



STScI | SPACE TELESCOPE
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

S&OC Update

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JSTUC Meeting, March, 18th-19th 2024



Summary

- JWST continues to produce spectacular science results across all fields of astronomy. More than 600 research papers based on JWST data have been published since the beginning of science operations in July 2022. More than 400 papers were published in 2023.
- Overall the observatory image quality is excellent; every other day Wavefront Front Sensing is used to monitor the wavefront error.
- The observatory should be in the MAZ no more than 20% of the time (goal 15%). Thanks to careful scheduling we are meeting that constraint for Cycle 2 observations
- Cycle 1 and 2 programs are 96% and 35% complete, respectively. Cycle 3 programs are being processed
- Cycle 2 pure parallel programs have used more than 85% of their assigned hours
- We generally have 10 hours DSN availability per day, sufficient to manage science. DSN availability limitations are managed by the scheduling team. Upcoming challenges: Artemis mission.
- During Cycle 2 the observatory typically spent close to 60% of the time executing prime science and calibration exposures (i.e. detector time) and less than 5% of the time on failed visits
- Good progress on approved enhancements, but work remains
- Throughout the presentation, and after the meeting, please ask any question and provide feedback/thoughts/ideas on specific topics: what are the concerns the community shares with you?

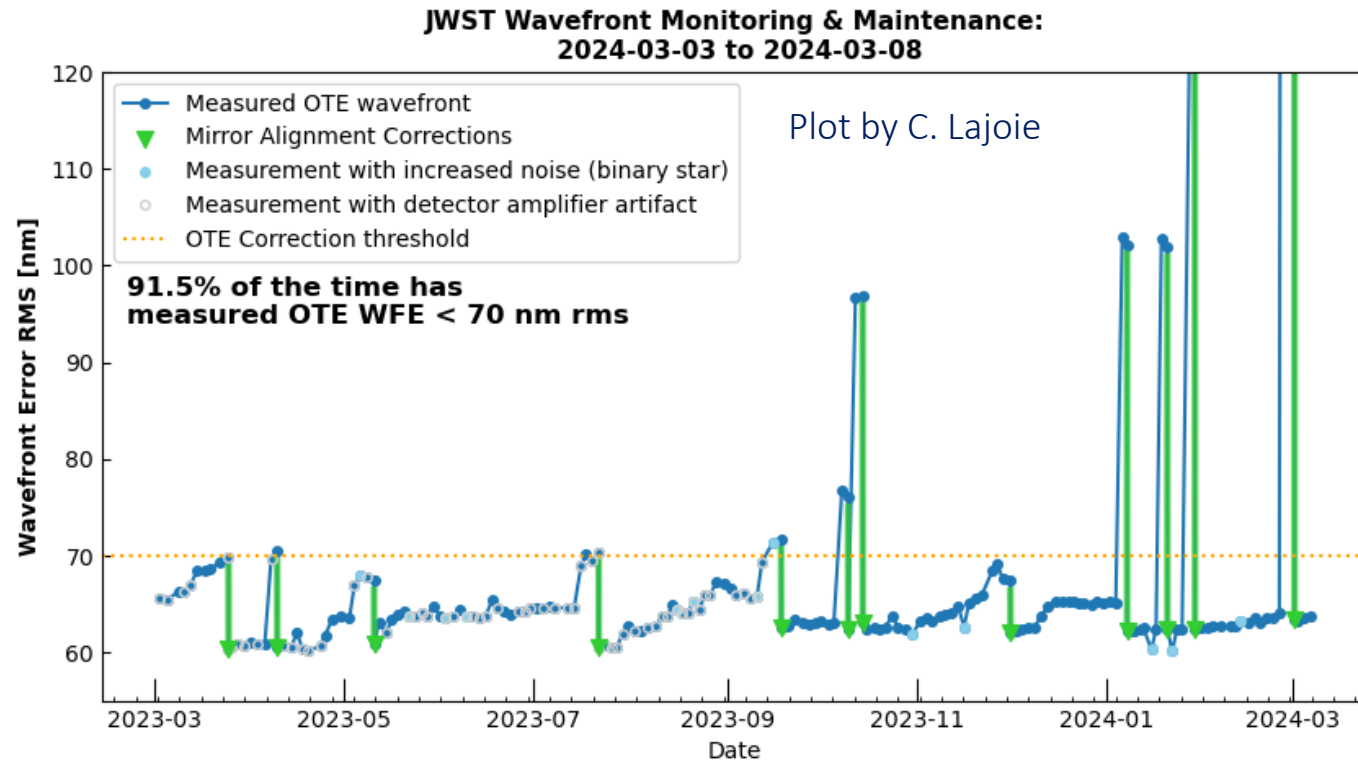


Science and Operations Center in Cycle 2

- In normal operations, the S&OC operates JWST, including:
 - Performing observatory maintenance, health and safety
 - Managing daily contacts via the Deep Space Network
 - Executing WFS&C visits every two days
 - Scheduling and execution of the approved science programs
 - Instruments calibration and trending (see SI presentations)
 - Processing through the calibration pipeline (see D. Law's presentation)
 - Making necessary improvements to scheduling, operations, pipeline, and archive
 - Managing anomalies
- Supporting calls for proposals (upcoming Cycle 4) and facilitating the TAC process
- User support:
 - Helpdesk, proposal reviews via contact scientist, training (JWebinars), JWST Office Hours
- We are continuously working on improving communication with the community and seek their feedback to understand their most pressing needs (see S. Bright's presentation)
 - User Survey, helpdesk, presence at AAS and other large conferences
 - Open communication via JWST observer news items and email "blasts"
- Engaging the public in JWST science results via the Office of Public Outreach



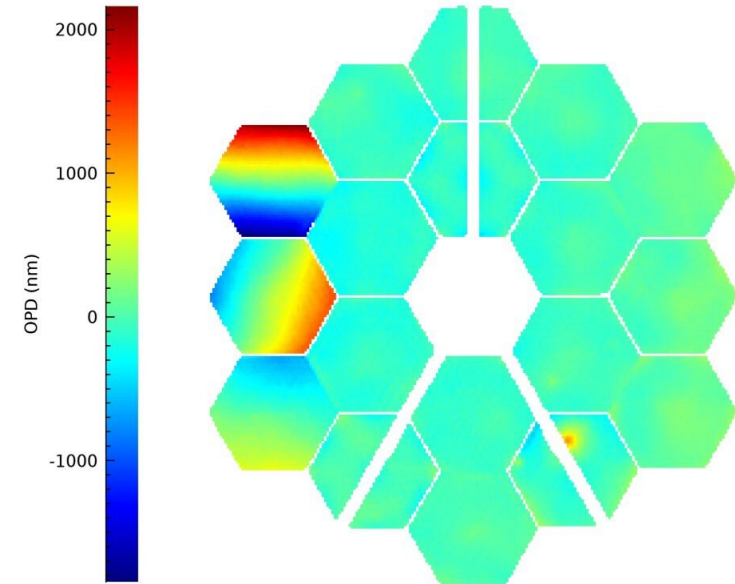
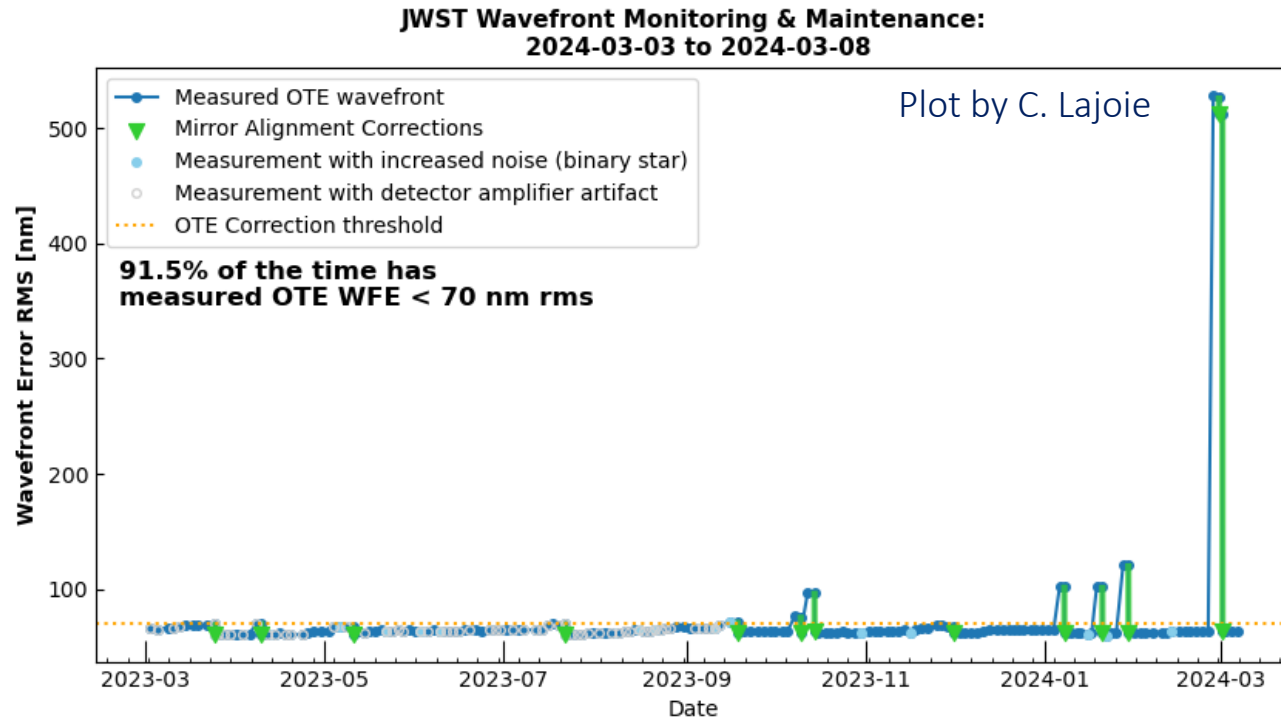
JWST image quality is excellent, with recent brief excursions



