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JWST Mission and Science Operations Center Update

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AAS 246 Anchorage AK, June 2025

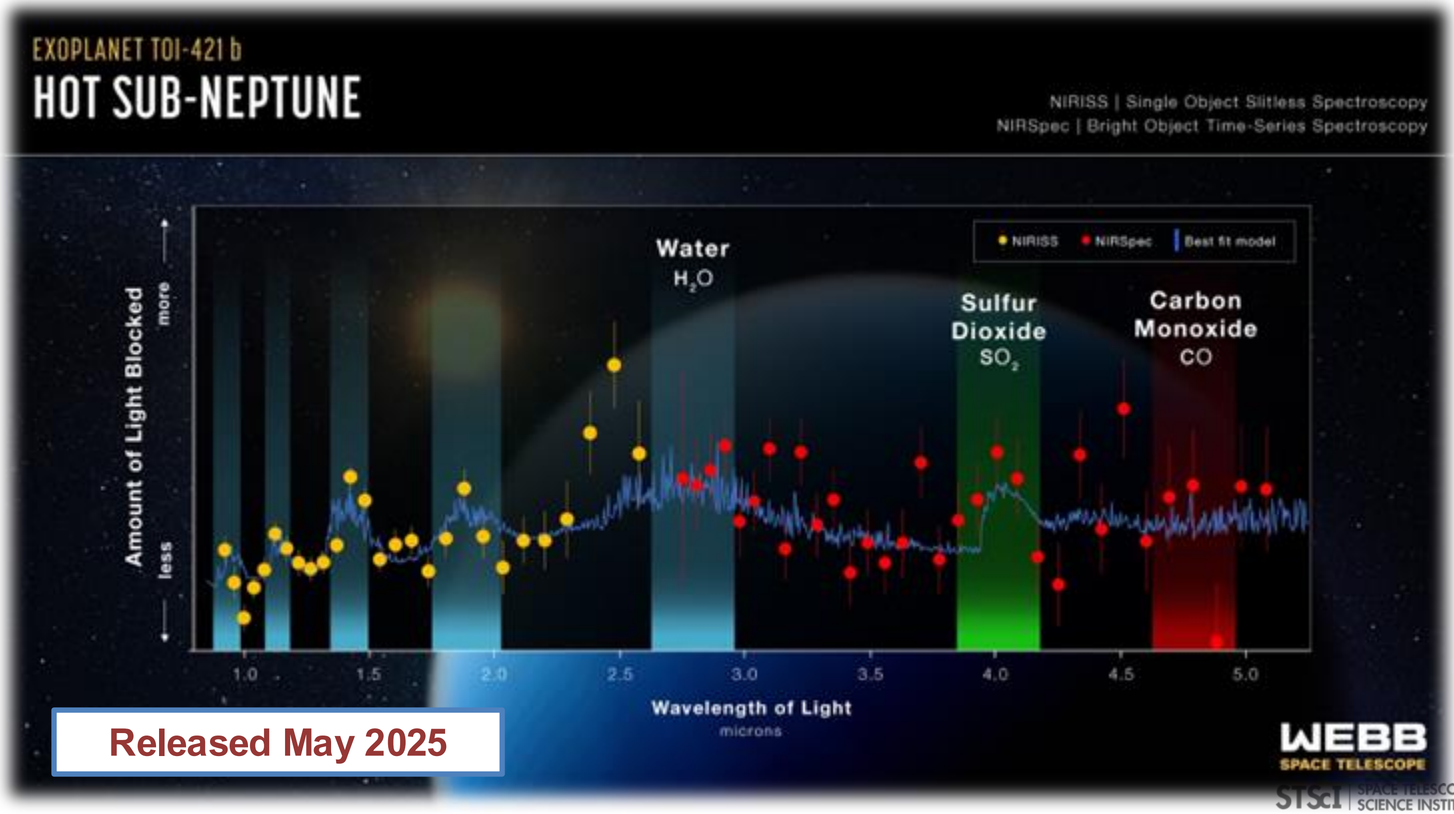
JWST Summary

- JWST continues to produce **spectacular science results** across all fields of astronomy, thanks to its unparalleled resolution, optical quality, sensitivity, stability and infrared capabilities

- **Publications and demand are still accelerating**; more than 760 peer-reviewed research papers were published and 2377 proposals were submitted in 2024.

- Overall, the **observatory performance is excellent** and we keep enhancing observatory operations and efficiency.

