



STScI | SPACE TELESCOPE
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

JSTUC: JWST Science & Operations Center

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JWST mission status

- JWST launched on 25 Dec. 2021.
- Inserted into nominal L2 halo orbit.
- The telescope and sunshield deployed as planned.
- Propellant onboard to last >20 years of mission life.
- Completed 6 month commissioning period with all 17 modes ready for science.
- Science and mission requirements are met or exceeded.
- **We are currently 7.5 months into normal science operations.**





Science and Operations Center in Cycle 1

After a successful commissioning period, the S&OC transitioned to *normal operations*.

- In normal operations, the S&OC is:
 - Executing the approved cycle 1 science program
 - Calibrating the instruments to support the approved science (this is an ongoing process)
 - Making necessary improvements to scheduling, operations, pipeline, and archive
 - Managing anomalies
 - Supporting Cycle 2 proposals
 - Engaging the public in JWST science results
- Recent post-commissioning updates include:
 - Performance updates (e.g., faster saturation due to higher throughput, straylight features)
 - Recommendation updates (e.g., add background observations in some cases)
 - ***Resources are always limited***- work must be prioritized based on health and safety, optimizing science return, community needs, etc.
 - Presentation by Macarena Garcia Marin
- We are continuously working on improving communication with the community!



Key developments in the first months of science operations

- More details in instrument presentations
- On August 24, the MIRI Medium-Resolution Spectrometer (MRS) experienced increased friction in one of its grating wheels.
 - This issue has been mitigated by modifying MIRI operations (see MIRI presentation):
 - Controlling the rotation direction of the wheel rotation to minimize friction.
 - Planning and tracking to ensure the adequate direction is used on each Observing Plan.
 - This process is not dependent on user input, but managed by STScI.
- System updates to manage/mask NIRSpec Multi-Shutter Array (MSA) electrical shorts (see NIRSpec presentation).
- Demonstrated improvement in observatory tracking rate from the nominal 30 mas/s to ~110 mas/s to successfully execute DART impact observation.
 - In cycle 2 up to 75 mas/s is allowed.



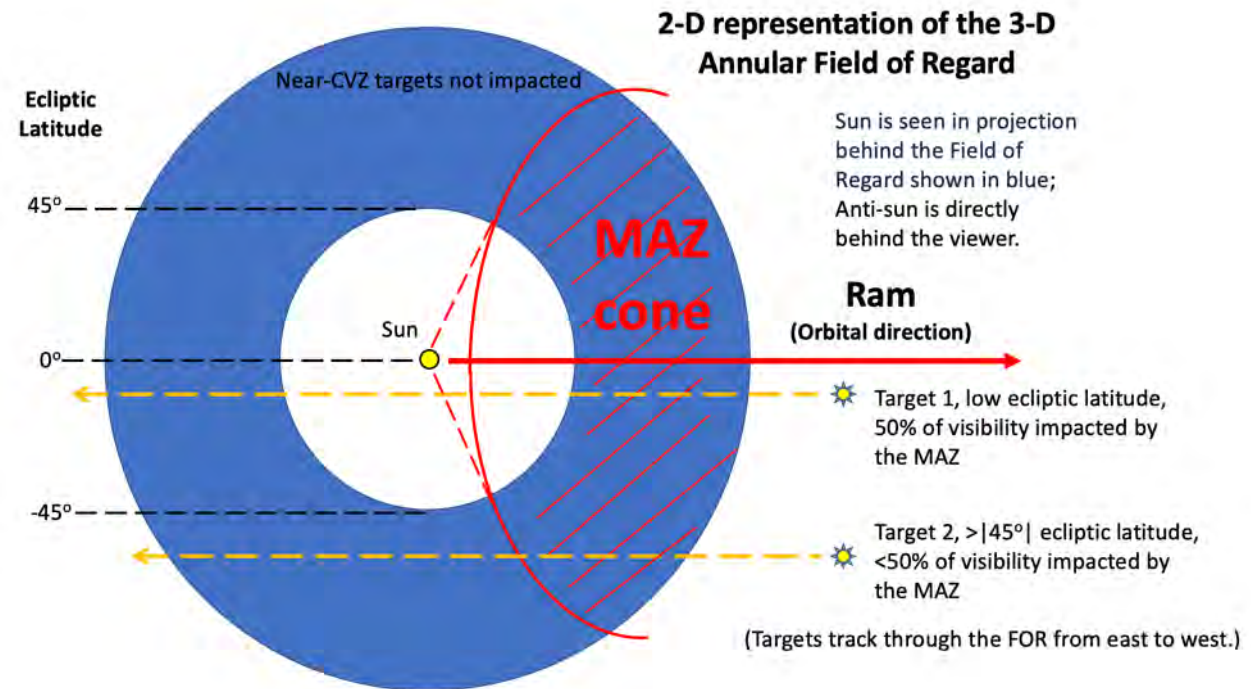
NIRCam image of DART ejecta

NASA, ESA, CSA, Cristina Thomas (Northern Arizona University), Ian Wong (NASA-GSFC)