- Every two days Wavefront Front Sensing is used to monitor the wavefront error.
- OTE WFE has remained below our correction threshold about 92% of the time over the last year.



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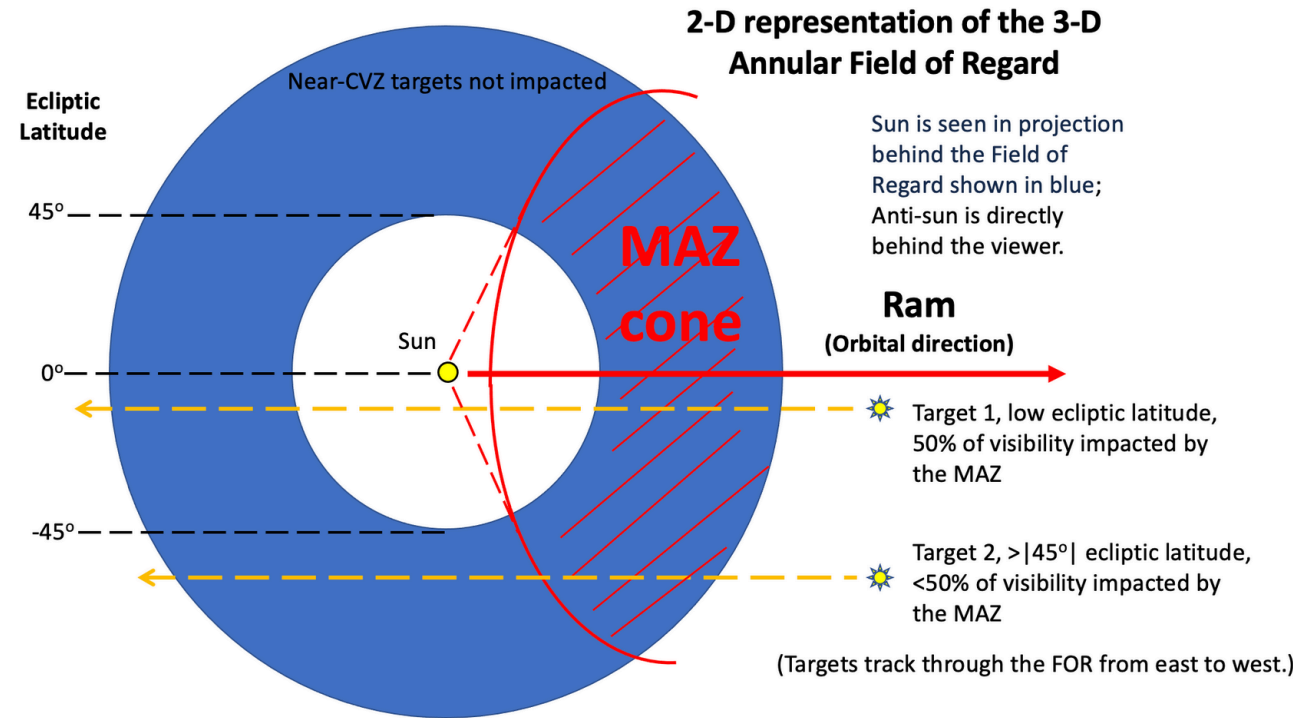


- On February 25th 2024, two of the mirror segments on the JWST primary mirror experienced a large “tilt” event: a sudden change in mirror position that are known to occur infrequently.
 - These events could be from stored energy resulting from the initial observatory cooldown.
 - No sign of any change or damage in the surfaces of the mirrors themselves (i.e. no micrometeoroid impact)
- The Telescopes team quickly determined the compensating mirror movements to realign the system.
- PIs of the potentially affected programs were informed, and can submit a repeat request. As of March 12th only one WOPR received



Micro-meteoroid avoidance

- The micro meteoroid impacts rate is as expected from pre-launch estimations (see Mike Menzel slides).
- Cycle 2 implements a micrometeoroid avoidance zone (MAZ) to limit the degradation of the JWST wavefront error over the lifetime of the mission
- The requirement for Cycle 2 and beyond, defined by the Micrometeoroid WG, is that the observatory should be in the MAZ no more than 20% of the time
 - The 20% averaged through a Cycle is considered a requirement
 - 15% or less is a desirable goal
- Thanks to careful scheduling we are meeting that constraint for Cycle 2 observations.





Long Range Plan – State as of Feb 20, 2024

About 7 months into Cycle 2:

- Cycle 1: 96% complete
- Cycle 2: 35% complete
- Cycle 1 significantly spilled into Cycle 2 nominal cycle
- SURVEY values only reported for Cycle 2 SURVEY with ASSIGNED plan windows
- 11% of nominal Cycle 3 time will be used for spillover from Cycle 1/2
- Cycle 3 programs are being processed. Plan is to start LRP build after April 1st, 2024

Cycle	Cycle 1		Cycle 2	
Category	Total Time [hrs]	Complete [hrs] (%)	Total Time [hrs]	Complete [hrs] (%)
GO	6205.8	5895.2 (95.0%)	5370.8	1697.4 (31.6%)
GTO	3811.3	3709.1 (97.3%)	176.4	91.8 (52.1%)
DD	168.1	155.5 (92.5%)	139.4	97.5 (69.9%)
CAL	706.8	703.1 (99.5%)	631.9	297.6 (47.1%)
ERS	554.2	554.2 (100%)	-	-
SURVEY	-	-	427.6	32.2 (7.5%)
Total	11,446.2	11,017.1 (96.3%)	6318.5 (w/o SURVEY)	2184.3 (34.6%)



Long Range Plan - Pure Parallels current status & TAC recommended

Cycle 2:

Program	Allocated (hours)	Charged(*) (hours)	Title
3383	Up to 205	184.2	JWST Wide Area 3D Parallel Survey
3990	Up to 600	518.5	A NIRCам Pure-Parallel Imaging Survey of Galaxies Across the Universe
4681	Up to 410	369.2	JWST Wide Area 3D Parallel Survey

- Pure parallel attachments began in October, 2023 after Calibration programs attachments and software fixes
- 2041 hours were available for science pure parallel slots (after Calibration program needs)
- 3383 was split into 2 programs (3383 & 4681) due to APT performance issues
- All 3 programs requested the same slots based on their specifications in APT

(*)Charged time reflects the visits that are listed in APT, and it includes executed and non-executed visits.