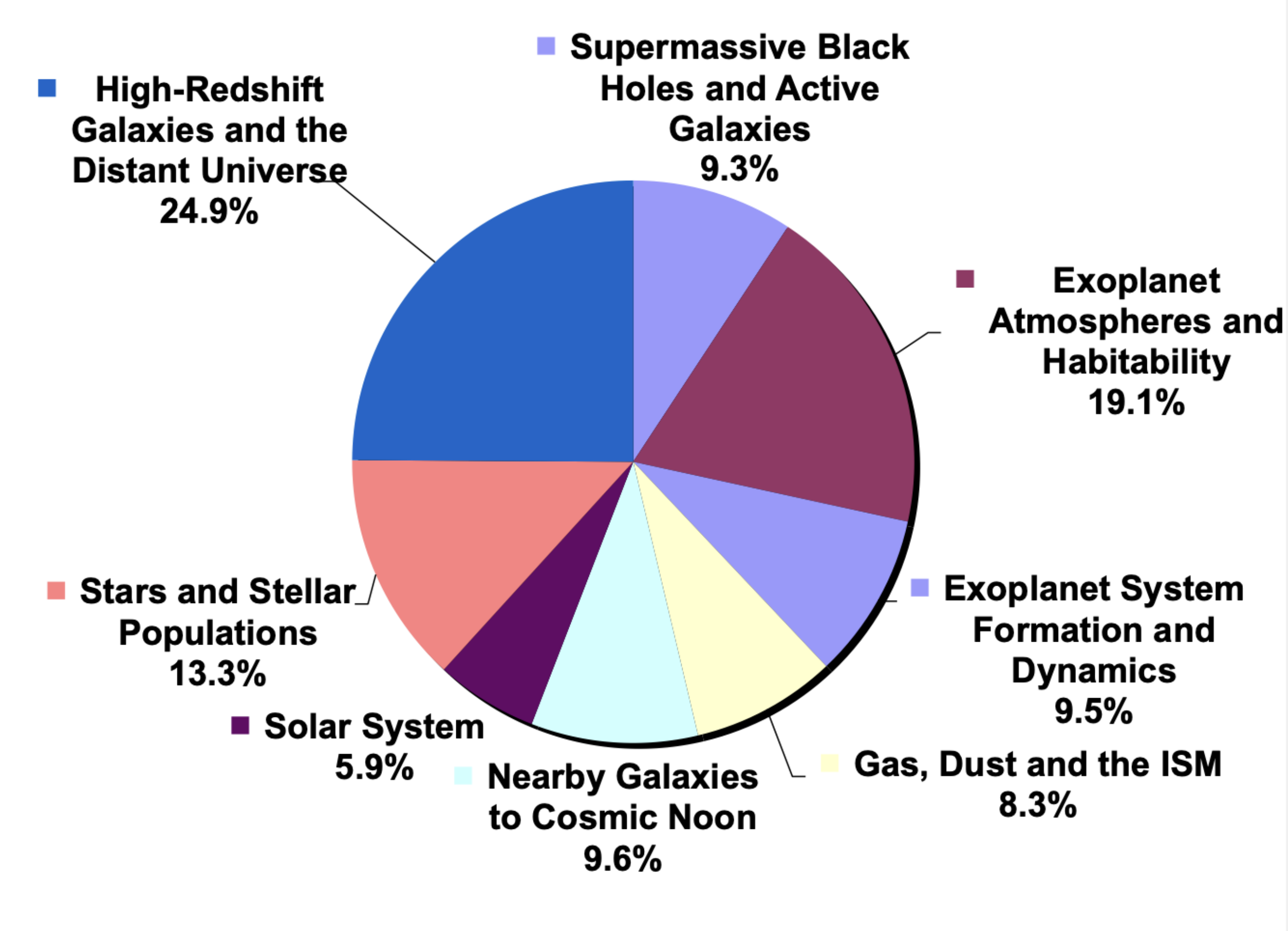
- STScI is continuing to **improve the pipeline** and calibration reference files. We are **providing resources** to and actively engaging with the user community.



Science Timeline: Cycle 4 - 5 and Beyond

- Cycle 4 Status:
  - 2,377 unique proposal submissions (another record!); over-subscription of around 9:1
  - 274 proposals were recommended by the JWST TAC.
  - Cycle 4 plan windows have been assigned and observing will begin on July 1 2024.

- Cycle 5 Call for Proposals:
  - Released: Aug 1, 2025
  - Deadline: Oct 15, 2025



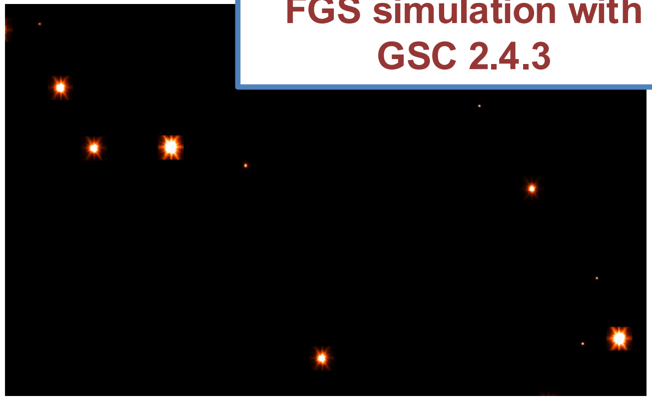
Observatory Performance

- **High efficiency:** 81% on source, steady progress on cycle completion rate (C1: 99.7%, C2: 97.3%, C3: 63.1%), declining rates of skipped (5.1%) and failed (2.1%) visits

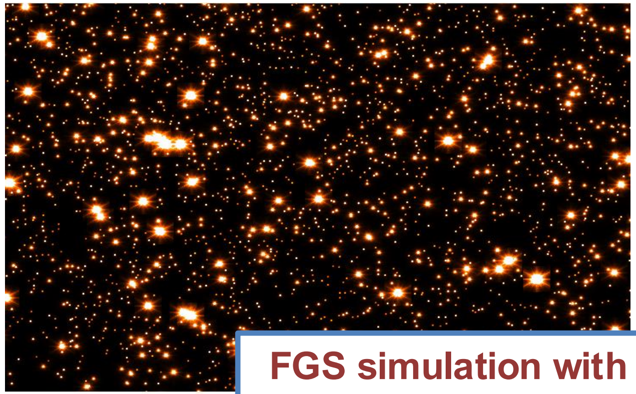
- **We continue to improve guiding performance in challenging, crowded fields**
  - GSC 3.1 now in operations
    - Better star-galaxy discrimination
    - We expect improvements in guiding success comparable to what we are now achieving in SgrA*

- **We maintained and improved pointing through geometric calibrations**

- **Wavefront error remains far better than requirements and expectations**
  - Wavefront sensing monitoring cadence now every 4 days instead of 2, giving 80 hours/year back to science pool



