STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

JWST Science & Operations Center Status

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July 25th, 2022

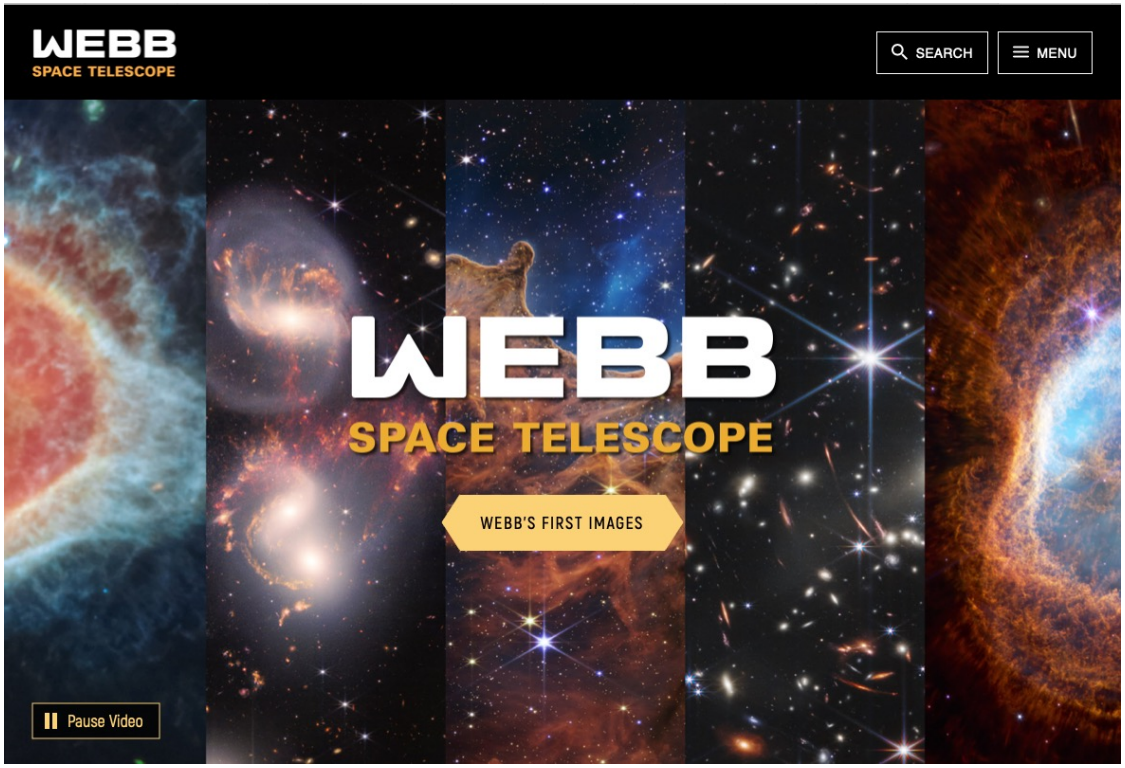
We are happy!

ERO release was very successful

- 26,500 articles (it broke our tracking systems set to a threshold of 20,000)
- 117 billion impressions

- ERO images staged on AWS
  - 423M requests
  - 530TB transferred

- Webbtelescope.org contains full resolution images and zoomable versions for some of the images



Science and Operation Center performance

Overall assessment of S&OC commissioning

- S&OC operations software generally worked very well
  - A few scenarios were not tested before launch, e.g., guide stars in both guiders
  - A few capabilities could not be fully tested on the ground, e.g., target acquisition
- S&OC updates were well executed
  - Exercised processes we have used for years leading up to launch
  - Operational work arounds and patient customers reduced urgency
  - Minimal impact on commissioning timeline
- S&OC staff demonstrated dedication and competence
  - Experts in all areas on shift or on call for months
  - Issues diagnosed and work arounds developed in hours
  - Long-term fixes being implemented in priority order
- S&OC staff need to restore life balance

Many S&OC updates since launch

- Some updates were planned
  - Software updates deferred until after launch freeze
  - Data updates that depended on commissioning activities
- Some updates were unplanned
  - Mitigate issues discovered during commissioning

Subsystem	Launch Version	Current Version	Updates
Operations Scripts Subsystem	OSS 8.2	OSS 8.4.11	23
Project Reference Database	SOC-040	SOC-055	18
Proposal and Planning Subsystem	PPS 14.16.4.1	PPS 14.18.6	14
Data Management Subsystem	DMS 7.8.2	DMS 8.0.1.1	11
Flight Operations Subsystem	FOS 6.5.2.10	FOS 6.5.4	4
WFSC Software Subsystem	WSS 7.1.2	WSS 7.3	2