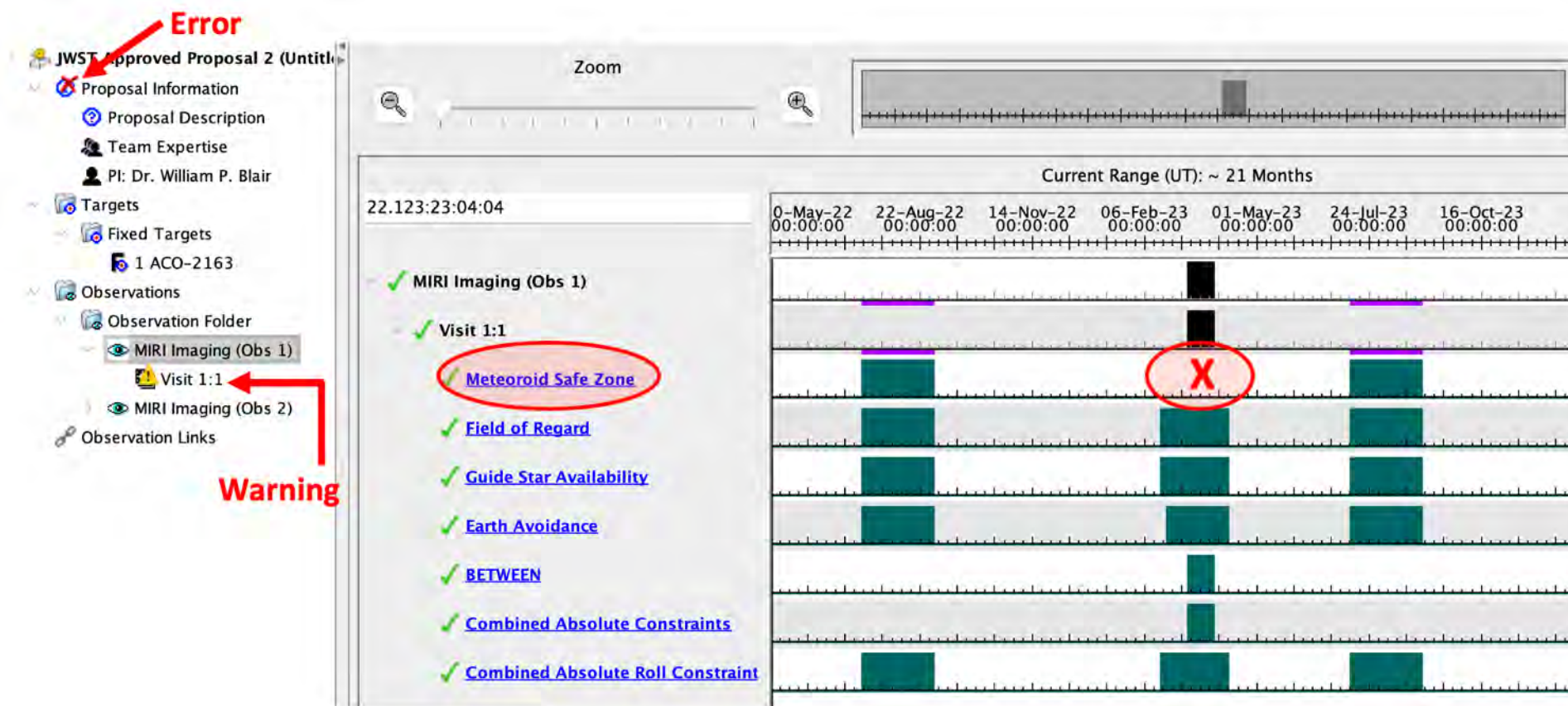
Micro-meteoroid avoidance

- JWST is designed to be resistant to inevitable impacts by micrometeoroids.
- On May 24, the C3 mirror segment was struck by a higher-energy micrometeoroid than expected.
 - This impact did not significantly degrade the JWST performance, but the cumulative effect of many impacts will limit the diffraction limited lifetime.
- Cycle 2 implements a micrometeoroid avoidance zone (MAZ) to limit the degradation of the JWST wavefront error over the lifetime of the mission.
- Several circumstances may force a target to be in MAZ
 - Time critical observations
 - PA limitations
 - Popular targets (e.g., specific transiting exoplanets)
- Reviewers need not take the MAZ into account in reviewing proposals
 - scheduling is STScI's responsibility



MAZ avoidance in APT

- Management of the Micrometeoroid Avoidance Zone (MAZ) was incorporated into APT, for use in Cycle 2.
- There has been no change to the scheduling of Cycle 1 observations due to the MAZ.