FGS simulation with GSC 2.4.3



FGS simulation with GSC 3

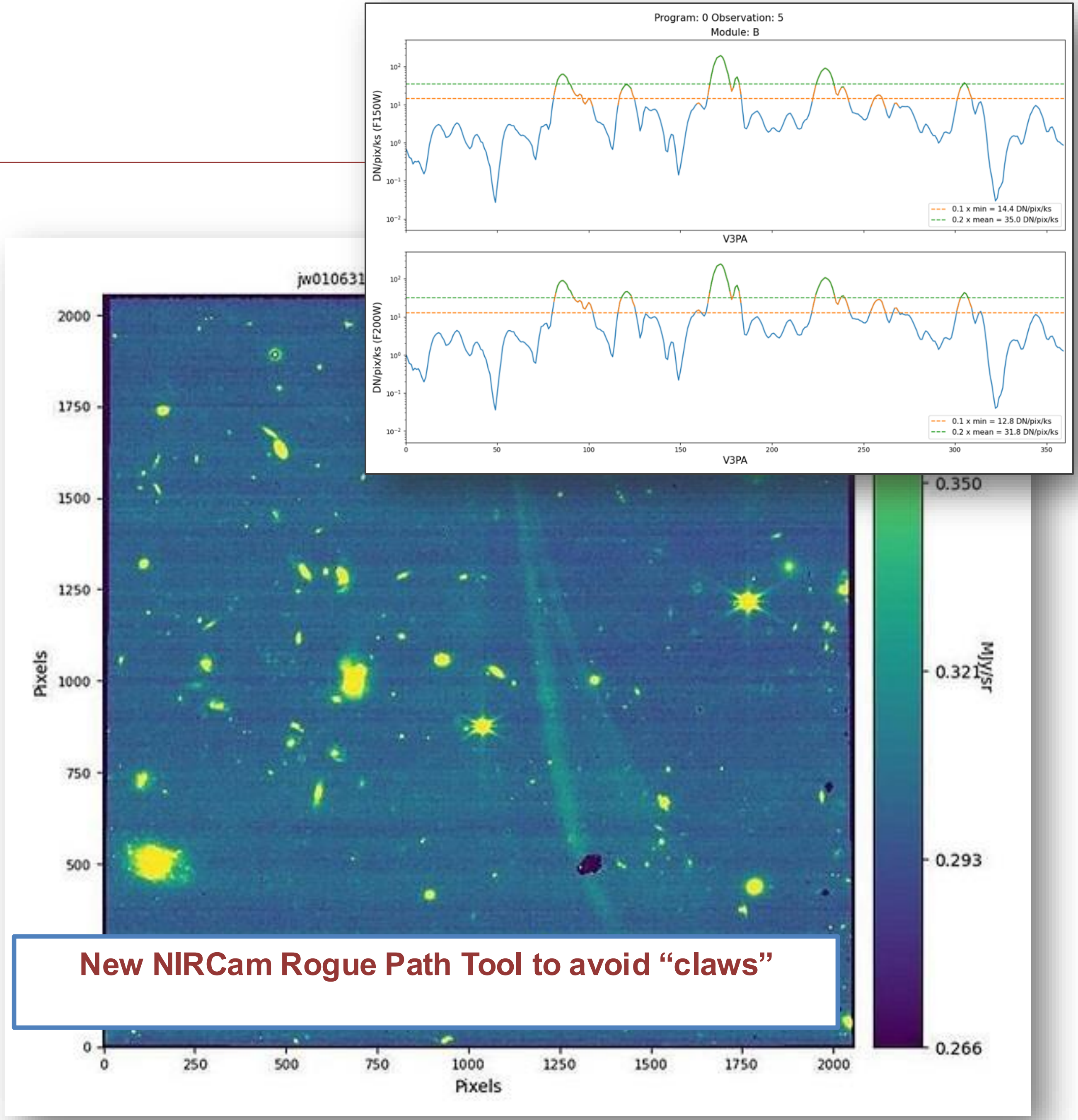
Science Instruments

- All NIR instruments are operating nominally and producing excellent scientific results

- The MIRI instrument loss of throughput at the longest wavelengths is being closely monitored and included in planning tools and calibration.
  - The Cycle 5 ETC will estimate S/N at the end of Cycle 5.
  - Keeps producing excellent science

- NIRCam:
  - Grism Time Series mode now includes short wavelength spectra (starting Cycle 4)
  - New "JWST Rogue Path Tool" to identify PAs to avoid claws

- MIRI wide-field slitless spectroscopy mode planned for Cycle 5

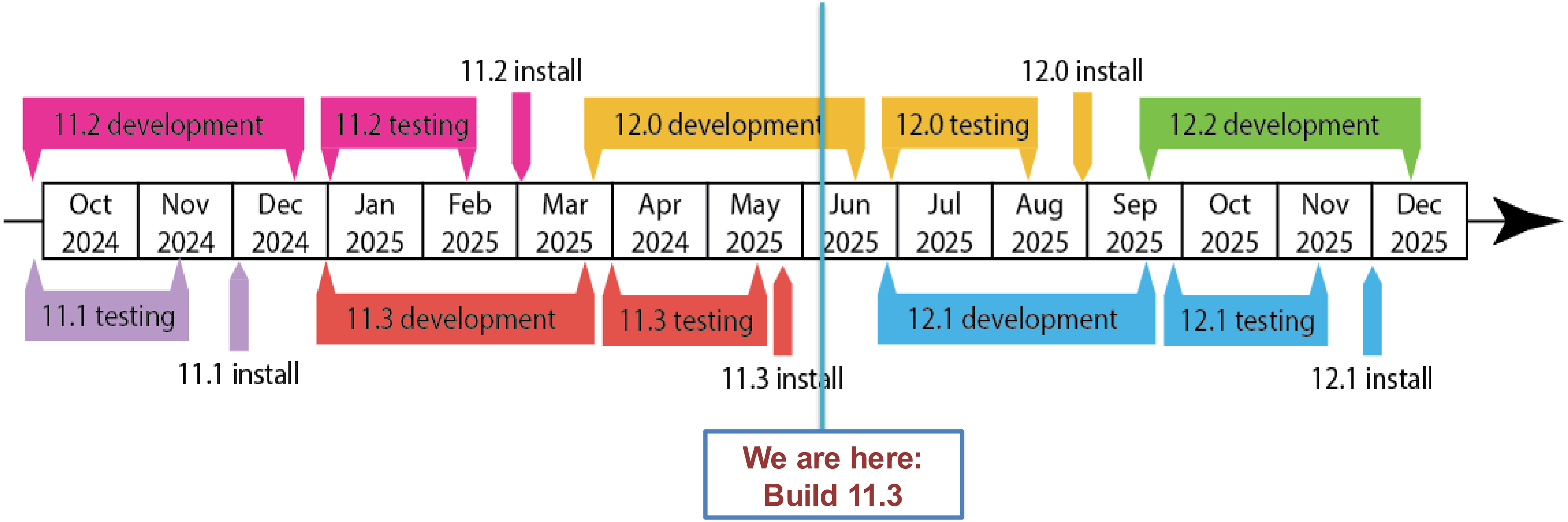


JWST Pipeline Update

Calibration pipeline continues to make significant improvements for all instruments:

- JWST Pipeline team identifies key areas of focus for each build, and relies on feedback from the community from the surveys, Help Desk tickets, etc.