Cycle 3:

Program	A (hours)	Title
5398	Up to 400	POPPIES: The Public Observation Pure Parallel Infrared Emission-Line Survey
6434	Up to 600	SAPPHIRES: Slitless Areal Pure-Parallel High-Redshift Emission Survey

- We expect Cycle 3 calibration will require approximately same number of slots as in previous cycles
- Data volume of Cycle 3 main science won't be clear until after the Cycle build starts
- Cycle 3 slot assignment will proceed once CAL assignments complete



Pure parallels documentation

Home / Methods and Roadmaps / JWST Parallel Observations

JWST Parallel Observations

Some capabilities to use more than one science instrument simultaneously (in parallel) will be available for JWST Cycle 3. Additional instrument combinations may be offered in future cycles.

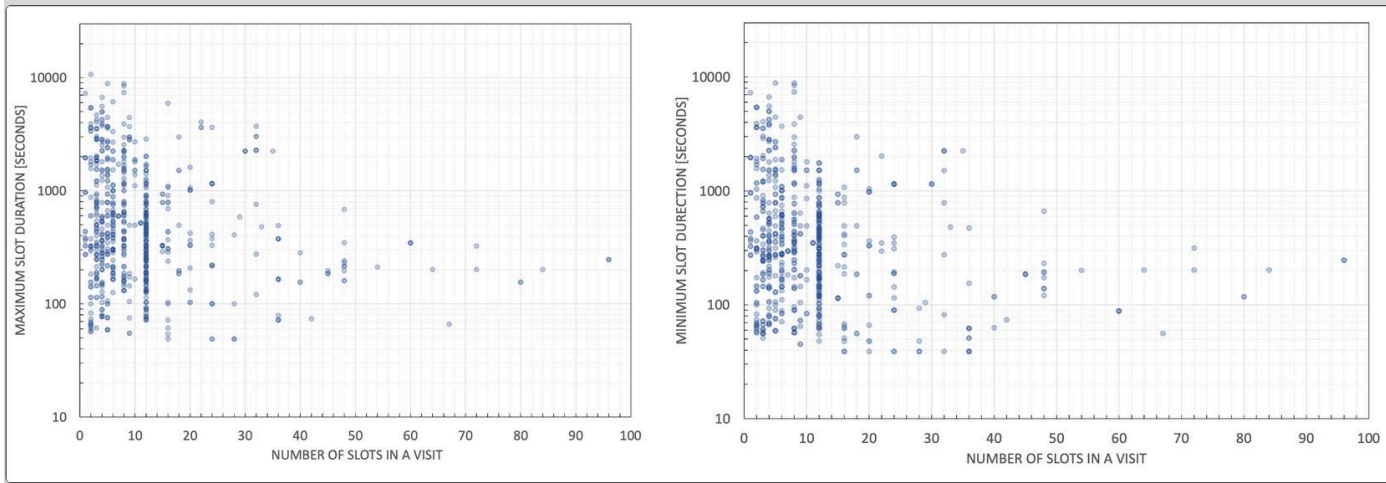
On this page

- [Principles in the use of parallel observing with JWST](#)
- [Coordinated parallels](#)
- [Pure parallels](#)
- [Pure parallels FAQ](#)

See also: [JWST Coordinated Parallels Roadmap](#), [JWST Coordinated Parallels Custom Dithers](#)



Figure 1. Cycle 2 available pure parallel slots



What additional details does the community need to be able to propose and plan for their pure parallels?

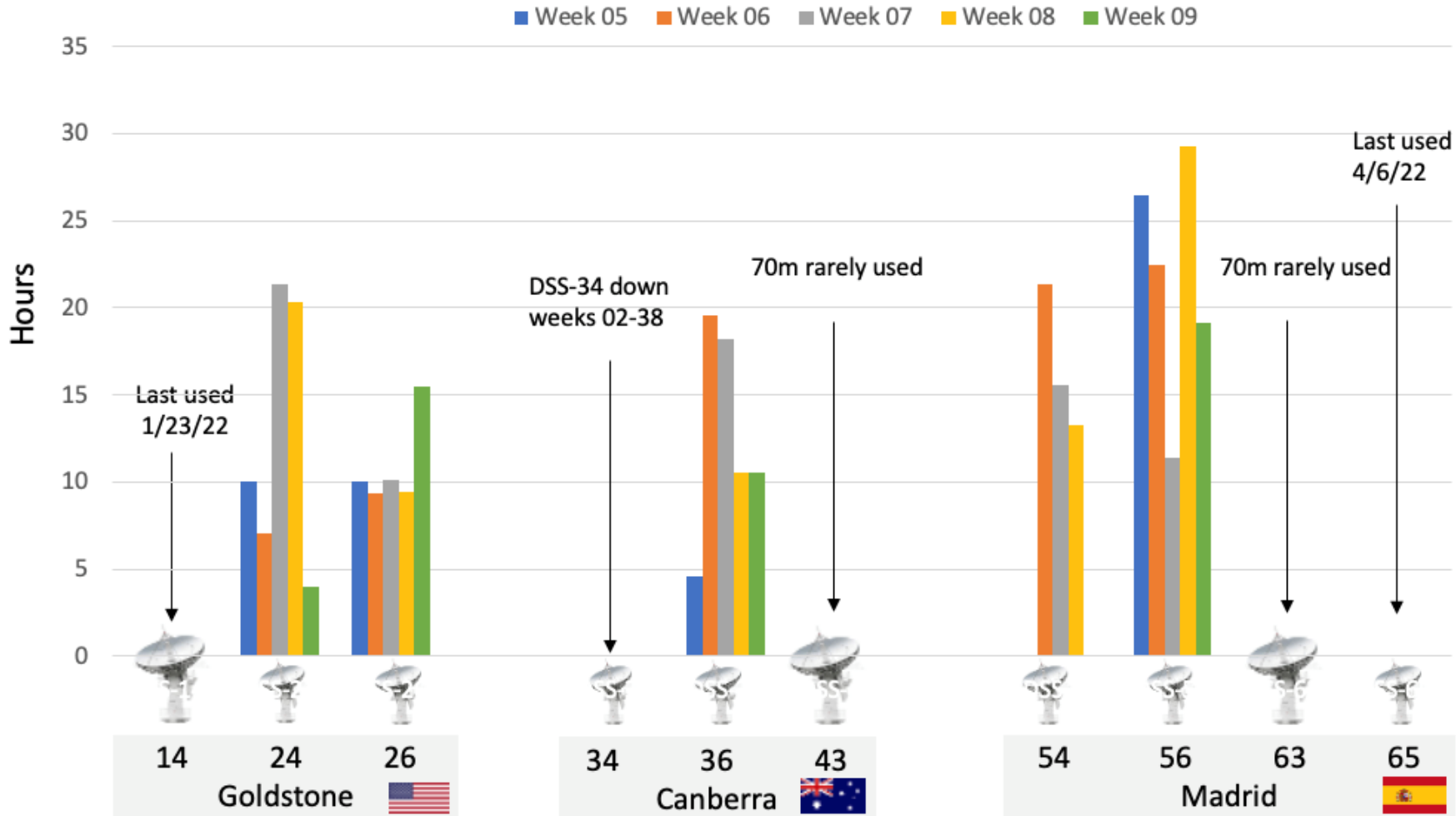


Deep Space Network

- Currently the on board Solid State Recorder is filled up to 58% capacity, compared to the 50% at the beginning of the mission.
 - Pro: This enables scheduling flexibility and could enable more parallel observations (both in number of slots offered and in number of instruments usable simultaneously)
 - Con: Increases the risk of an OP stoppage if a DSN contact is skipped, although reasonable margin remains
- In order to conduct the desired amount of science, at least 10 hours of DSN time per day is required on a regular basis. This generally occurs (see next slides)
 - However, when there is decreased coverage, it creates additional work for the science scheduling team. They develop short term schedules that compensate for and accommodate the DSN availability limitations by scheduling observations with a lower than average data generation rate.
 - Future Artemis launches pose a risk (see M. Menzel slides)