[APT and the Micrometeoroid Avoidance Zone](#) Video Tutorial



Skipped observations/visits

- There are instances of observations/visits skipped by the observatory due to:
 - **Guide star acquisition failure**
 - Guiding success rate is over 95% of visits
 - Each instance of failure is diagnosed in detail; typically a repeat uses a different guide star candidate/guider detector region and is successful.
 - Crowded fields (e.g., the Galactic Center) are the most challenging.
 - Upcoming updates to the guide star catalog and updates to the guider detector bad pixel mask will help further improving success rate.
 - **Time window for that particular observation plan is missed.**
 - **Observatory issues or procedural adjustments**
- For skipped visits, the PI receives an automatic email alert, and they may be advised to issue a Webb Observation Problem Report (WOPR) to request a repeat.
- STScI will aim to re-schedule observations in a timely manner, but users should expect typical turnaround times of ~14 days

| | HOURS | # WOPRS | # APPROVED | % APPROVED |
|---------------------------|---------------|----------------|-------------------|-------------------|
| JUL 22 | 17.43 | 6 | 5 | 83.3 |
| AUG 22 | 162.47 | 35 | 30 | 85.7 |
| SEP 22 | 93.81 | 26 | 25 | 96.2 |
| OCT 22 | 141.23 | 20 | 18 | 90.0 |
| NOV 22 | 90.22 | 25 | 23 | 92.0 |
| DEC 22 | 65.04 | 15 | 12 | 80.0 |
| JAN 23 | 75.67 | 25 | 23 | 92.0 |
| FEB 23 | 66.91 | 15 | 12 | 80.0 |
| MAR 23 | | | | |
| APR 23 | | | | |
| MONTHLY AVERAGES | 92.27 | 23.0 | 20.4 | 88.8 |
| TOTAL SINCE JUL 22 | 712.77 | 167 | 148 | 88.6 |



JWST Data Limitations

- The data acquisition rate is a key resource for the observatory!
 - Hence the common APT data rate warnings.
 - Coordinated parallel observations are not free, but must be justified.
- If the on-board solid state recorder fills, the observatory will halt observations
- We can downlink 57 GB/day via Deep Space Network.
 - Mission requirement to downlink data for 8hr out of 24 hr.
 - Only 11% margin. To mitigate, we are currently using up to 12/hr/day of DSN.
- In general we can skip one ground contact with no impact.
- Artemis is a potential concern, as that requires significant DSN resources. Artemis 1 had essentially no impact due to fortuitous launch date.





Scheduling and need for Survey programs

- The JWST instantaneous field of regard is smaller than for Hubble
- The JWST observatory has a restricted ability to roll from its nominal (~ 5 degrees)
- The scheduling system includes
 - observatory maintenance activities such as station keeping (orbit maintenance)
 - angular momentum dumps
 - wavefront sensing visits.
 - The system is designed to have minimal impact on science observations but these activities have high priority and might require to be scheduled between science visits in a program.
- **Survey** programs are designed to fill small gaps in the scheduling plan
 - Experience with Cycle 1 indicates that about 200 hours of survey observations are needed.
 - There is no strict limit on visit duration, but visits longer than 90-100 minutes are more difficult to schedule and use as survey observations.
 - Survey observations should have minimal special scheduling requirements.
- Investigating if required wait time during station keeping activities can be used for science.