- Quarterly calibration updates (each pipeline build is tied to a specific set of reference files). Improved reproducibility, no unexpected changed in reductions, easier to release updates.

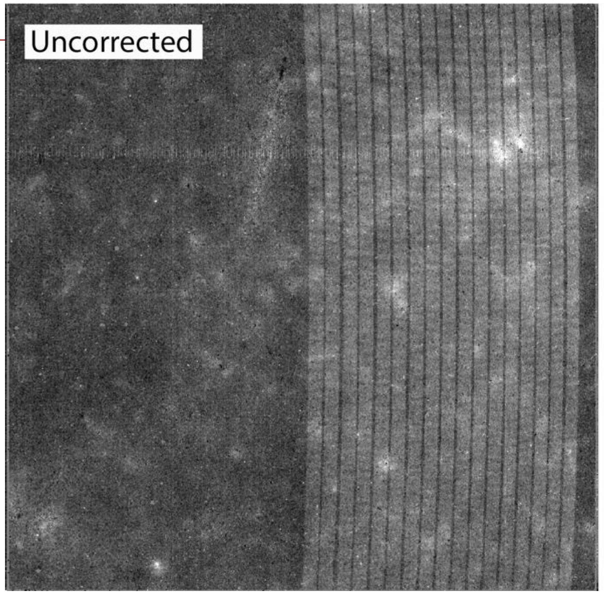


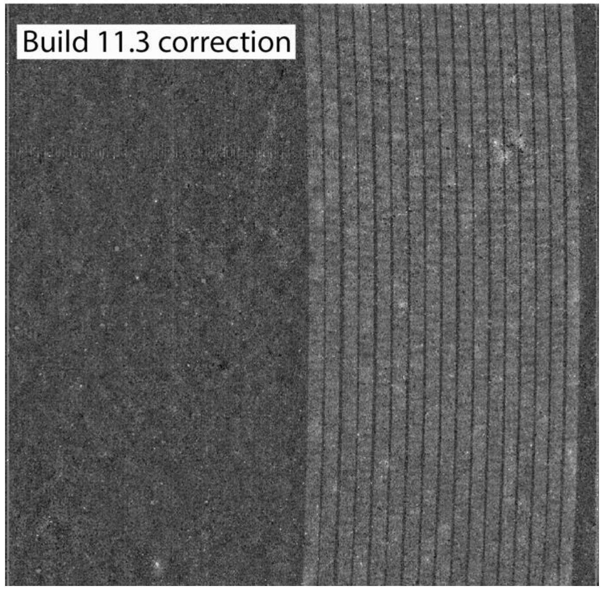
JWST Pipeline Update

Highlights from Builds 11.2 and 11.3:

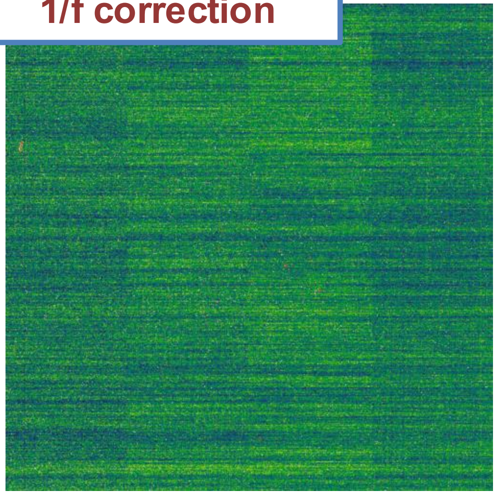
- Improvements to code infrastructure and detector runtime
- *Progress on 1/f and 1/f-like noise*
- *Major improvement to MIRI MRS cosmic ray showers*
- Improvements to spectral extraction and cosmic ray flagging
- Improvements to background subtraction for NIRISS WFSS
- Fixes to outstanding WCS issues