Deep Space Network Support - 2024 Weeks 05-09

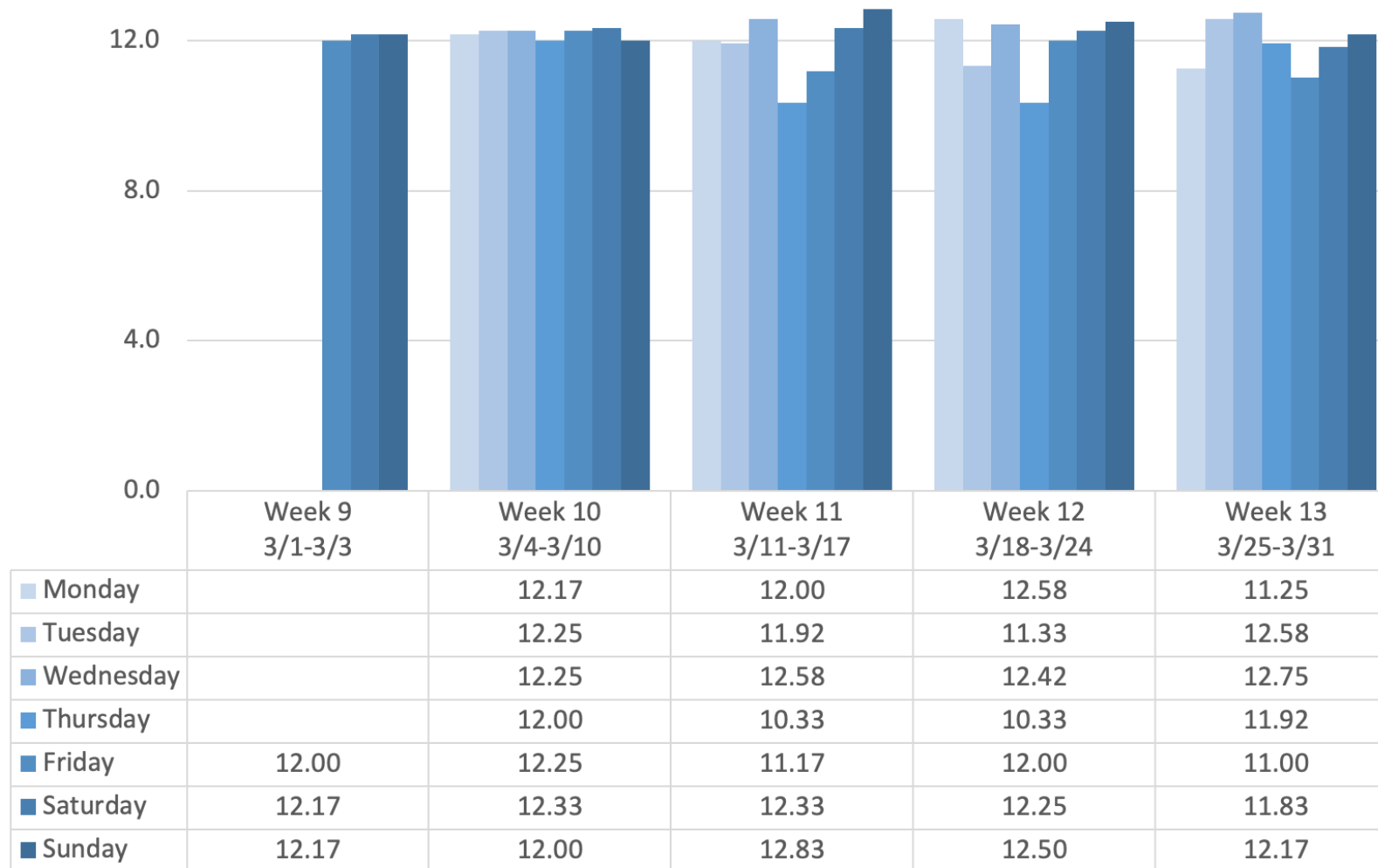


DSS-34 will be down for maintenance until September 2024
We continue to be heavily reliant on Madrid and Goldstone time

*Time shown is as-scheduled



Deep Space Network Coverage Example: March 2024

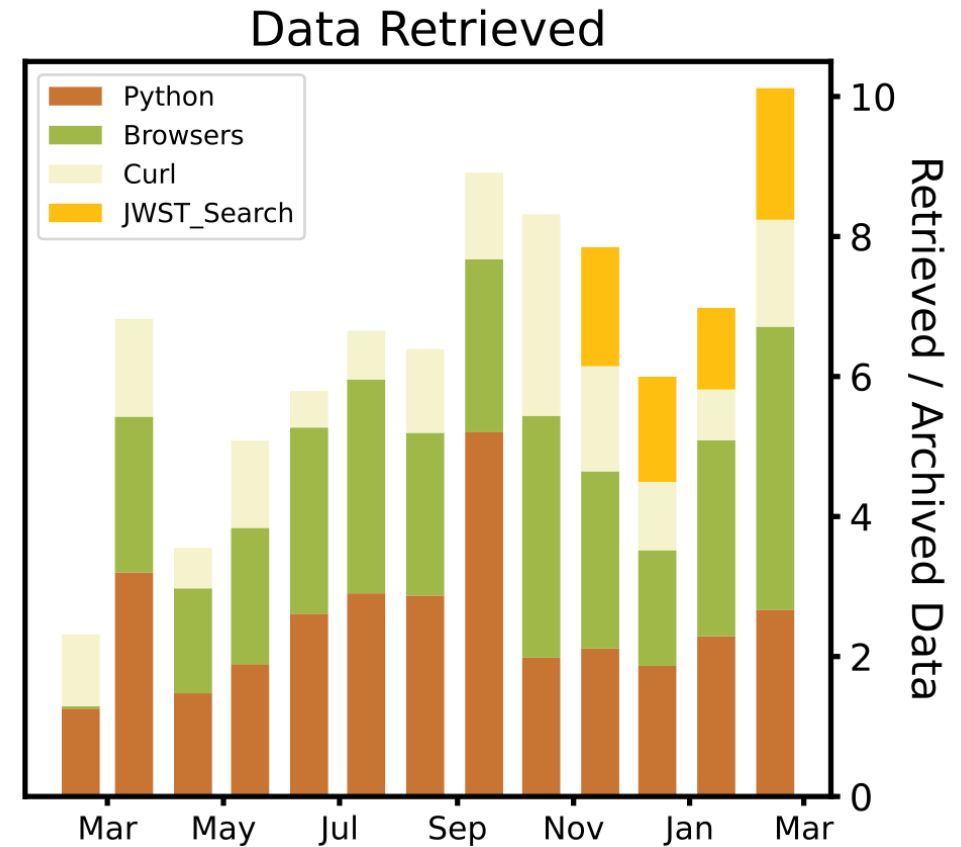
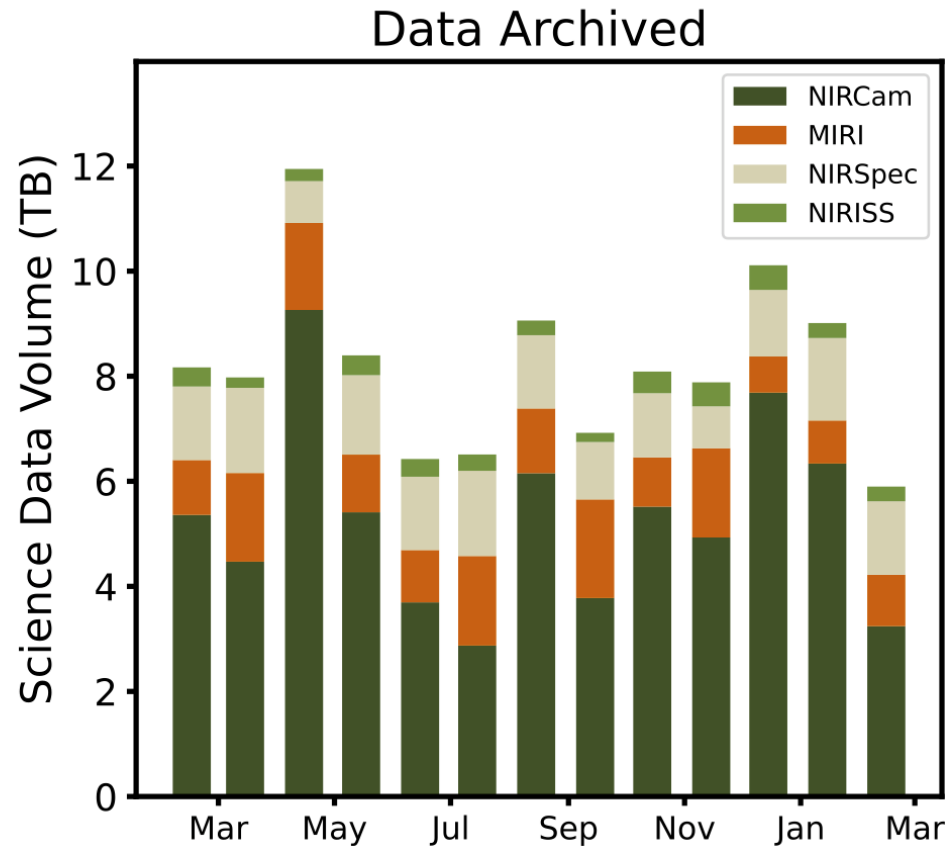