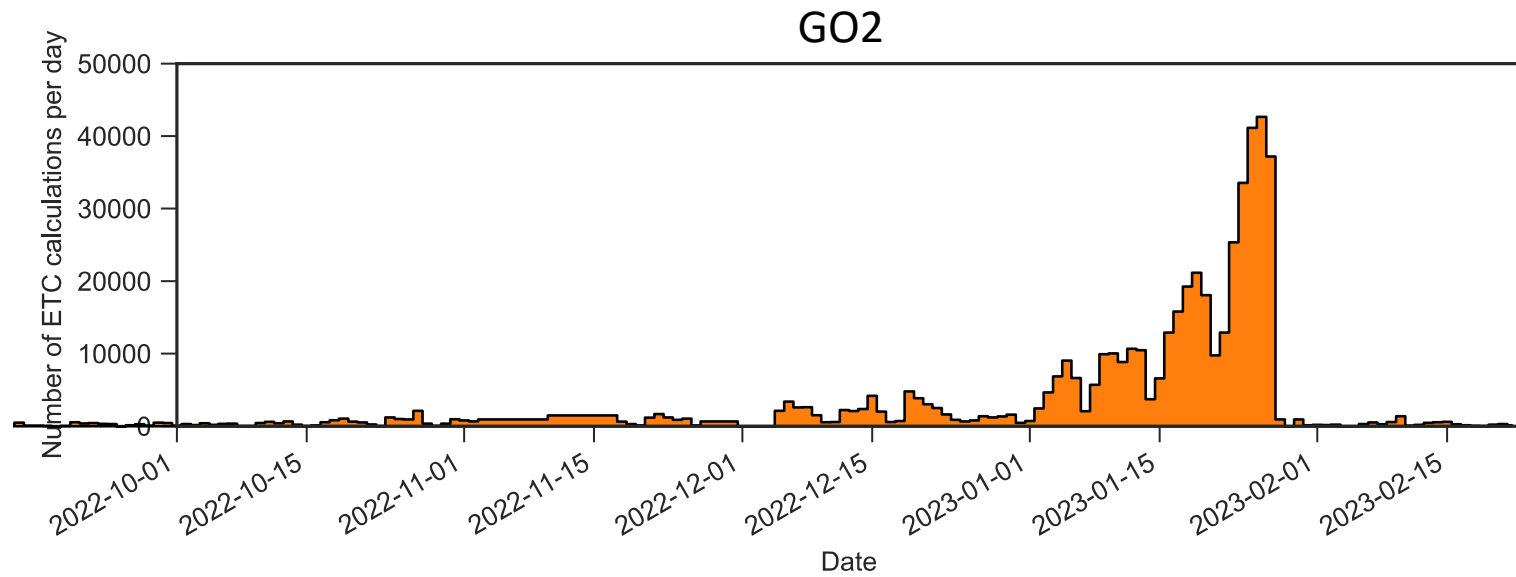
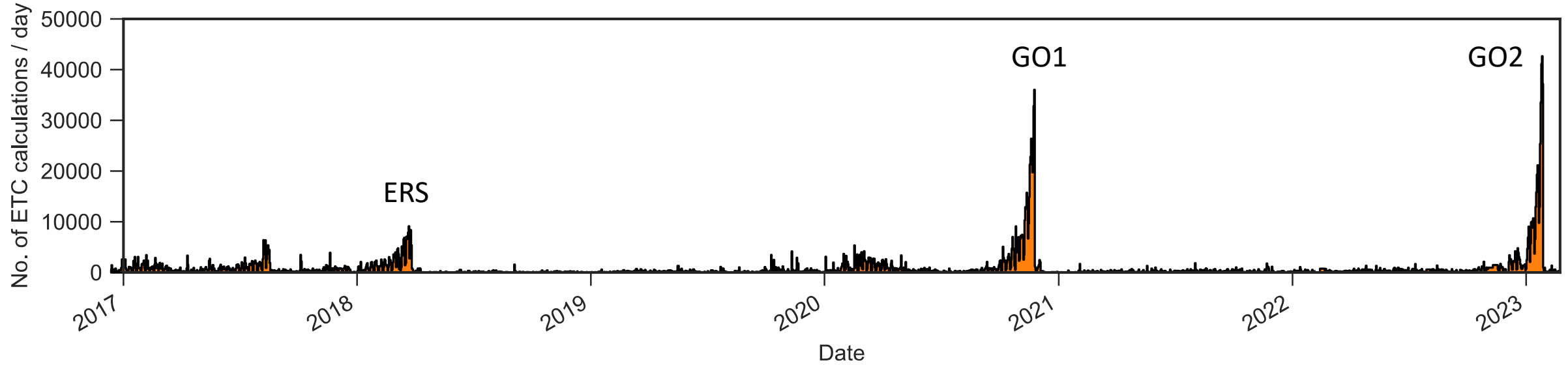


Proposal planning tool ecosystem

- The [Cycle 2 Call for Proposals](#) on JDOx contains the most up to-date information about proposals.
- The [JWST User Documentation \(JDOx\)](#) has been updated with on-orbit performance information.
- The JWST Observer [YouTube channel](#) contains short video tutorials to help you get started with the [Exposure Time Calculator \(ETC\)](#) version 2.0, [Astronomer's Proposal Tool \(APT\)](#) version 2022.7.2.
- The [JWST Interactive Sensitivity Tool \(JIST\)](#) provides quick access to the basic sensitivities of the observatory.
- You can browse all of the currently [Approved Observing Programs](#) on [jwst.stsci.edu](#).
- To get information on a specific program, you can search the [Program Information tool](#) for details using a Program ID or the investigators' names.
- The [Observing Schedules](#) provide the planned short-term schedules so you can see which programs are being observed in the next few days.
- Use [mast.stsci.edu](#) to check for duplications.
- To view the latest refereed publications using JWST data, check out the [Science Publications](#) page.
- You can learn about JWST data analysis with our various [JWebinars](#).