MIR Shower correction

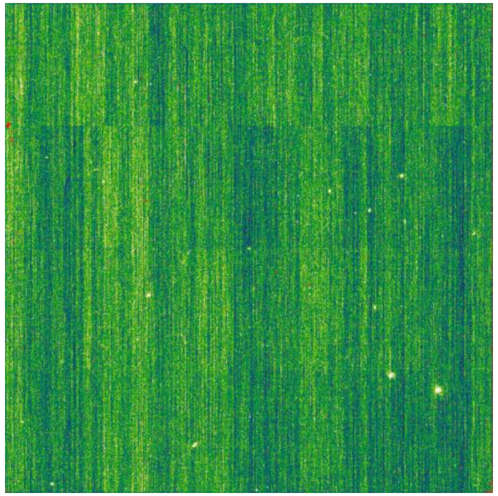




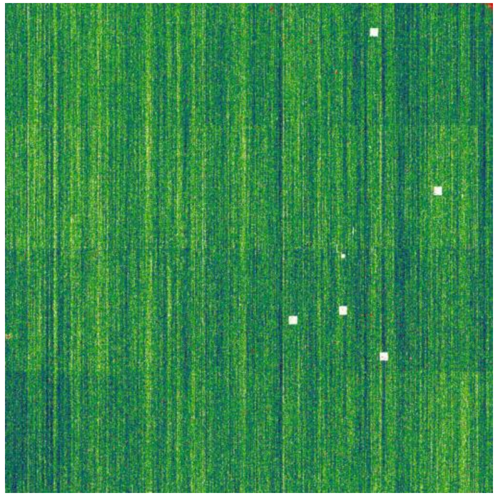
1/f correction



NIRCam LW



NIRISS

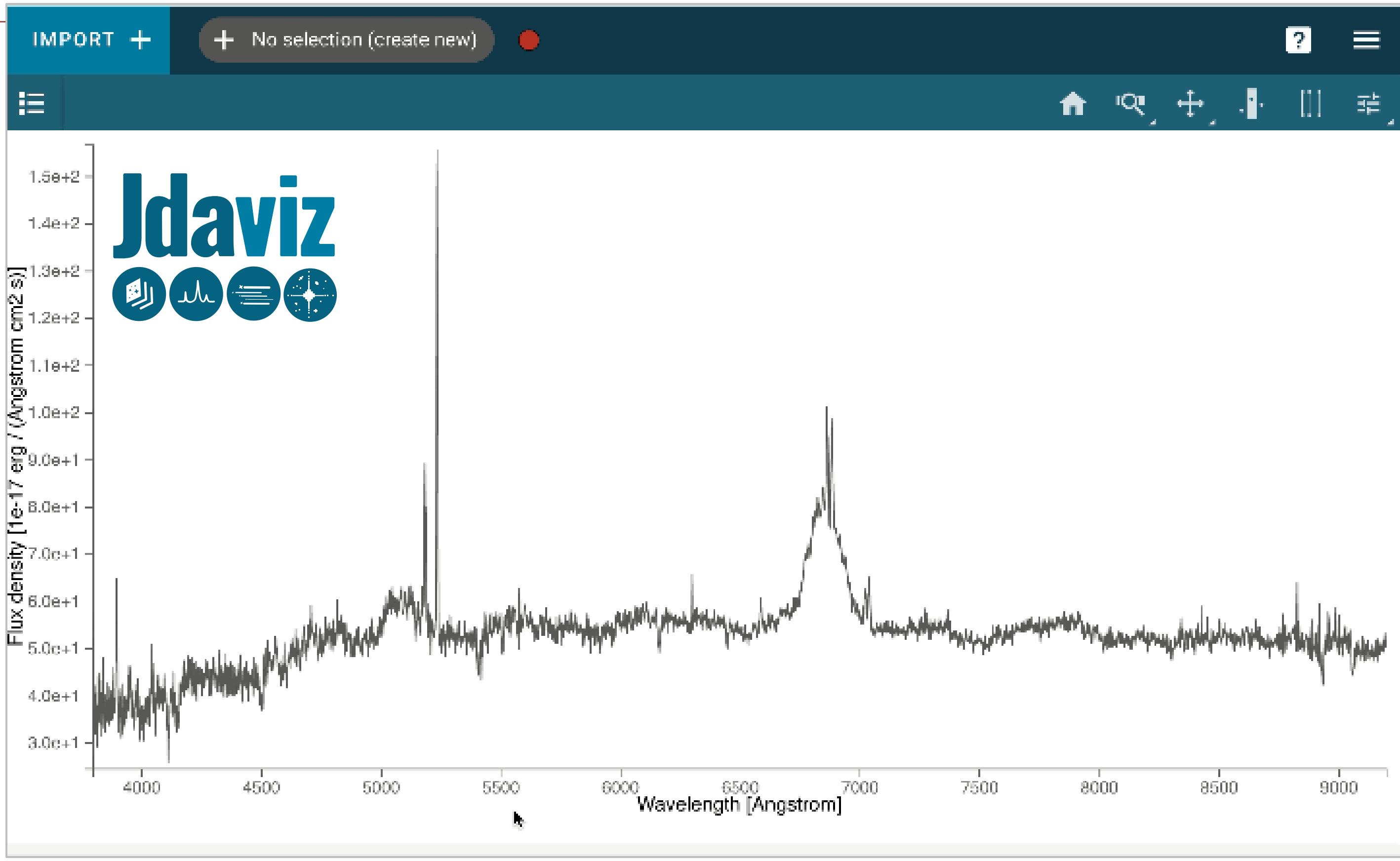


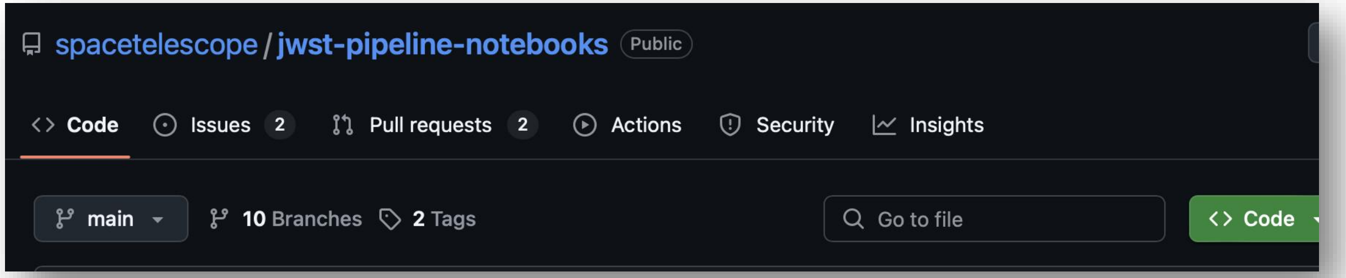
NIRSpec (NRSRAPID)

JWST Data Analysis Tools

- [Jdaviz]
  - Interactive visualization of JWST spectroscopic and imaging data
  - New data menu design and features implemented based of community feedback
  - Continual improvements to performance and bug fixes

- Curated [Pipeline Notebooks] demonstrate how to rerun the pipeline and analyze data
  - New notebooks are available for NIRCam and MIRI imaging; MIRI LRS; MIRI TSO; NIRSpec FS, BOTS, and MOS
  - New analysis notebooks: MIRI and NIRCam PSF photometry; STPSF examples; NIRCam WFSS simulations

