDB		
	Comments:	· Extended=Unknown			

<u>Pro</u>	Proposal 2869 - Observation 1 - The interiors of Jupiter Trojans as tracers of Solar System evolution											
		Observation 1: 19									Wed May 10 23	:00:54 GMT 2023
I∵≝	Diagnostic Stat	us: Warning										
Observation	Observing Temp	olate: NIRSpec IFU	J Spectroscopy									
l se												
١ö												
Diagnostics	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
ß	# N	ame	Level	1			Level 2		]	Level 3		
Solar System Targets	(1) 1	998SU52	TYPI	E=ASTEROID,A	=5.0775798032588	87,E=0.1077						
عّا			27170 O=2	53004729,I=2.29 84 78660095906	4929726163167 53,W=149.2068964	473947 M=1						
ľε			86.40	18862942164,EQ	QUINOX=J2000,EP	OCH=15-						
Ē	G	1.1.110	MAY	-2017:00:00:00,1	EpochTimeScale=T	DB						
ڇ٦	Comments: Exte	naea=NO										
<u></u>												
Į												
_	T 1 1 1											
<u>a</u>	TA Method NONE											
밀	NONE											
Template												
	#		Dither Type		Size		Starting Poin	f	Number of Poir	nts.	Points	
Dithers	1		2-POINT-NOD		, SIEC		Starting 1 om	<u> </u>	Trainisci of Lon		Tomes	
ΙĦ												
	#	Grating/Filter	Readout	Groups/Int	Integrations/Ex	Laakcal	Dither	Autocal	Total Dithers	Total	Total Exposure	FTC
Spectral Elements	<i>"</i>	Grating/Fitter	Pattern	Groups/Int	p	LCarcai	Dither	Autocai	Total Ditlicis	Integrations	Time	Wkbk.Calc ID
١٤	1	PRISM/CLEAR	NRSIRS2RAPI	8	1	false	true	NONE	2	2	262.6	
I≗			D									
<u></u>												
ਰਿ												
l a												
-												
nts		IDOW: ANGULA	R RATE 1998SUS	52 FROM JWST	LESS THAN 0.075							
l e												
ē												
Ϊ́Β												
Re l												
<u>=</u> [												
ec.												
Special Requiremen												
	I											

<u>Pro</u>	Proposal 2869 - Observation 2 - The interiors of Jupiter Trojans as tracers of Solar System evolution												
		9, Observation 2: Aı									Wed May 10 23	:00:54 GMT 2023	
Iĕ	Diagnostic S	tatus: Warning											
Observation	Observing Te	mplate: NIRSpec IFU	Spectroscopy										
Se													
lg													
Diagnostics													
छ	#	Name	Level	1			Level 2		]	Level 3			
Solar System Targets	(2)	ANCHIALOS	TYPI	E=ASTEROID,A	=5.1811225442304	47,E=0.0394							
آع ا			5570 <sub>4</sub> .O=3	179469644,I=10. 11.41040995689	61603602785205 12,W=147.3505524	0962.M=176.							
Ē			63763	357578446,EQU	INOX=J2000,EPOC	CH=30-OCT-							
ige	Comments: E	vton do d=NO	2016:	00:00:00,Epocn	ΓimeScale=TDB								
څا	Comments. E	xienaea=NO											
ä													
Ŋ													
_	TA Method												
<u>a</u>	NONE												
[ 문	TOTAL												
Template													
_	#		Dither Type		Size		Starting Poin	t	Number of Poi	nts	Points		
ē	1		2-POINT-NOD		,		, 3						
Dithers													
Spectral Elements	#	Grating/Filter	Readout	Groups/Int	Integrations/Ex	Leakcal	Dither	Autocal	<b>Total Dithers</b>	Total	Total Exposure	ETC	
je l	1	DDICM/CLEAD	Pattern NRSIRS2RAPI	11	<u>p</u> 1	false	tenso	NONE	2	Integrations 2	Time 350.133	Wkbk.Calc ID	
<u>e</u>	1	PRISM/CLEAR	D NKSIKSZKAPI	11	1	raise	true	NONE	2	2	330.133		
IΞ													
<u>ra</u>													
ပ်													
ဇွ													
nts	DEFAULT W	/INDOW: ANGULA	R RATE ANCHIA	LOS FROM JW	ST LESS THAN 0.	075							
e													
l E													
ΙĚ													
6													
2													
ä													
Special Requiremen													
တ													