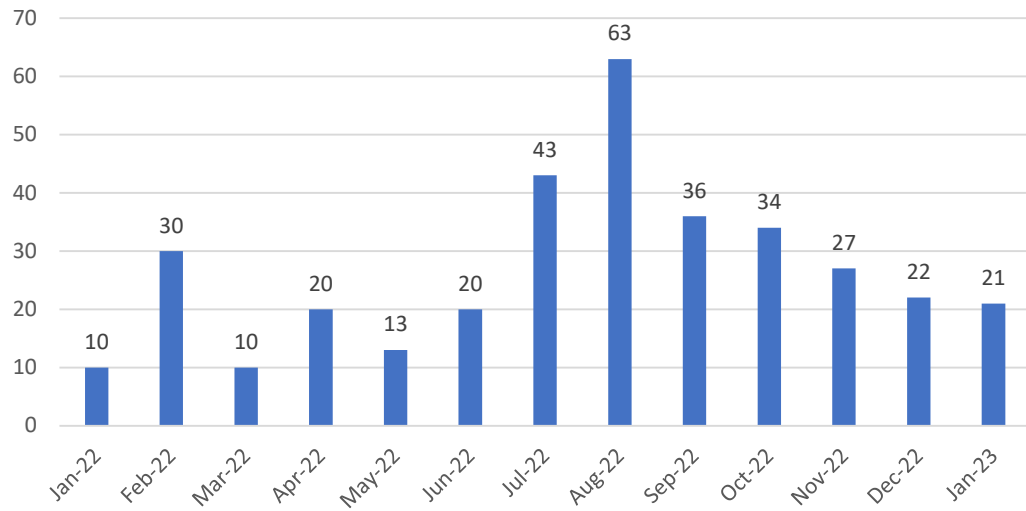
Exposure Time Calculator metrics during Cycle 2