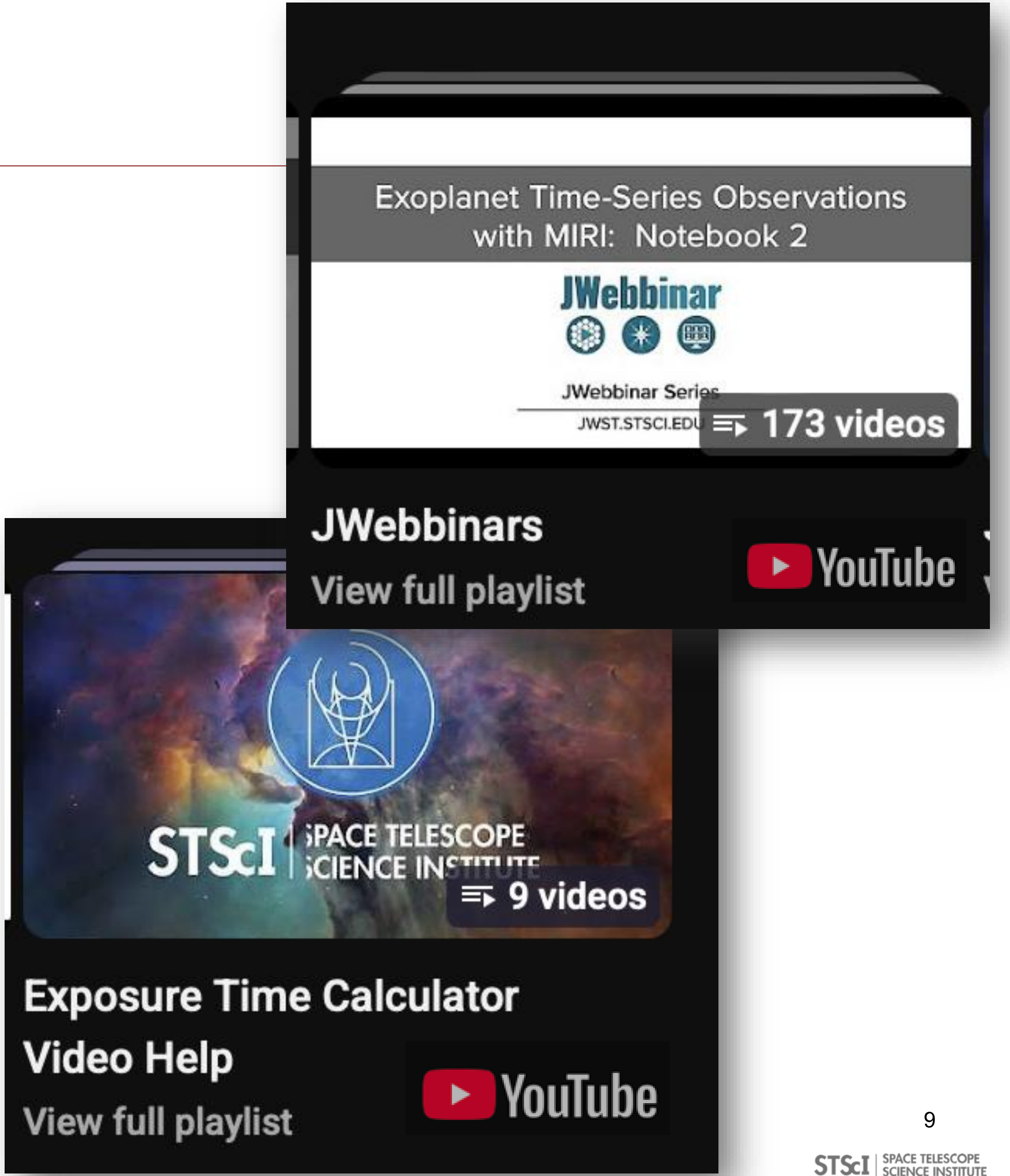




JWST Data Analysis Tools

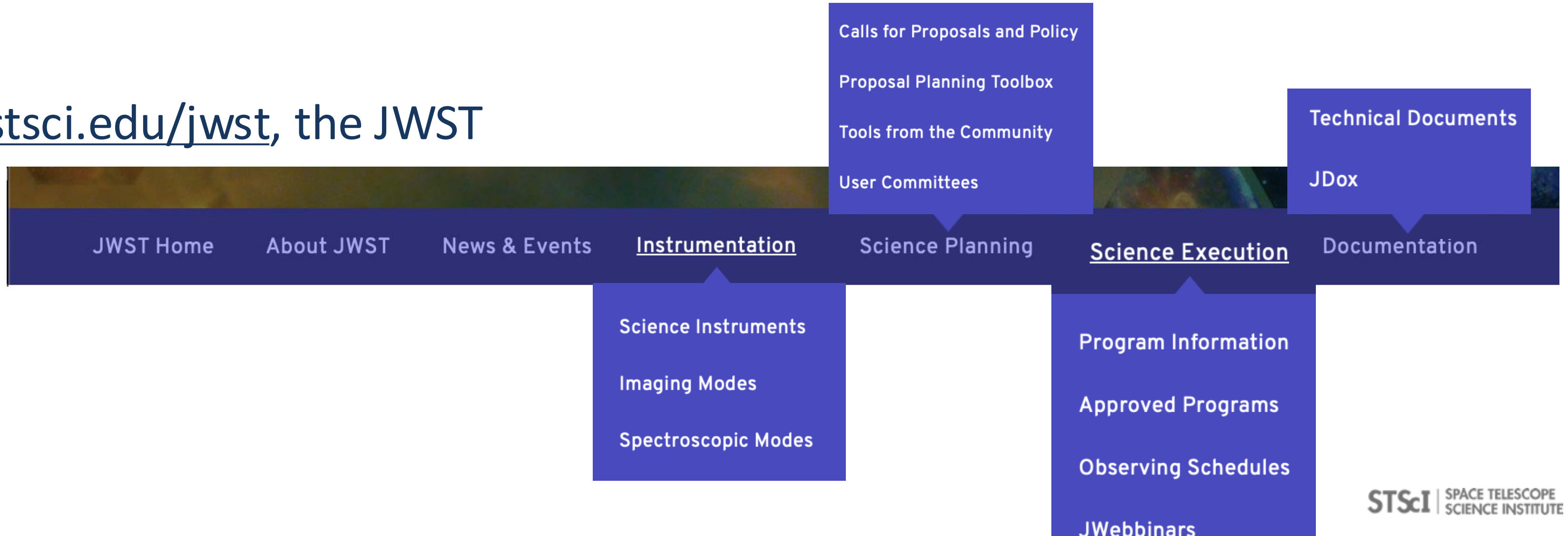
- JWebbinar courses
  - Live, hands-on instruction on data analysis tools and methods for JWST observations
  - Virtual programming environment (hosted platform) is provided so that participants will not be required to install software prior to attending the event.
  - Many new sessions planned for fall and winter 2025

- JWST Observer YouTube channel
  - Newest video on NIRCam Rogue Path Planning Tool for Avoiding "Claws" Artifacts
  - ETC, APT demonstrations



