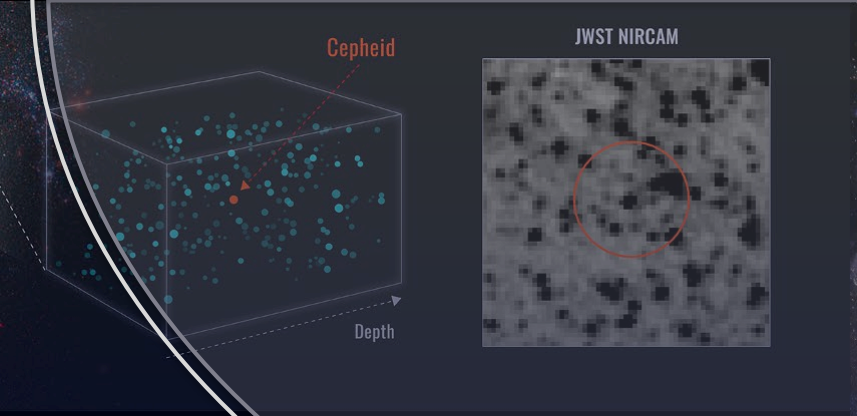
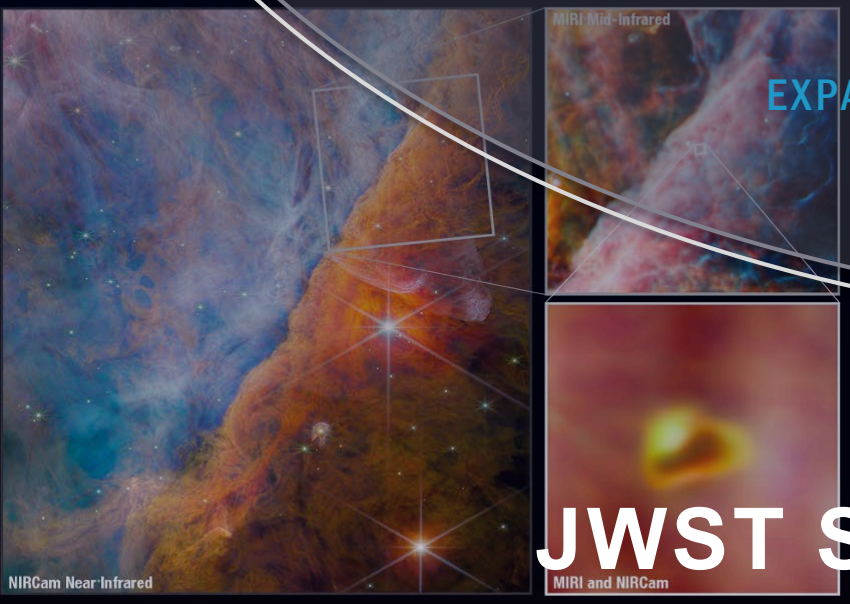


STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY



JWST Science Operations Update

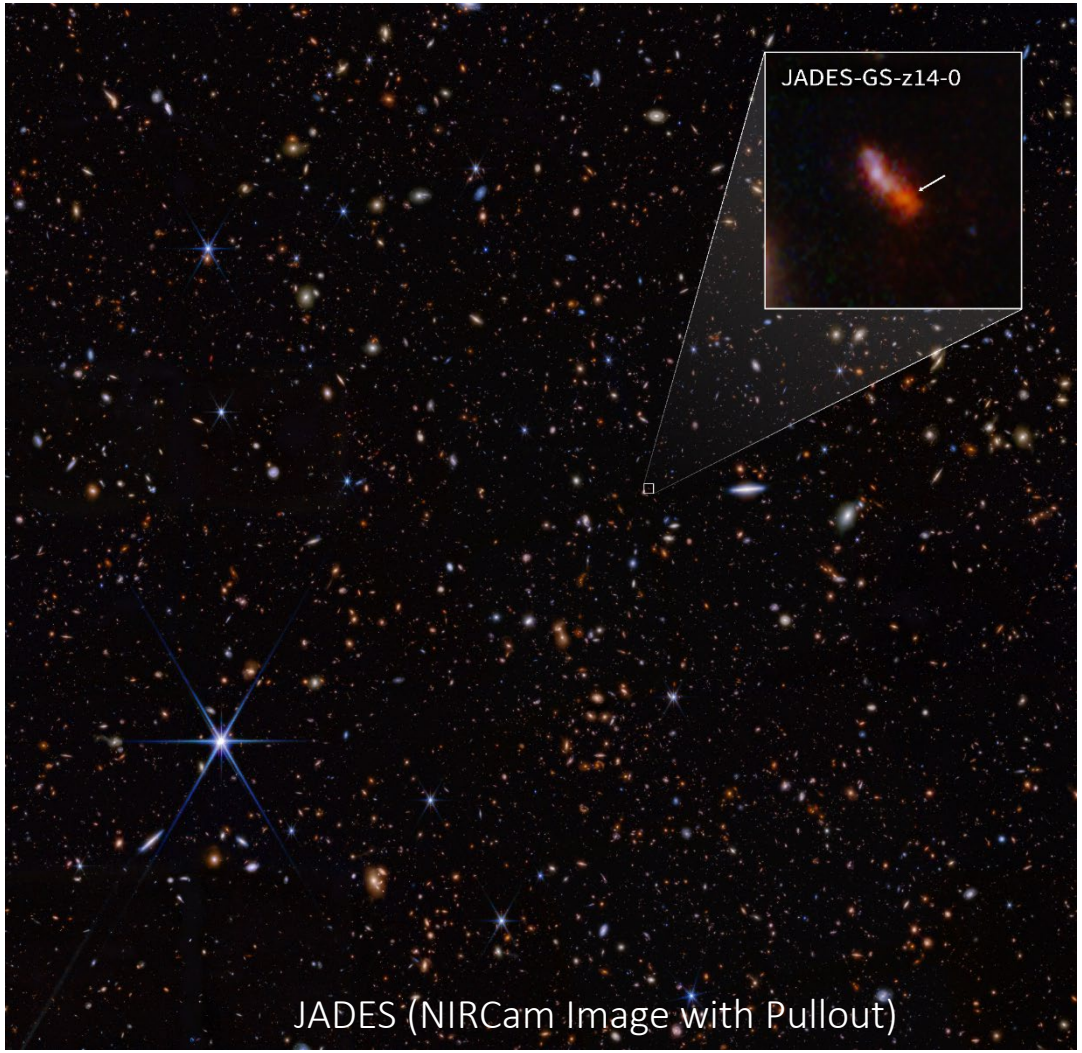
Stacey Bright

STScI JWST Deputy Project Scientist

244th AAS, Madison WI

Introduction

- 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 performance is excellent. We measure wavefront error every other day and rarely need to adjust the mirror.
- We keep enhancing observatory operations and efficiency.
- STScI is continuing to improve pipeline algorithms and calibration reference files as well as communication with the user community.



Credit: NASA, ESA, CSA, STScI, B. Robertson (UC Santa Cruz), B. Johnson (CfA), S. Tacchella (Cambridge), P. Cargile (CfA).