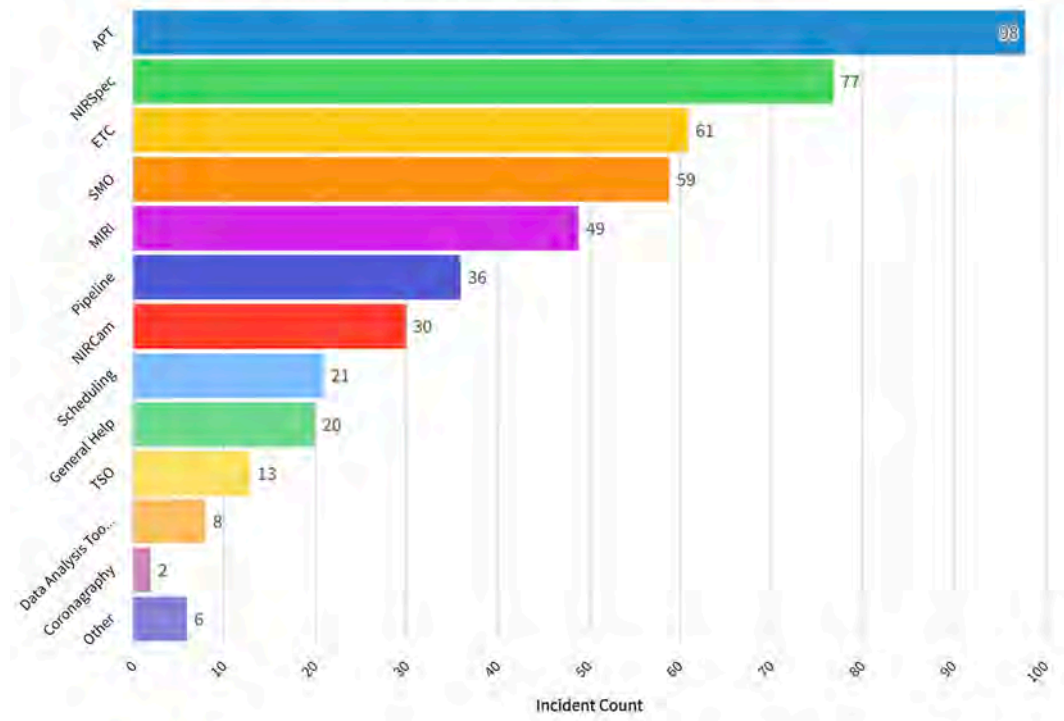


Help desk during G02

Number of JWST Helpdesk Tickets



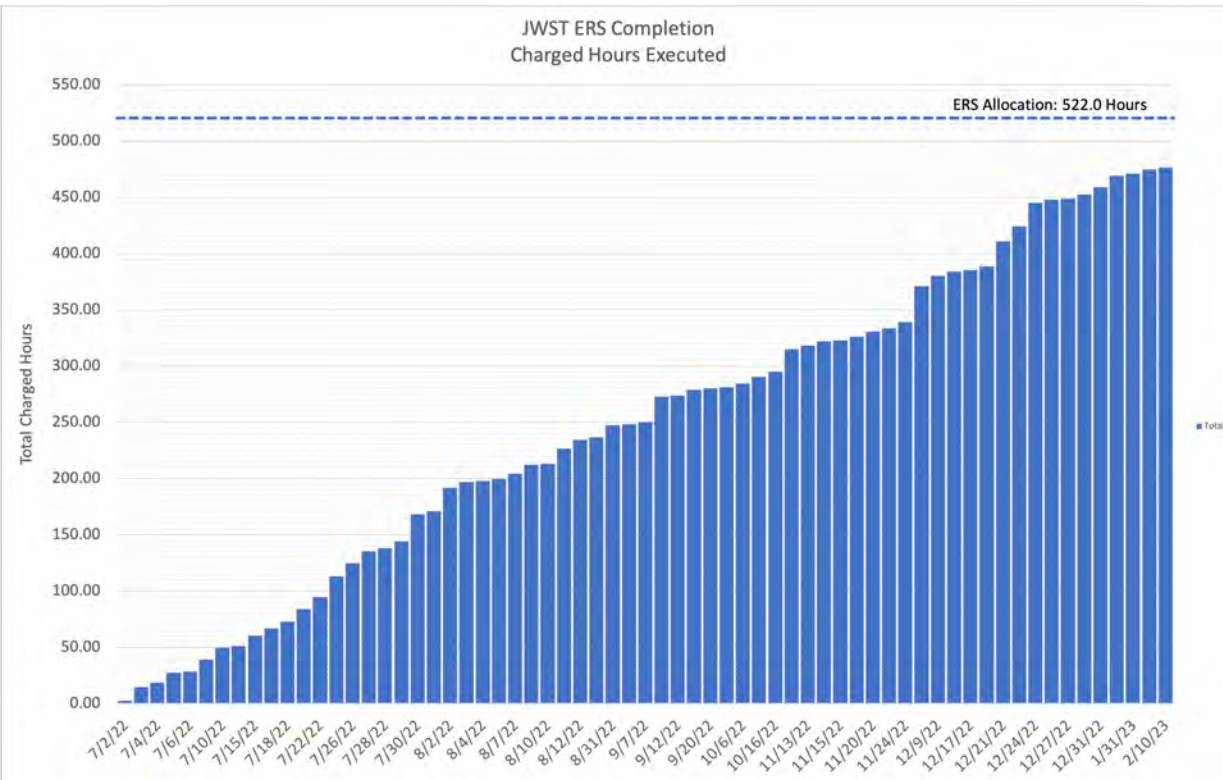
Cycle 2 Tickets per Category : 2022/11/27 - 2023/01/27