There is sufficient DSN coverage scheduled in March



JWST Archive Metrics

JWST science data ingest and retrieval.



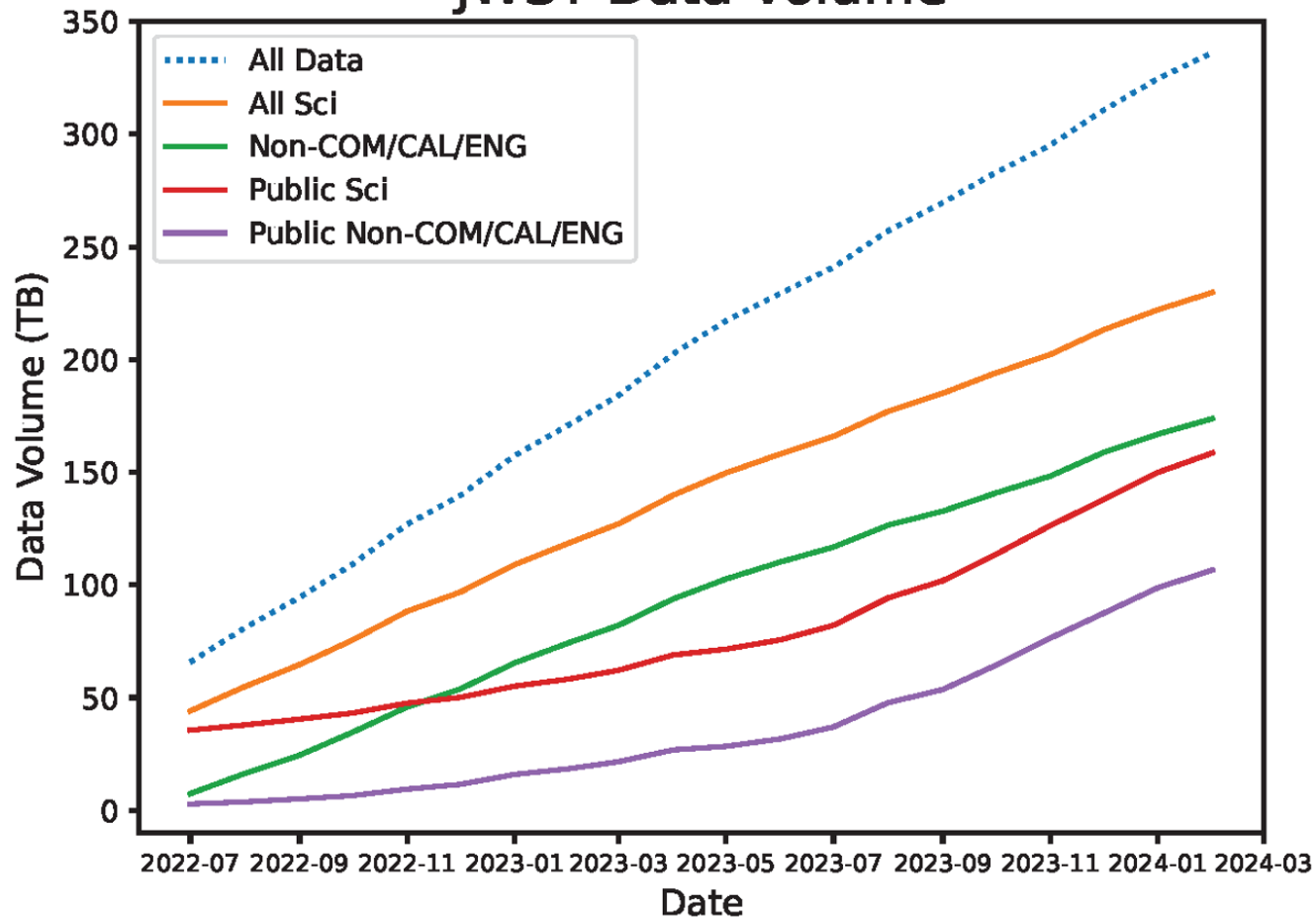
JWST Search launched in Nov 1st 2023



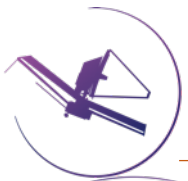
JWST Archive Metrics

The volume of JWST data is now >336 TB, with the following categories:

JWST Data Volume



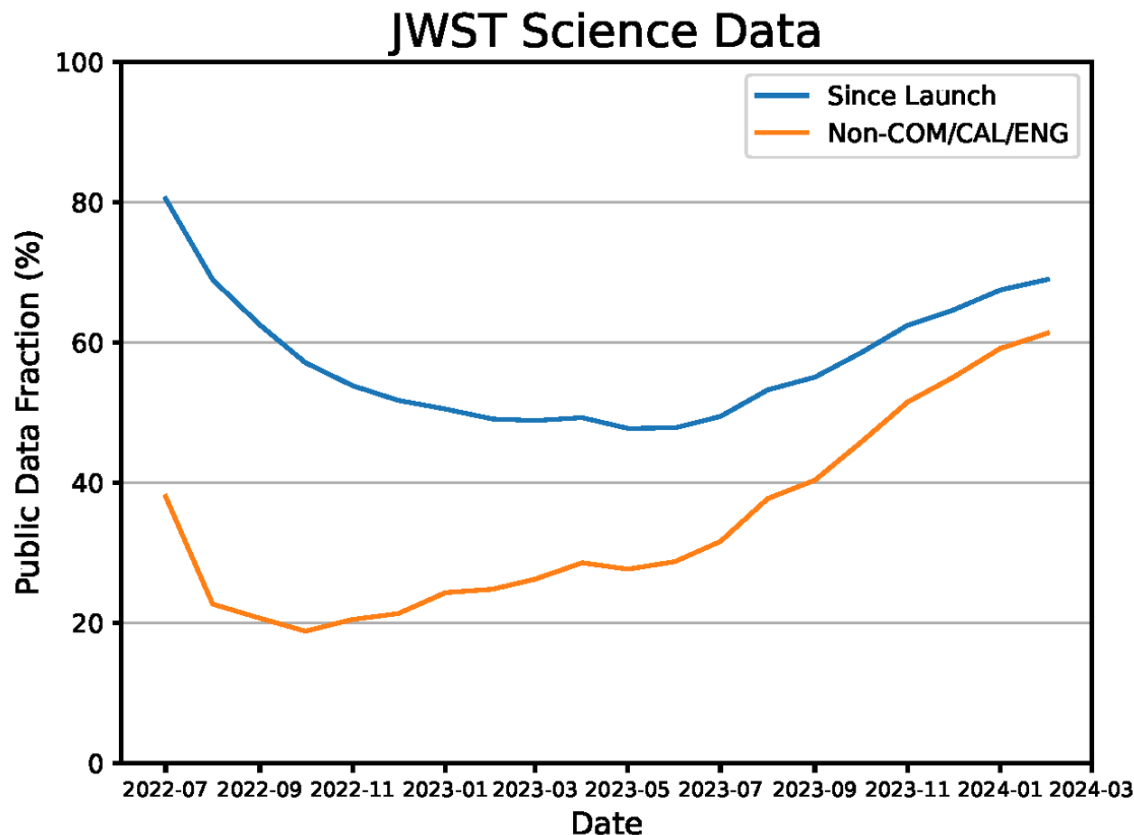
- All data, including restricted products
- Data accessible by a scientist
- Data Excluding COM, CAL, ENG programs
- Public science data
- Public science data excluding COM, CAL, ENG