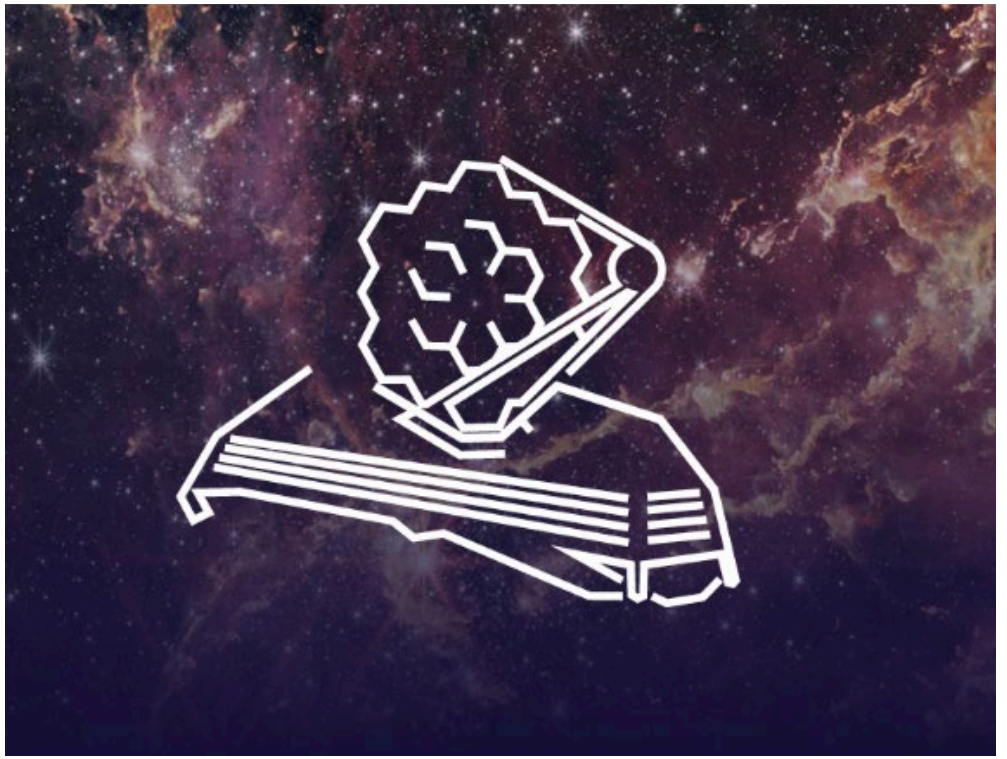
Observatory Update

- Cycle 1 and 2 programs are 97% and 52% complete, respectively. Plan windows for Cycle 3 have been published. Observations begin July 1, 2024.

- During Cycle 2 about 87% of observatory time was dedicated to schedule prime science visits. 60% of the time was spent collecting science and calibration photons and less than 5% of the time on failed visits.

- We nominally have 10 hours Deep Space Network (DSN) communication per day, sufficient to manage observations and download data. DSN availability limitations are managed by the scheduling team.

- The observatory is in the Micrometeoroid Avoidance Zone (MAZ) less than 20% of the time. Thanks to careful scheduling we are meeting that constraint for Cycle 2 observations.