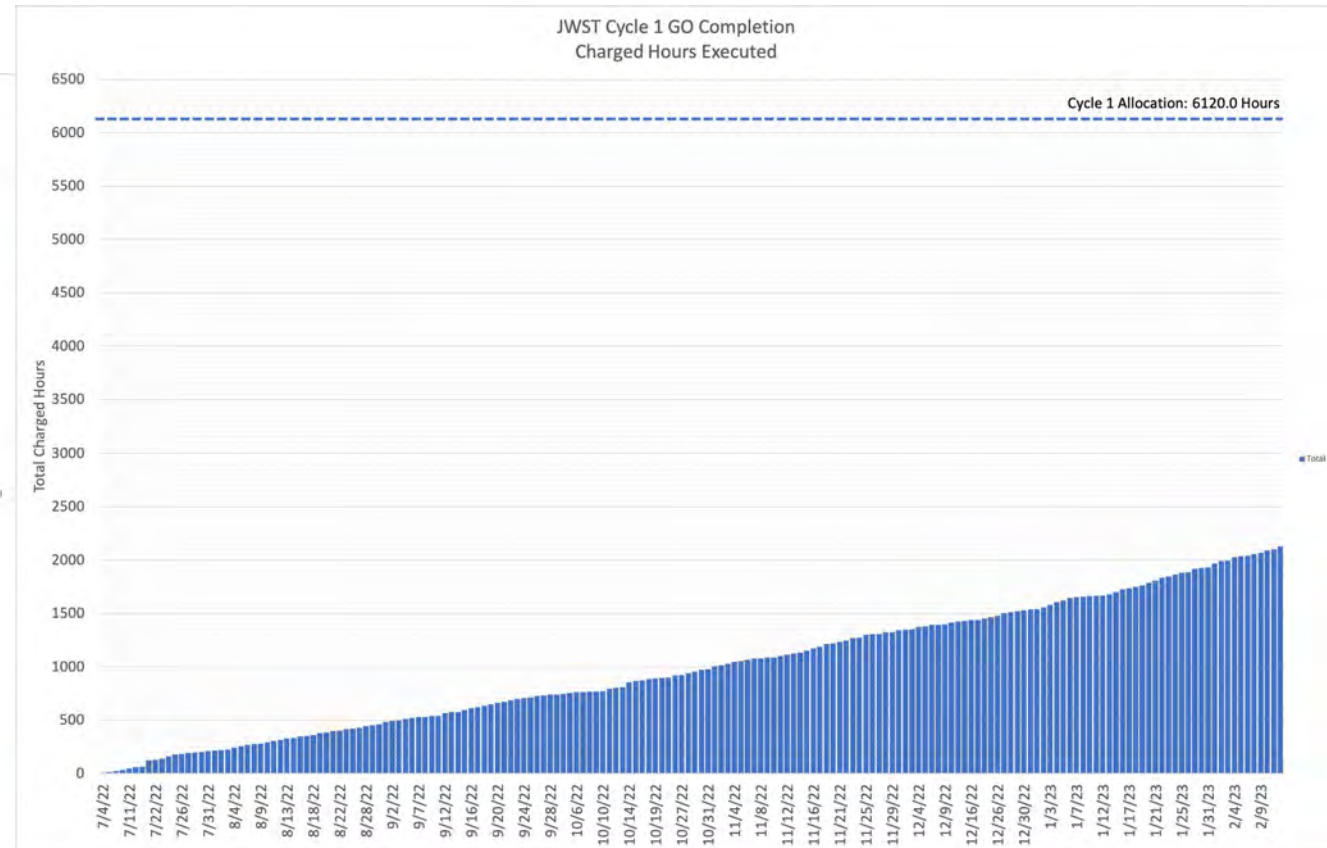


GO completion rates

ERS 87% complete as of 2/10/23



GO 34% complete as of 2/10/23





Calibration Pipeline

The **calibration pipeline** automatically processes all JWST data

- Default parameters for all pipeline steps
- Raw, intermediate and final products are archived on mast.stsci.edu
- Users can install and run the pipeline locally github.com/spacetelescope/jwst
- The pipeline is developed as open source, and community can open issues or even issue pull requests.
- The calibration pipeline is now generally producing science-ready data
 - but will continue to be improved.
 - Frequent updates lead to better products, but also frequent changes.

spacetelescope / jwst Public

Notifications Fork 135 Star 406

Code Issues 538 Pull requests 28 Discussions Actions Projects Wiki Security Insights

master 74 branches 146 tags

Go to file Code

About

Python library for science observations from the James Webb Space Telescope

jwst-pipeline.readthedocs.io/en/latest/

python astronomy jwst

Readme View license Code of conduct Cite this repository + 406 stars 32 watching 135 forks

Releases 45

JWST 1.9.4 (DMS build B9.1.1) Latest on Jan 27

+ 44 releases

| File | Commit Message | Time |
|--------------------|---|--------------|
| .github | changes for tox>=4.0 release (#7384) | last month |
| docs | JP-3095: Fix extract_id usage of use_source_posn param (#7466) | 2 weeks ago |
| jwst | JP-2862: Push DO_NOT_USE flags to groupdq array from mask (#74... | last week |
| pytest_crds | Add --report-crds-context pytest option (#6070) | 2 years ago |
| .codecov.yml | Use Codecov carryforward flags (#5406) | 3 years ago |
| .gitignore | move scripts into subpackage so that they can be packaged with `en... | 2 months ago |
| .readthedocs.yml | use canonical filename for RTD configuration (#7050) | 4 months ago |
| CHANGES.rst | JP-2862: Push DO_NOT_USE flags to groupdq array from mask (#74... | last week |
| CITATION.cff | metadata changes for 1.9.4 release | last month |
| CODEOWNERS.txt | Rename CODEOWNERS.md -> CODEOWNERS.txt | 5 years ago |
| CODE_OF_CONDUCT.md | add code of conduct | 6 years ago |
| CONTRIBUTING.md | adding more contribution instructions / notes for developers (#6864) | 8 months ago |
| JenkinsfileRT | uncomment MacOS in Jenkins (#7445) | last month |



The JWST Calibration Program

- Calibration presentation by Greg Sloan
- Goal of the calibration program is to scientifically calibrate the instruments and monitor their behavior.
- Commissioning did generally not calibrate the instrument
- Calibration observations are on-going for Cycle 1, and will continue in future cycles.
- Will be informed by needs of approved science observations.
- JWST is a complex observatory, so it is possible to submit calibration proposals as GO.
- Since November 10th 2022, all observers should use the standard CRDS OPS server (jwst-crds.stsci.edu) for obtaining the best JWST calibration reference files

CYCLE 1 CALIBRATION

JWST Home About News & Events Instrumentation Science Planning Science Execution Documentation

Home > James Webb Space Telescope > Science Execution > Approved Programs

Calibration Programs in Cycle 1

To ensure the calibration of all science instruments and observing modes, the Cycle 1 Calibration plan has been designed to focus on the observations planned for Cycle 1. The plan includes the data and methods necessary to:

- Test and improve all calibration files used by the data reduction pipeline
- Establish baselines for future comparisons
- Monitor the health, responsivity, and throughput of the telescope and science instruments for any temporal changes

It is important to remember that the Cycle 1 Calibration plan is not final. When the General Observer programs for Cycle 1 have been determined, the calibration plan will be re-assessed to ensure that the calibrations are appropriate based on the approved programs. Commissioning may also lead to revisions in the calibration plan. For these reasons, the plan as laid out here should not be interpreted as a guarantee that any single observation will be obtained. Rather, it is our best estimate of what will happen in Cycle 1 based on what we know now (as of March 2020).