JWST Archive Metrics

More than half of JWST science data are now public. The curves indicate whether COM, CAL, and ENG programs are included. Note:

- JWST Cycle-1 was front-loaded with ERS programs, and all commissioning data is public
- Some programs, by choice or policy, have a zero-length exclusive access period



Blue line:
Science data+Commissioning/Calibration/Engineering data
Orange line: Science data only

The COM/CAL/ENG data includes data from astronomical targets used to verify the science instruments in commissioning, spectrophotometric and wavelength calibration target, data from the JWST astrometric field etc.



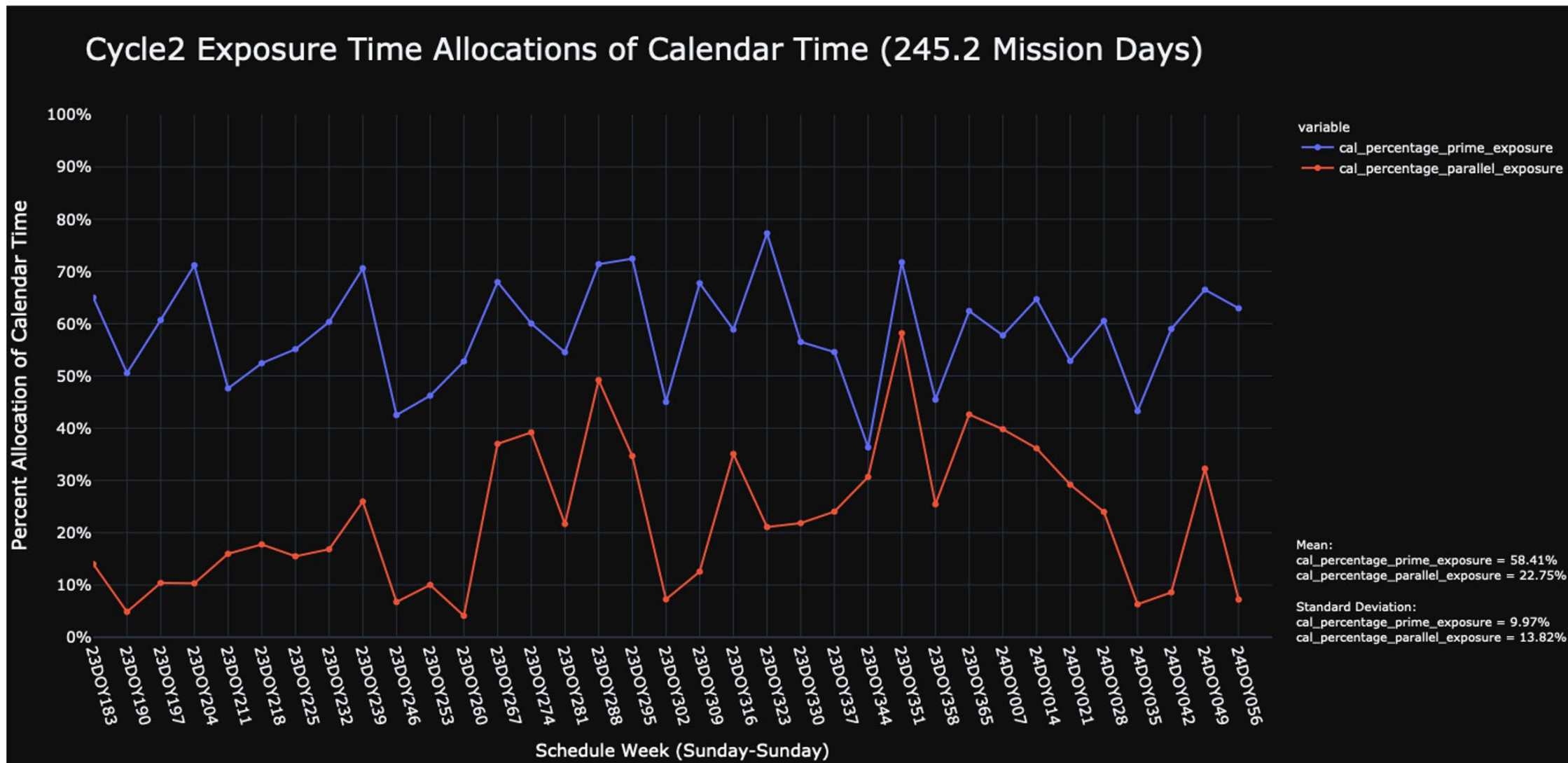
Observatory Operations Efficiency Report

Monthly Summary (Feb 2024): Key monthly efficiency metrics as a percentage of either the total month's calendar duration or the total month's science visit duration, compared to the Cycle 1 and Cycle 2 mean values:

% Time	Metric	C1 Mean*	C2 Mean	Monthly
Calendar	Prime Science Visits	80.5	86.6	88.51
Calendar	Real-Time Engineering	0.8	0.8	0.46
Calendar	Idle Time	8.17	7.1	5.73
Calendar	Parallel Science Visits	18.43	24.13	12.96
Calendar	Prime Science Exposure	54.73	58.41	57.91
Calendar	Failed/Skipped Prime Visits	3.15	2.72	3.16
Science Visit	Prime Science	66.72	71.23	68.62
Science Visit	Visit Overheads: Slew	17.47	15.83	17.10
Science Visit	Visit Overheads: All Others	11.13	11.21	12.83