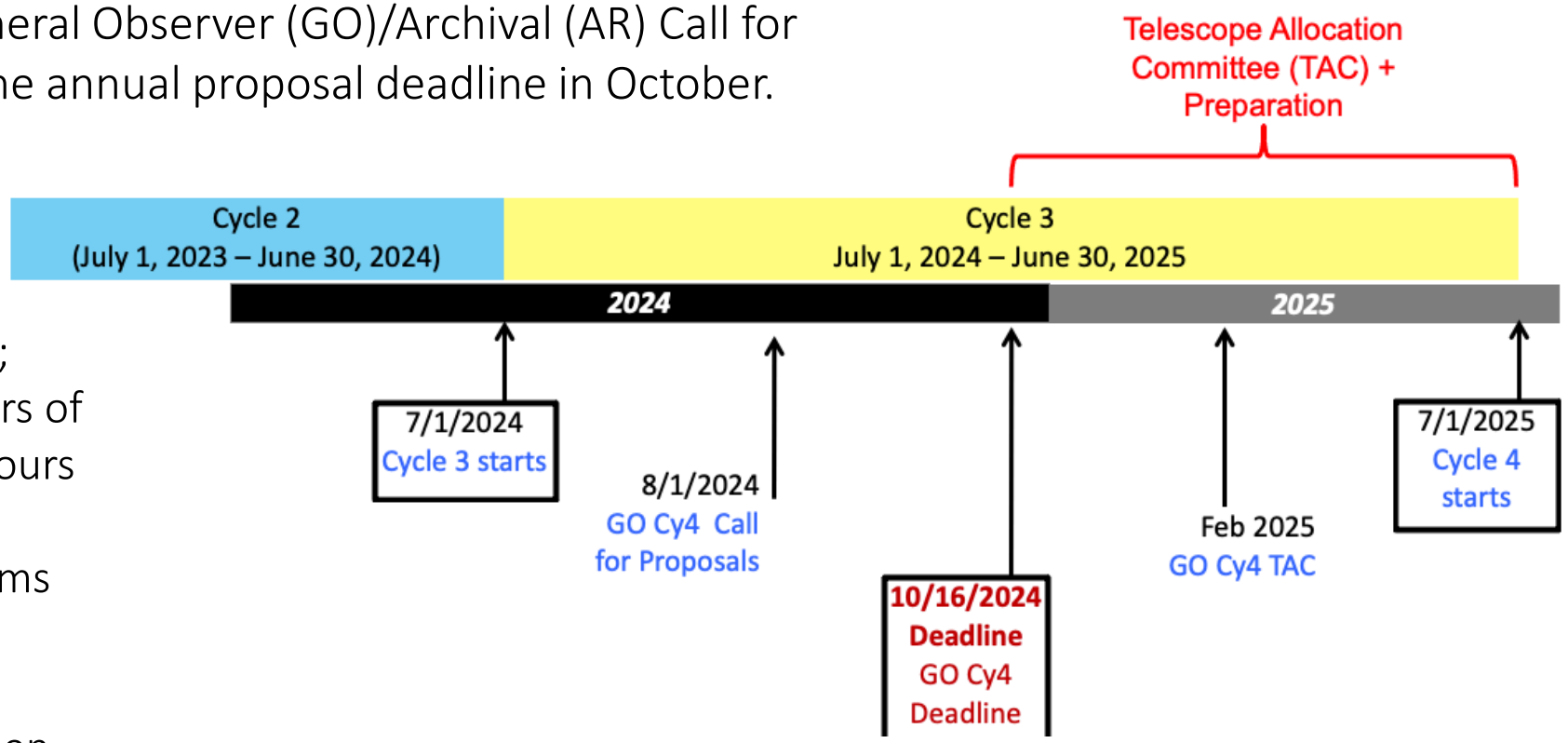


NASA Project Science Team

Science Timeline: Cycle 3 - 4 and Beyond

STScI releases the annual JWST General Observer (GO)/Archival (AR) Call for Proposals in August leading up to the annual proposal deadline in October.

- Cycle 3 update:
  - 1,931 unique proposal submissions (a world record!); 253 proposals with 5,500 hours of prime time and up to 1,000 hours of parallel time), as well as 25 archival and 12 theory programs were selected by the Cycle 3 JWST TAC.
  - Cycle 3 plan windows have been assigned and observing will begin on July 1 2024.



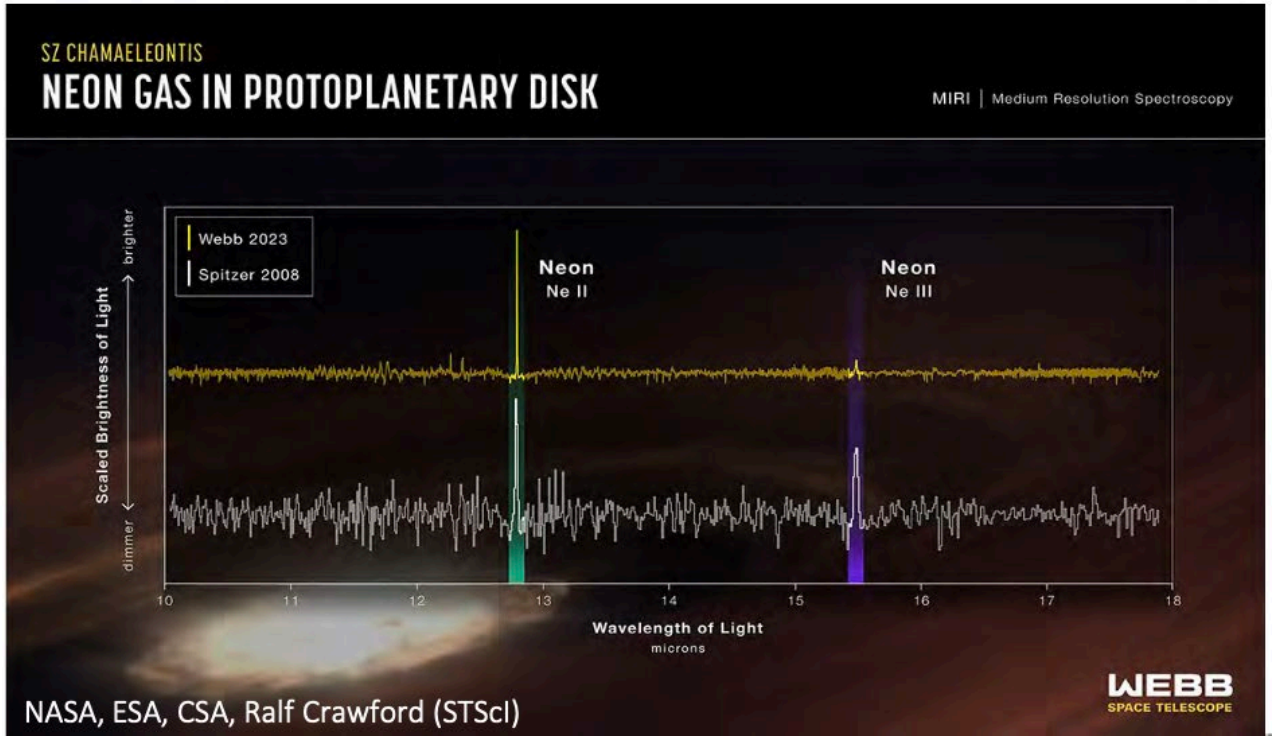
Science Timeline: Cycle 3 - 4 and Beyond