Community Engagement

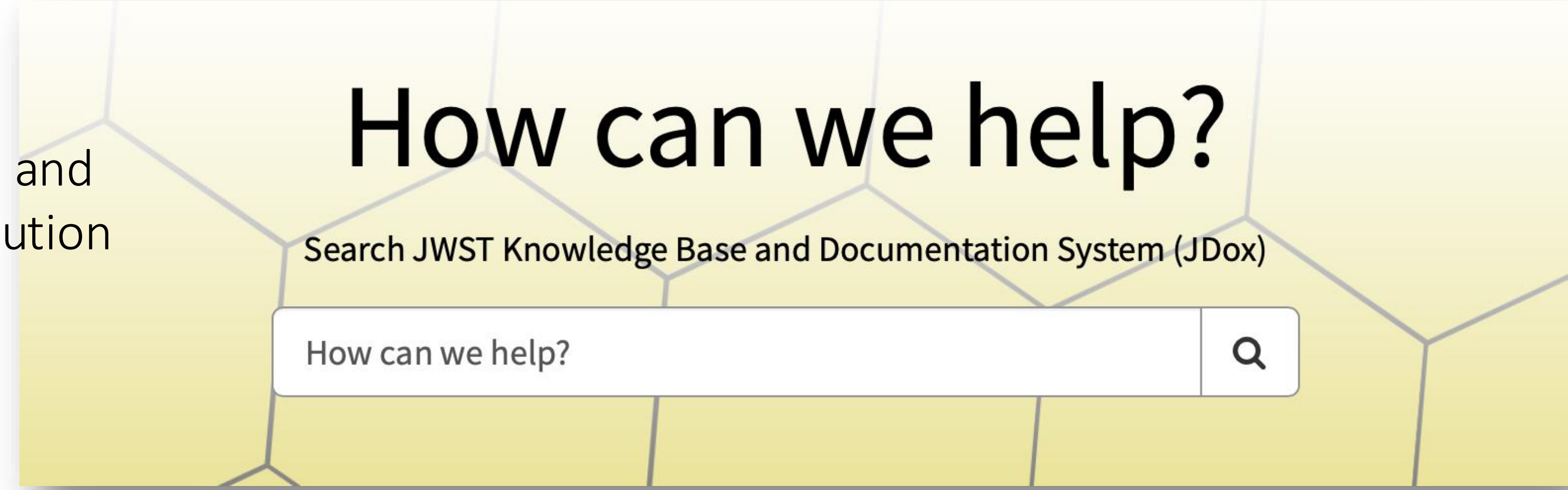
- Subscribe to JWST Observer News:
- Our primary line of sharing news and communicating with our user community.
- Post instrument/calibration/pipeline updates, observatory operations, upcoming events, workshops and webinars
- Starting in Cycle 4, all PIs and Co-Is are automatically subscribed
- Follow us on social media
- More resources on https://www.stsci.edu/jwst, the JWST Observer Ecosystem:



Get Help

- [Webb Office Hours]
  - Invite the community to join a team of STScI experts to directly ask data questions
  - Every 2nd and 4th Thursday of each month at 11am ET on WebEx
  - Answer questions on Pipeline, calibration, instrument performance, proposal planning, etc.

- JWST Help Desk & User Surveys
  - We want to hear from you!
  - Ongoing surveys are sent to PIs and Co-Is 1 and 9 months after execution of first observation



Community Engagement

- Inaugural JWST Summer School: Aug 4 – 15, 2025
  - Week 1: Features lectures on JWST and High-z transient science
  - Week 2: Hands- on focus on observational and analytical techniques, creating JWST programs and running the calibration pipeline
- *Registration for virtual participation during the first week is still possible!*
  - Deadline: June 27th

Public Outreach

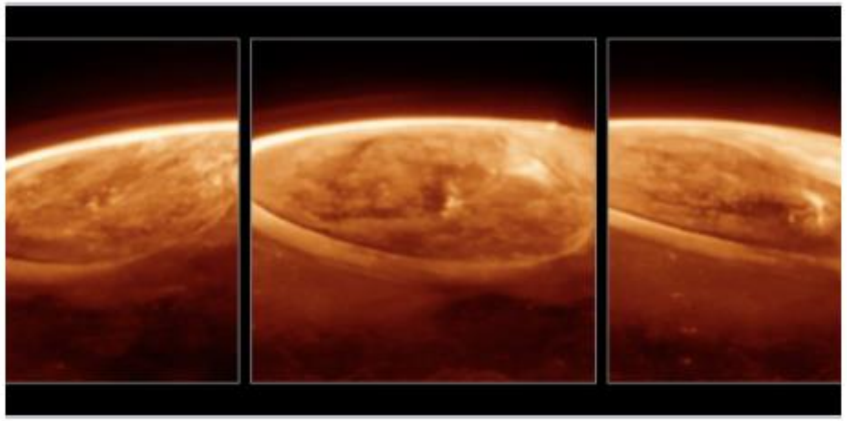
Outreach engages the public and drives broad support for NASA's current and future missions:

- 21 News Releases since January 2025
- 36 Webb news releases in 2024 resulted in 13,000+ online mentions & articles with a total potential audience of 48 billion

Do you have a potentially newsworthy result?

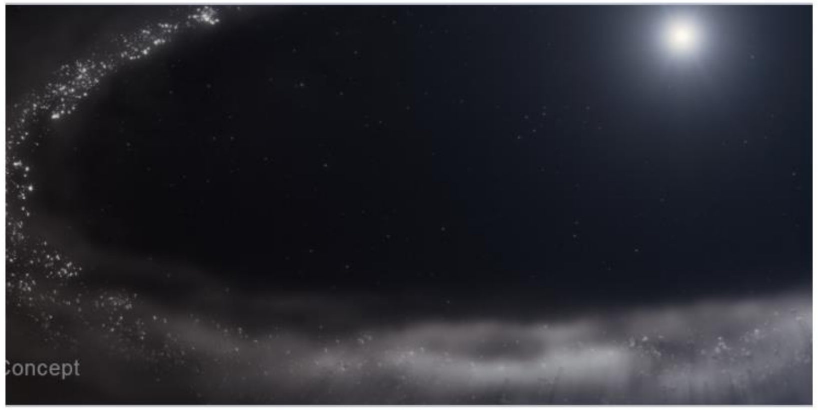
- Reach out to the STScI's Office of Public Outreach*
- If selected STScI works closely with investigator team to develop text and supporting visuals
- Come early! At least – 6 weeks before publication or conference