<u>Pr</u>	Proposal 2869 - Observation 3 - The interiors of Jupiter Trojans as tracers of Solar System evolution												
		Proposal 2869, Observation 3: 19									Wed May 10 23	:00:54 GMT 2023	
Ιij		Diagnostic Status: Warning											
Observation	:	Observing Template: NIRSpec IFU	Spectroscopy										
Ιö	5												
Diagnostics	20100116512												
ts	; ;	# Name	Level	1			Level 2		]	Level 3			
Solar System Targets	(3) 1988RM11 TYPE=ASTEROID,A=5.156557320233074,E=0.0379 8565135126015,I=3.353432579701592 ,O=140.7011585401921,W=237.0578118710311,M=9 4.78911585902534,EQUINOX=J2000,EPOCH=21- JAN-2016:00:00:00,EpochTimeScale=TDB												
Ste	<b>;</b> [,	Comments: Extended=Unknown	0111	2010.00.00.00,2	poenrimeseure 12	-							
જે													
lar	5												
၂ဖွ	3												
ē	?	ΓA Method											
Template		NONE											
ΙĔ													
Dithers	) ;	#	Dither Type		Size		Starting Poin	t	Number of Poir	nts	Points		
1		1	2-POINT-NOD										
Spectral Elements	) ;	# Grating/Filter	Readout Pattern	Groups/Int	Integrations/Ex p	Leakcal	Dither	Autocal	<b>Total Dithers</b>	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
l e	<u> </u>	1 PRISM/CLEAR		8	1	false	true	NONE	2	2	262.6		
	<u> </u>		D										
ctr													
De	2												
-	-												
nts	֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֡֓֓֡֓֡	DEFAULT WINDOW: ANGULAR	R RATE 1988RM	11 FROM JWST	LESS THAN 0.075	5							
	1												
ire	2												
	5												
Re	?												
<u>_e</u>													
ec.													
လ	}												
Special Requirement													
ئے													

<u>Pro</u>	oposal 2869 - Obse	rvation 4 - Th	e interiors	of Jupiter Tr	<u>ojans as</u>	s tracers of S	<u>Solar Syster</u>	<u>m evolution</u>				
	Proposal 2869, Observation									Wed May 10 23	:00:54 GMT 2023	
Ι <del>ặ</del>	Diagnostic Status: Warning											
Observation	Observing Template: NIRSpe	c IFU Spectroscopy										
Se												
١ö												
Diagnostics	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
_												
ts	# Name	Leve	el 1			Level 2		]	Level 3			
Solar System Targets	(4) 2001CT13 TYPE=ASTEROID,A=5.162165783085905,E=0.0583 317611017318,I=13.99540048133923 ,O=120.1085246895411,W=182.9163546779045,M=3 37.900385600269,EQUINOX=J2000,EPOCH=04- JUN-2017:00:00:00,EpochTimeScale=TDB											
ste	Comments: Extended=Unkno		2017.00.00.00,1	spocii i inicseaie– i E	.Б							
<u>S</u>												
<u>a</u>												
၂၀												
_	TA Method											
Template	NONE											
ΙĔ												
Dithers	#	Dither Type		Size		Starting Poin	nt	Number of Poir	nts	Points		
þ	1	2-POINT-NOD	ı									
一吉												
Spectral Elements		Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
ΙĚ	1 PRISM/CL	EAR NRSIRS2RAPI D	12	1	false	true	NONE	2	2	379.311		
🛎		Ъ										
ह्य												
뒪												
۱ĕ												
-	DEFAULT WINDOW: ANG	III AD DATE 2001CT	12 EDOM IWET	TIESS THAN 0.075								
ints		ULAR RATE 2001CT	13 FROM JWS1	LESS THAN 0.073								
ΙĔ												
I≟												
윷												
2												
<u>a</u> .												
Special Requiremen												
Ŋ												