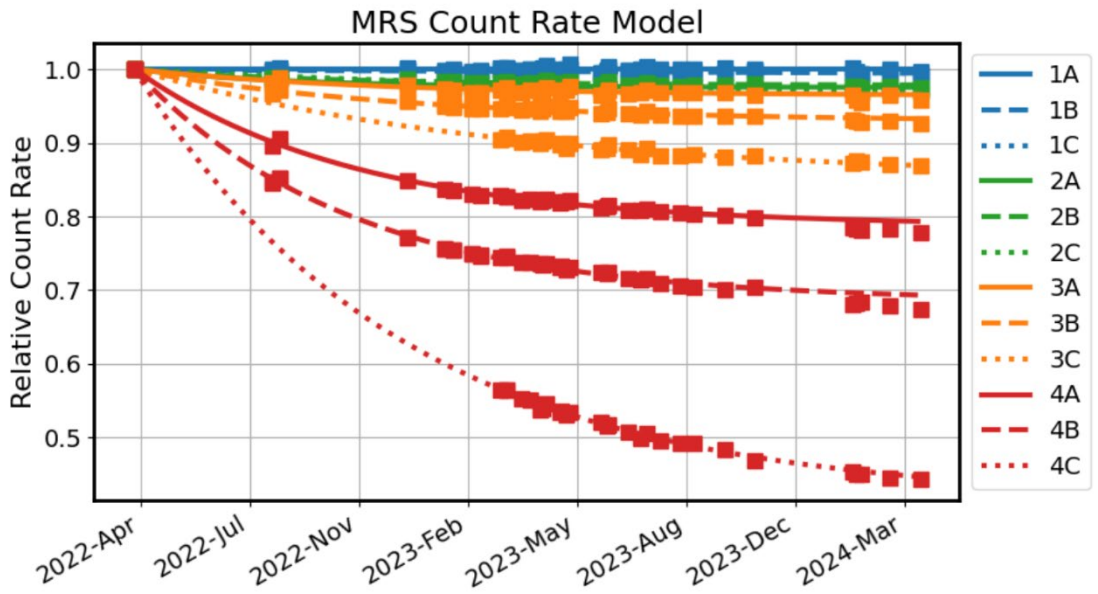
- Cycle 4 Call for Proposals has **three major changes** as recommended by the JSTUC:
  - *Page limits:* Small proposals will decrease from **8 pages to 4 pages** and those for Large proposals from **12 pages to 6 pages**. This will reduce workload for reviewers and match other major observatories
  - *Scientific categories:* science categories will better reflect scientific communities and needs.
  - *Proposal hour boundaries:* moderate increases in the proposal hour boundaries of Small, Medium and Large programs to help equalize the review load across panels.

Science Instruments

- All Near-IR instruments are operating nominally and producing excellent scientific results.

- The MIRI instrument has experienced a loss of throughput at the longest wavelengths:
  - The overall MIRI trend shows that the imager, as well as most MRS channels/bands, exhibit a settling behavior.
  - The root cause remains under investigation
  - The JWST pipeline accounts for this evolution in sensitivity
  - The Cycle 4 ETC (available ~ Aug 1) will estimate S/N at the end of Cycle 4.
  - Still producing excellent science





JWST Pipeline Update

The JWST pipeline is our top priority:

1. create the best automated pipeline capable of providing science ready data products for most users
2. provide the necessary tools for users to make further improvements for their unique science cases.

- New JWST Pipeline (JP) Coordination Team, led by D. Law, created to plan pipeline updates

- We seek input from users to help set our priorities. The November/December 2023 user survey provided feedback from 400+ individual responses on the pipeline.