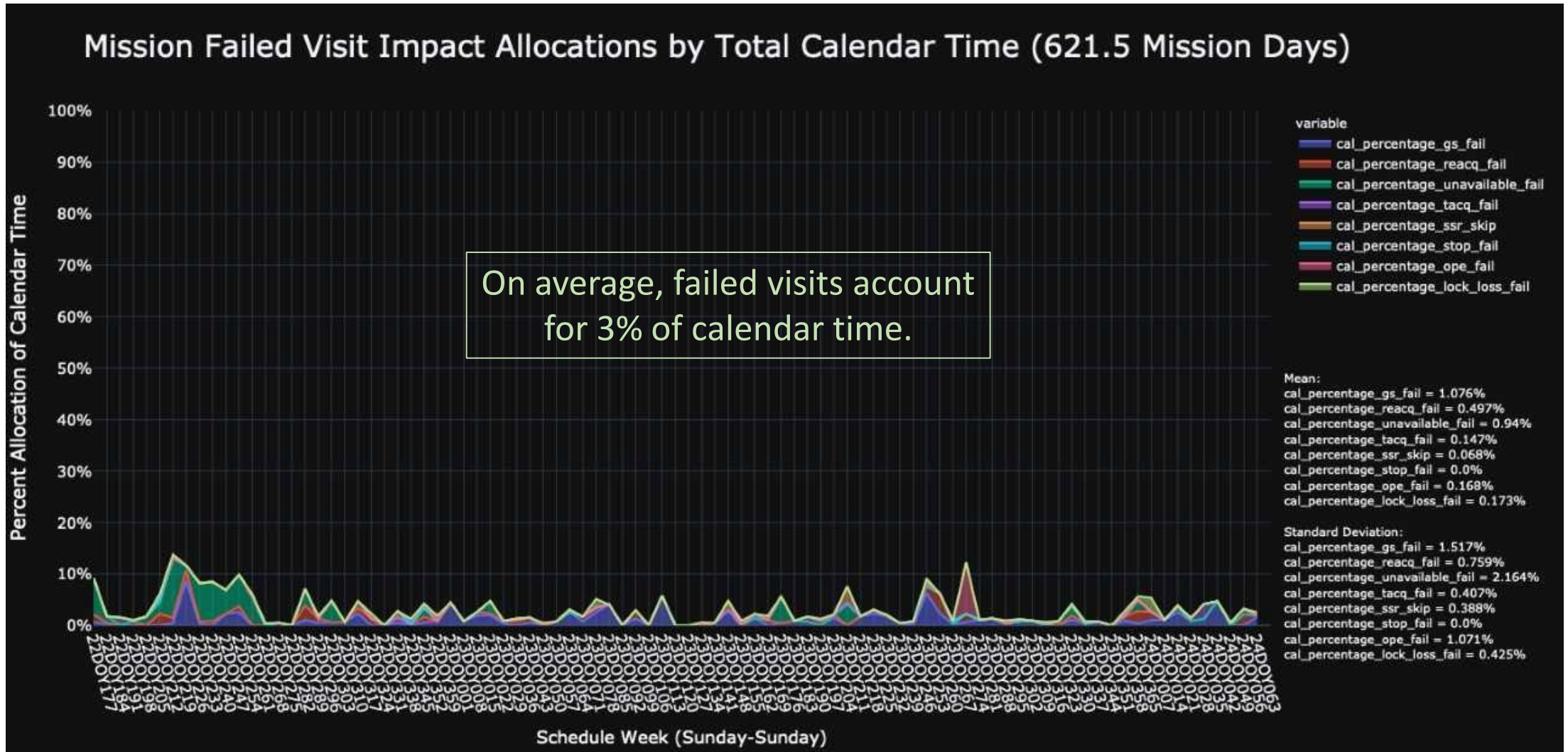
Detector Exposure Time Cycle2-to-date

Percent calendar time for prime and parallel exposures





Failed visits for the life of the mission





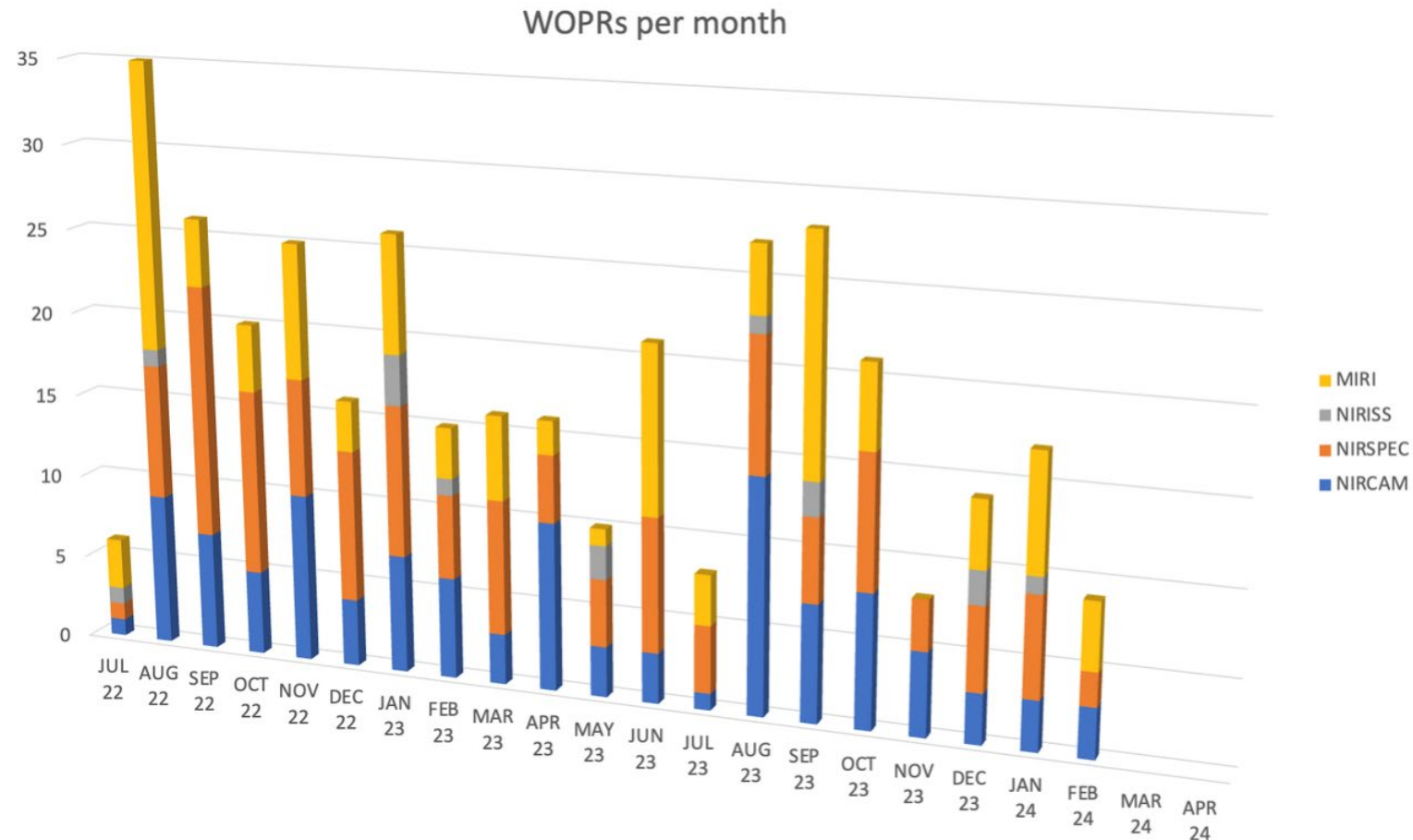
Failed visits and WOPRs

- When a visit fails the proposal PI receives a notification.
- They can submit a WOPR (Webb Observation Problem Report) asking for a repeat.
- The TTRB (Telescope Time Review Board) is the arbiter that decides whether the repeat is granted.
- There are additional reasons that can trigger a TTRB (e.g. MRS reduced count rate, low data quality due to persistence from previous visit)

TTRB Activities Summary: WOPRS since June 2022

Total number of since June 2022:

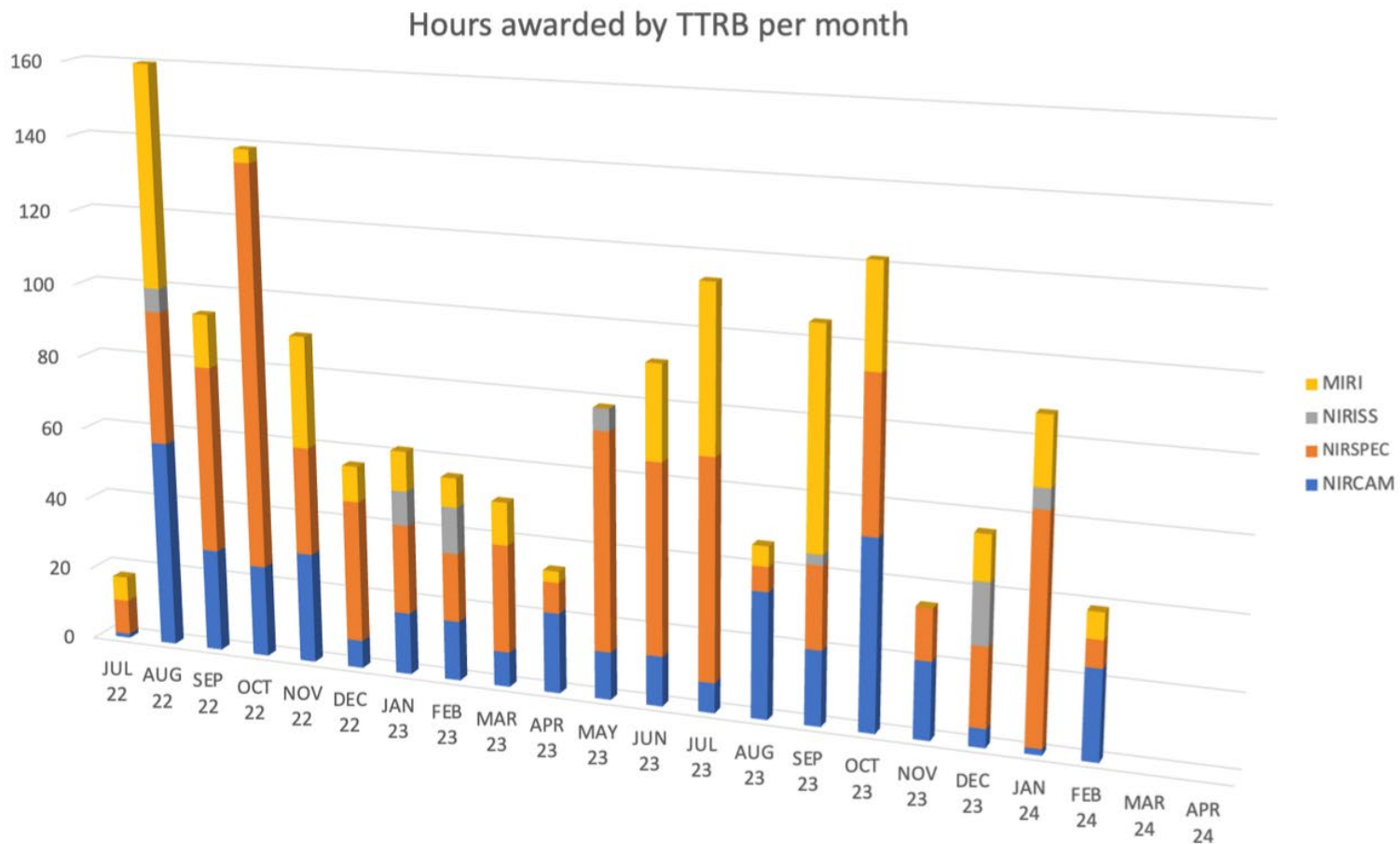
- 315 WOPRs submitted (for 1673 hrs), 278 approved (for 1543 hrs)
- 88.3% approval rate