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



May 12, 2025 | Release ID: 2025-108

NASA's Webb Reveals New Details, Mysteries in Jupiter's Aurora



May 14, 2025 | Release ID: 2025-119

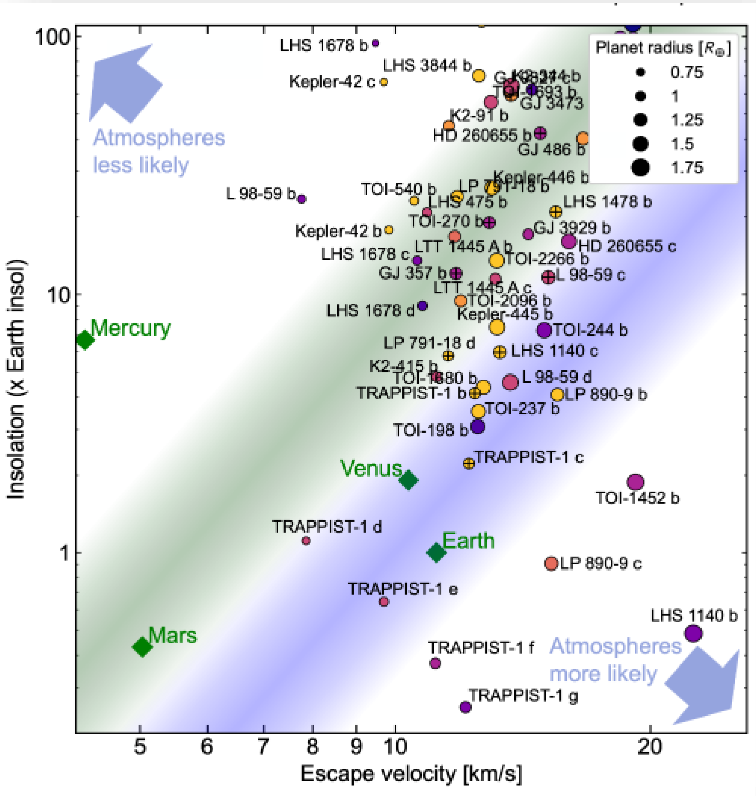
Another First: NASA Webb Identifies Frozen Water in Young Star System

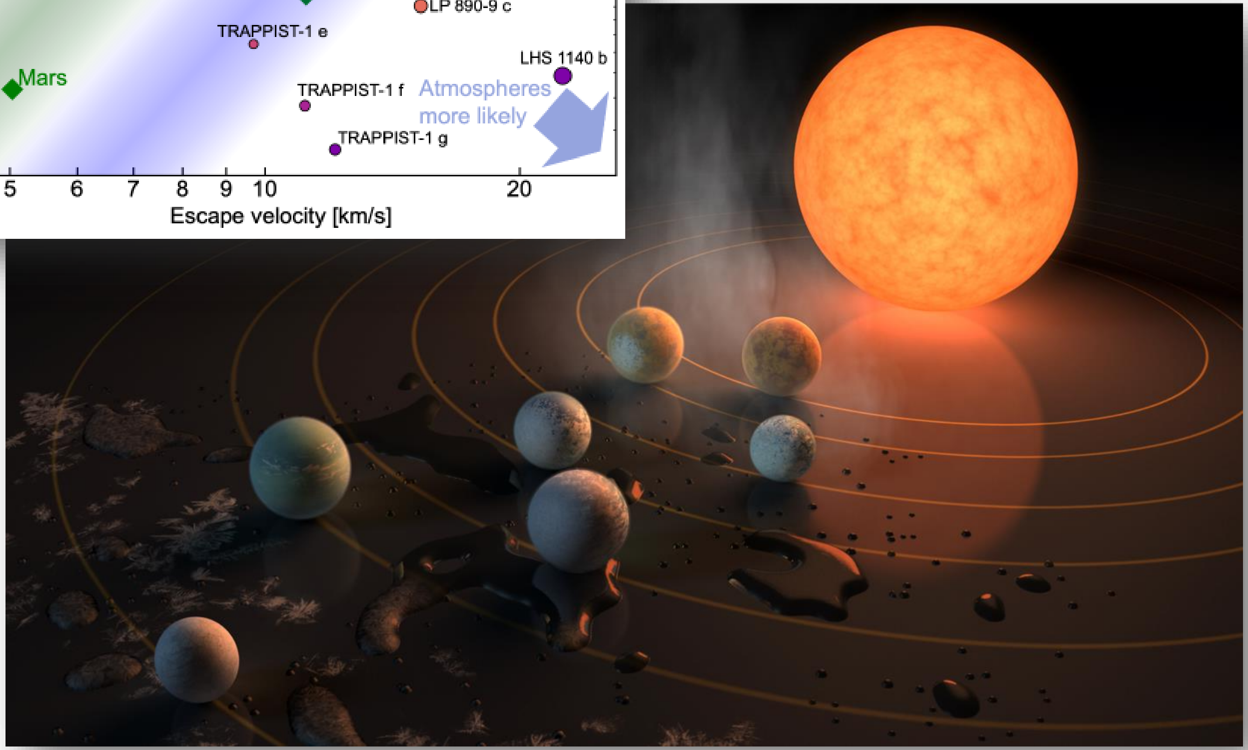
Future Outlook

- We are looking forward to an expected mission of 20+ years! We are working hard to optimize Webb's science productivity and impact over its entire lifetime

- The Rocky Worlds DDT program will use 500 Webb hours and 250 Hubble orbits in tandem to investigate the cosmic shoreline delineating worlds with atmospheres
    - First MIRI observations scheduled for July

- JWST & HST exoplanet investigations will inform Habitable Worlds Observatory, and these missions may be operating simultaneously!





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Visit us at the STScI Booth:

“Ask-an-Expert” sessions are available

Share your thoughts, concerns and feedback with us!

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246TH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY

ANCHORAGE, ALASKA **8 – 12 JUNE 2025**