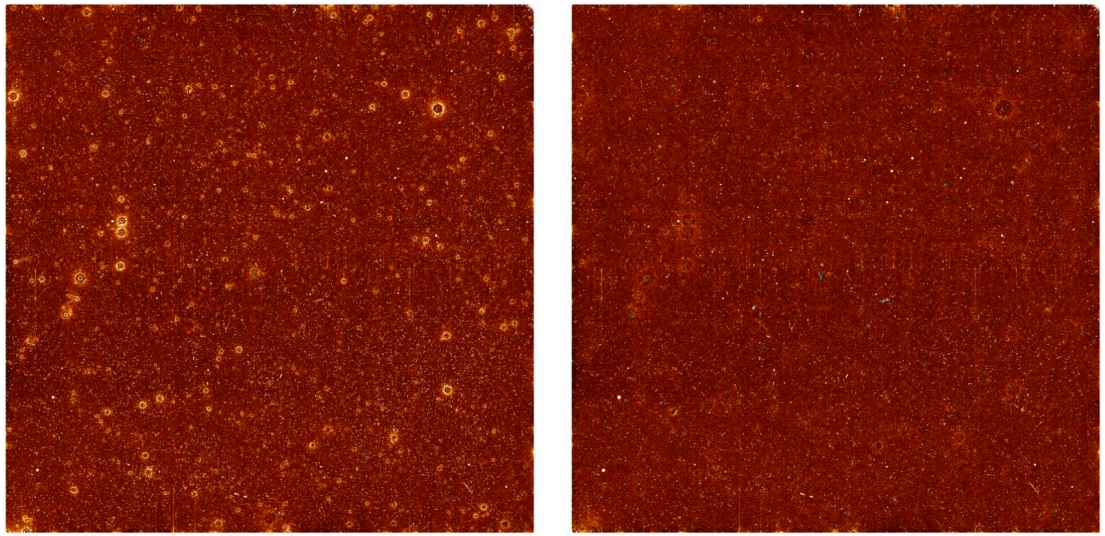
Identified top 5 areas to focus on:

1) Bad pixels/cosmic rays/outlier detection
2) Correction for 1/f noise
3) Runtime (detector1 pipeline stage in particular)
4) Better JDox documentation of the pipeline data, known issues, and options for reprocessing for each instrument mode.
5) WCS alignment

The latest development pipeline is always available from: https://github.com/spacetelescope/jwst

JWST Pipeline Updated

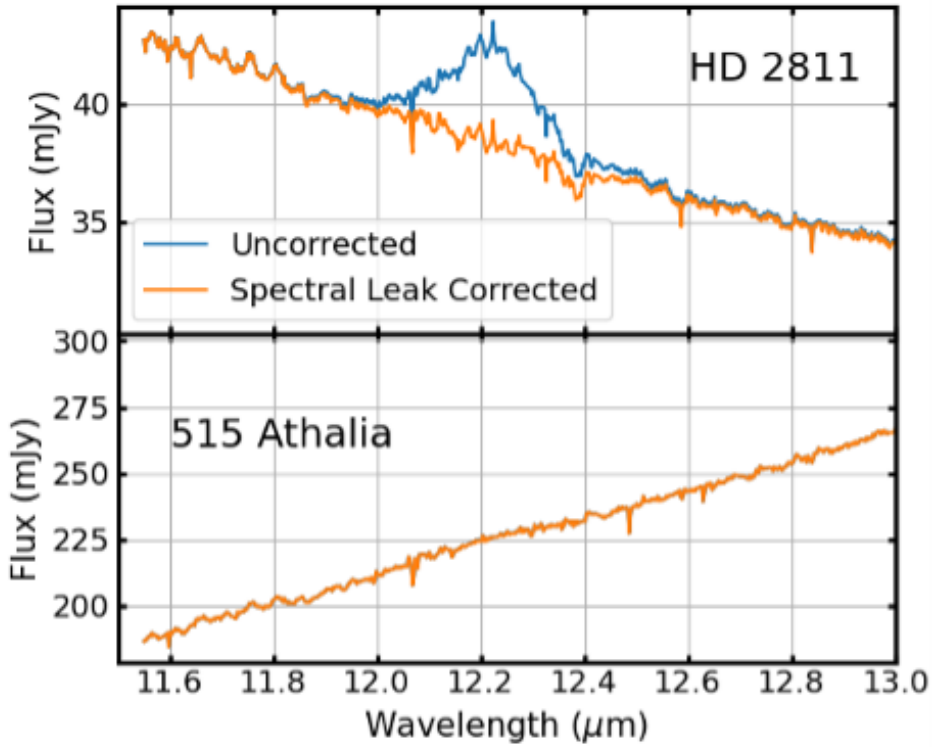
- Some recent updates:
  - Major overhaul of the JDox pipeline docs and data organization
  - WCS issues in pure-parallel data fixed
  - NIR detectors ”snowball” and MIR detectors “showers” correction
  - MRS Spectral leak correction
- Upcoming highlights:
  - major changes to detection and treatment of bad pixels
  - runtime of the calwebb_detector1 stage
- See JDox for a list of improvements in current and future builds