The information below provide details for the four science instruments, the Fine Guidance Sensor (FGS), and the absolute flux calibration plan (a multi-instrument plan that is treated as its own integrated program). Each entry provides the program ID, title, and abstract of each Cycle 1 calibration activity, as well as a link to the STScI Program Information tool, which provides access to the APT file. The APT files can also be accessed directly within the APT by querying the program ID. To view the details of a specific program, expand a category below and then click the ID number for the program.

Expand All Collapse All

| | |
|---------|-----|
| MIRI | [+] |
| NIRCам | [+] |
| NIRISS | [+] |
| NIRSpec | [+] |



Calibration file update subscriptions

Reference files are frequently updated, but you can get notified by email!

Simply send an email to **<subscribe command>@maillist.stsci.edu**.

Subscribe commands

- MIRI: *miri_reffiles_upd-subscribe-request*
- NIRCAM: *nircam_reffiles_upd-subscribe-request*
- NIRISS: *niriss_reffiles_upd-subscribe-request*
- NIRSPEC: *nirspec_reffiles_upd-subscribe-request*
- FGS: *fgs_reffiles_upd-subscribe-request*



JWST Cycle 2 user survey

- User input and metrics key to drive future development
 - Usage metrics (ETC, downloads, proposal submission statistics, etc...)
 - Volunteered input (help desk, **user survey**)
 - User Committee (that's you!)
- Plan to repeat survey yearly
 - Used to interleave proposal planning and data analysis; now merged
- Standard questions allow for trending
- Survey released 2/22/23
 - Open for 2 weeks – preview experience shows that we get 95% of the input on this time scale.
- Please encourage your local communities to respond to the survey. This is one of the key drivers for change and prioritization.



2023 JWST User Survey

Please take a few minutes to provide us with your anonymous feedback on JWST systems, tools, and processes. There are 24 questions in all. Your participation is greatly appreciated.

Next

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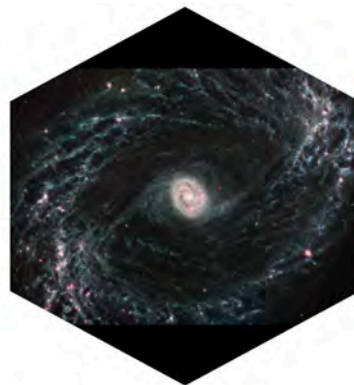


See how easy it is to [create a survey](#).



JWST outreach and news

- STScI's Office of Public Outreach leads JWST news and outreach product development.
- News releases post to [WebbTelescope.org](https://www.webbtelescope.org) and [nasa.org/webb](https://www.nasa.org/webb)
 - [WebbTelescope.org](https://www.webbtelescope.org) is the “deep dive” site for science and contains all high-resolution products
- JWST Press Releases
 - JWST News chief: Christine Pulliam, OPO
 - Generally requires a peer-reviewed journal paper
 - Exception 1: Findings presented at the AAS
 - Exception 2: Image-only releases (e.g., First Images)



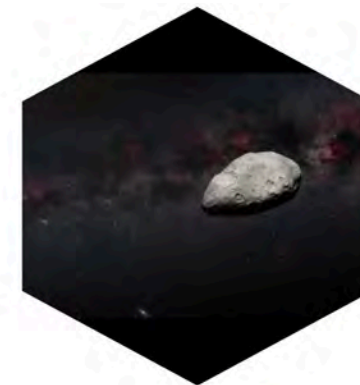
FEBRUARY 16, 2023

NASA's Webb Reveals Intricate Networks of Gas and Dust in Nearby Galaxies



FEBRUARY 15, 2023

NASA's Webb Uncovers New Details in Pandora's Cluster



FEBRUARY 06, 2023

Webb Detects Extremely Small Main Belt Asteroid



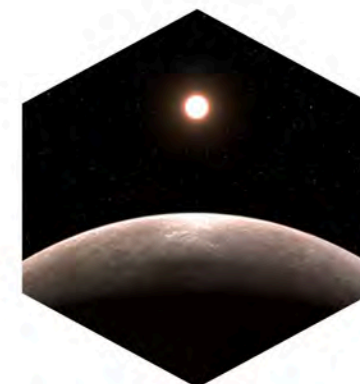
JANUARY 23, 2023

Webb Unveils Dark Side of Pre-stellar Ice Chemistry



JANUARY 11, 2023

NASA's Webb Uncovers Star Formation in Cluster's Dusty Ribbons



JANUARY 11, 2023

NASA's Webb Confirms Its First Exoplanet



News process

- Team submits a potentially newsworthy result
 - Earlier is better!
 - Ideally by email using the news template:
<https://www.stsci.edu/news/scientist-resources>
- Submission is considered by the STScI news office
 - If the PI is European, the submission is typically forwarded to ESA.
- If selected, STScI develops text & visuals based on interviews with science team.
- NASA reviews the news package before release.