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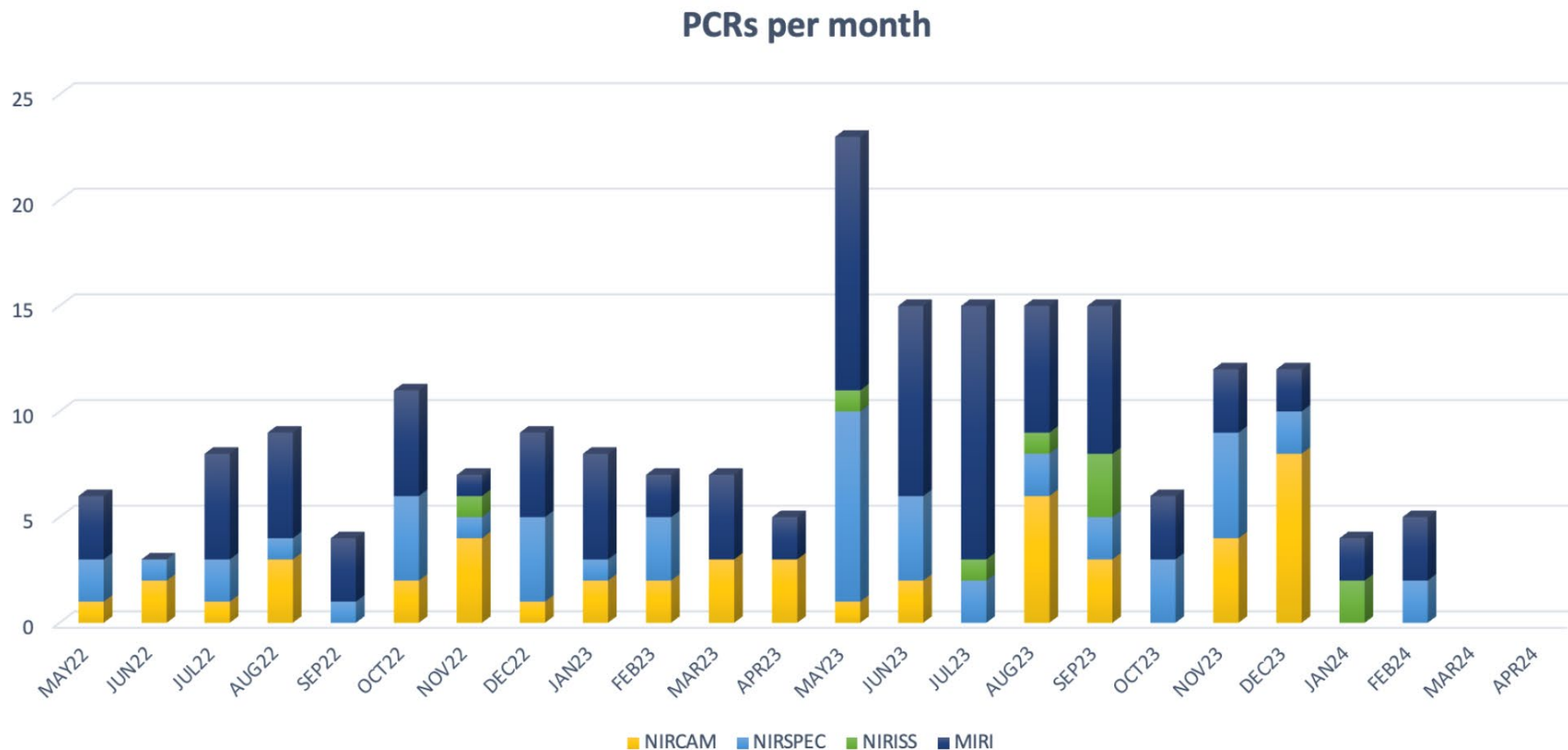
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TTRB Activities Summary: PCRs since June 2022

Total number of Program Change Requests submitted: 197 PCRs submitted,


- 156 approved
- 79.2% approval rate



Science planning board enhancements - Completed

ID	Enhancement	Status
411	Reduce overhead when changing NIRSpec detector mode	Installed in Operations Nov 2023
729	Improve Efficiency of NIRSpec MSA short Detection Procedures: OP-driven Mask Handling	Installed in Operations Nov 2023
678	ISIM memory image transfer through DMS	Installed in Operations Nov 2023
732	Tracking SURVEY Program Allocations	Installed in Operations Feb 2024
714	Support MIRI MRS Return to Science	Installed in Operations Feb 2024

Science planning board enhancements - Ongoing

ID	Enhancement	Status	Notes
797	Improve Guiding for Galactic Center Observing	In progress	<p>The new Guide Star Catalogue, GSC3.0, is operational Announced as a JWST Observer News item</p> 
807	NIRSpec Dark Improvements: GW configuration	In progress	Planned for deployment in May 2024
805	NIRSpec dark Improvements: switching readout modes	In progress	Planned for deployment in May 2024
812	MSA Planning Tool Improvements	In progress	Planned for deployment in May 2024
736	Improve utility of MIRI simultaneous imaging	In progress	Planned for deployment in May 2024
721	Allow NIRCams Wide Field Slitless spectroscopy pure parallels	In progress	Planned for deployment in May 2024 Mode offered in Cycle 3 CfP

Science planning board enhancements - Ongoing

ID	Enhancement	Status	Notes
302	Update maximum exposure/visit duration for Time Series observations	In progress	Planned for deployment in May 2024
264	Enable Dispersed Hartman Sensor use in NIRCam Grism Time Series template	In progress	Plan is to offer it for the Cycle 4 call for proposals
799	Avoiding impacts of persistence in NIRCam from bright extended sources	In progress	NIRCam team exploring operations concept



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- The observatory image quality is excellent;
- The observatory is meeting the MAZ constraints
- Cycle 1 and 2 programs are 96% and 35% complete, respectively. Cycle 3 programs are being processed
- Cycle 2 pure parallel programs have used more than 85% of their assigned hours
- DSN contacts have been sufficient to manage science.
- During Cycle 2 the observatory spent close to 60% of the time executing prime science and calibration exposures and less than 5% of the time on failed visits
- Good progress on approved enhancements, but work remains. We will discuss this further at the next JSTUC meeting