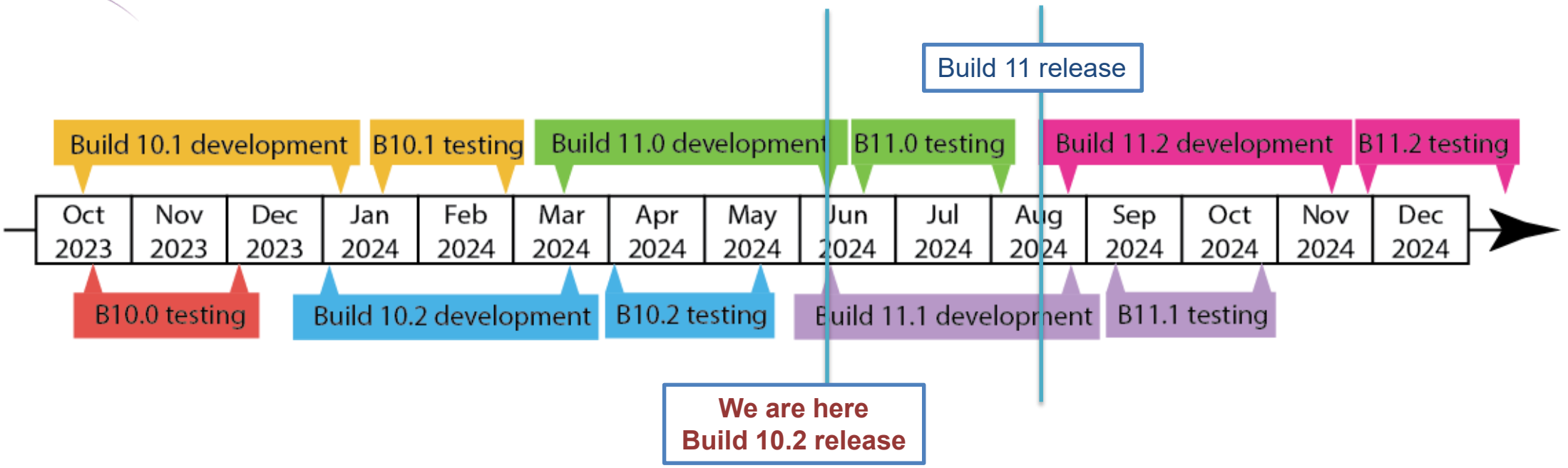
Before snowball correction

After snowball correction

MRS Spectral leak correction



JWST Pipeline Update



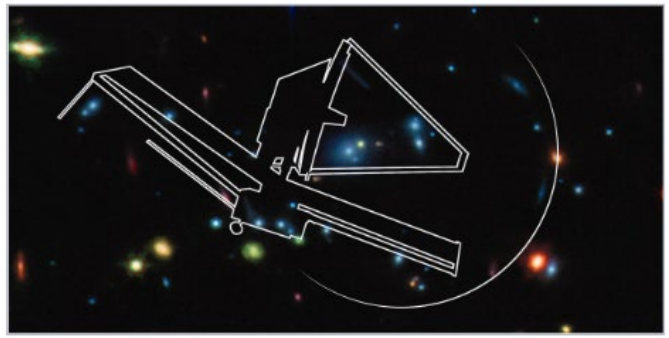
New pipeline builds are released quarterly (following 3 months of development and 6 weeks of testing)

- Build 10.2 due this week
- Build 11.0 tentatively set for August 2024
- 6-8 weeks for full reprocessing of all data in MAST or you can reprocesses yourself if you need it sooner
- See JDox for a list of improvements in current and future builds

Community Engagement

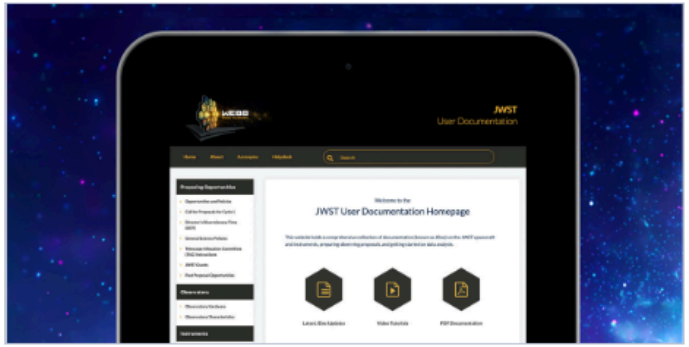
- Subscribe to JWST Observer News:
  - Subscription news mailing list
  - Aim for ~ 4 news items per month
  - Post instrument/calibration/pipeline updates, observatory operations, upcoming events, workshops

- Visit us at the STScI Booth:
  - ”Ask-an-Expert” sessions are available to schedule
  - Take a 1-minute survey!
  - Share your thoughts, concerns and feedback with us



May 15, 2024

Pipeline News: MIRI Emicorr Step Is Now Available



May 23, 2024

New Documentation for Users with Accepted JWST Programs Is Now Available

New user documentation describes the process of finalizing accepted programs for scheduling and execution.

Community Engagement

We aim to provide the JWST User Community with the most up-to-date information on observatory operations, instrument performance, pipeline, calibration, data analysis tools, proposals, surveys & events

- We want to hear from you!
  - JWST Help Desk
  - Webb Office Hours
  - JWebbinars
  - Dedicated Instrument Scientists for PIs

JWST Help Desk

Community Engagement

- Webb Office Hours:
  - Invite community to join a team of STScI experts to directly ask their data questions
  - Cadence: 2nd and 4th Thursday of each month at 11am ET on WebEx
  - Answer questions on Pipeline, calibration, instrument performance, proposal planning, etc.
  - Not recorded, but Q&As are captured on the JWST Event Archive Page

Community Engagement

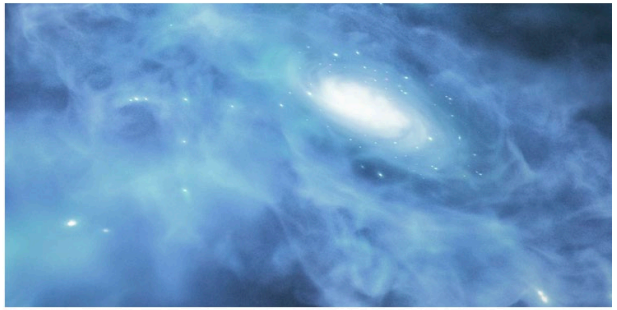
- JWebbinars:
  - STScI hosts regular JWebbinars to provide virtual, hands-on instruction on common data analysis tools and methods for JWST observations (e.g. Pipeline , Jdaviz, proposal tools, Jupyter notebook demos)
  - Virtual programming environment (hosted platform) is provided so that participants will not be required to install software prior to attending the event.

Do you have a newsworthy result?

- Do you have a potentially newsworthy result?
  - Reach out to the STScI's Office of Public Outreach*
  - A press release discusses scientific findings and why they are significant for a general audience
  - If selected STScI works closely with investigator team to develop text and supporting visuals
  - Requires a peer-reviewed journal paper, exceptions:
    - Findings presented at AAS conferences
    - Image-only release
  - Come early! At least – 6 weeks before publication or conference

- Hannah Braun is at AAS to talk about your submission!

*If PI is European, submission is forwarded to ESA for consideration



May 23, 2024 | Release ID: 2024-114

Galaxies Actively Forming in Early Universe Caught Feeding on Cold Gas

Read the release >

May 20, 2024 | Release ID: 2024-113

NASA's Webb Cracks Case of Inflated Exoplanet

Read the release >

We look forward to 20 years of science with this fantastic observatory!