Remaining liens against Cycle 1 observing modes

- General
  - Avoid saturation in second group up the ramp
    - Check with observer before scheduling visit
  - Verify that target acquisition works in bright, crowded field (Galactic Center)
    - Execute deferred commissioning test or execute Cycle 1 visit as test
- NIRCam and NIRISS
  - Avoid “rogue path” scattered light artifacts (claws, lightsaber)
    - S&OC instrument scientists review visits before execution, where feasible
- NIRSpec
  - Avoid loss of detector thermal control after failed wide-aperture TA
    - Schedulers manually inserting appropriate dark until ISIM flight software update
  - Avoid target getting too close to edge of NIRSpec IFU
    - Check with observer if 0.2” offset is OK. If not, wait for fix to centering

Remaining liens against Cycle 1 observing modes

- MIRI
  - Enable all target acquisition options for MIRI coronagraphy
    - Use one TA mode and apply manual offset until all options are enabled
  - Switch MIRI imaging detector to full frame after visits that use subarray
    - Schedulers manually inserting MIRI dark visits until OSS 8.4.12 is operational
  - Avoid source stepping out of MIRI subarray (first seen in Cycle 1 data)
    - Fix incorrect small angle maneuver when using both short and long-wavelength filters
  - Avoid poor background subtraction at 25 µm
    - Check with observer before scheduling visit
  - Update dither offsets to yield better fringe removal for MIRI MRS
    - Block visits that require best quality fringe removal

Liens impacted scheduling of visits in their plan window

- In April, we published plan windows for most Cycle 1 visits
- S&OC scheduling process
  - Only considers flight-ready proposals for scheduling
  - Gives strong preference to visits in plan window
- No automated way to assess whether a visit is affected by a lien
  - Manual review of all candidates for scheduling was labor intensive
  - Some visits missed their plan window because of manual errors, not a lien
- Last week we began using our standard scheduling process
  - Still some risk that standard process may miss the impact of a lien

Still digesting commissioning data into new reference data

- Aperture locations in focal plane, geometric distortion within apertures
  - Updated multiple times during commissioning to enable Cycle 1 observing
  - Small refinements still expected, notably distortion across MSA field of view
- Reference data for ETC
  - OTE and SI teams will provide updated reference data Sep-Oct
    - S&OC will update ETC before Cycle 2 Call for Proposals
  - Still using pre-launch reference data, which underestimate throughput
    - Observers will generally get data as good or better than expected
    - Reaching out to observers with only one or two groups up the ramp
- Reference data used by the calibration pipeline
  - SI teams are providing updated reference files as soon as they are ready
  - CRDS context updates: 10 in April, 41 in May, 54 in June
  - DMS reprocesses affected data after significant updates as resources permit

Calibration reference file volatility

Calibration Reference File Volatility

Frequent Calibration pipeline and reference file updates will occur over the early months of science operations as commissioning and other in-flight data continue to be analyzed.

Refer to JWST Calibration Pipeline Caveats for details on tracking and reporting this information in publications.

https://jwst-docs.stsci.edu/jwst-science-calibration-pipeline-overview/jwst-data-calibration-reference-files

July 2022: At this early stage of the mission, with the current operational pipeline and available reference files, calibration products may show a variety of known issues that produce poor registration of images, double spectral lines, or other effects that may limit their usefulness for scientific analysis. Also, users should note that early data available from MAST may have been processed with ground data or model based reference files and will require reprocessing over time to produce the best science-quality results. These issues are being addressed as quickly as possible. Instrument teams will be working in the next weeks to finish updating the reference files with inflight data obtained during commissioning and later on with data obtained during Cycle 1 observations.

Tracking the Pedigree of Data Products: Several FITS header keywords document what version of software and reference data were used to generate the data product. The CAL_VER keyword document what version of the JWST Science Calibration Pipeline was used (e.g., '1.4.6'). The CRDS_CTX keyword documents what context of calibration reference data was used (e.g., 'jwst_0857.pmap'). Check the JDox General Pipeline Processing Caveats page for known issues in these or subsequent versions. If an issue that impacts your science was addressed in a later version, download the latest version or reprocess the data locally.

Please note the CAL_VER and CRDS_CTX values of JWST data used in publications so that future researchers can both reproduce results and retrospectively assess possible calibration issues or reprocessing needs.

https://jwst-docs.stsci.edu/jwst-calibration-pipeline-caveats

JWST documentation (JDox) updates

- JWST JDox latest updates
  - (https://jwst-docs.stsci.edu/jwst-jdox-latest-updates)

- 31 new articles
  - Breaking news
  - Policy articles: DD, Cycle 2 GTO
  - Features and caveats for instruments
  - General pipeline information
  - Pipeline caveats for instrument modes

- 23 updated articles
  - Observatory characteristics
  - Background limited observations
  - Instrument characteristics
  - MSA spectroscopy
  - Data analysis tools
  - Video tutorials

Data release and Community support

MAST Release of Science Data

Schedule of Release

- Jul 13 morning – ERO science data released after being processed by JWST pipeline
- Jul 14 morning – Release Cycle1 Science data and engineering database
- Jul 14 afternoon – more than 40TB Commissioning data made public
  - Finish copying all data to public disk on Jul 17

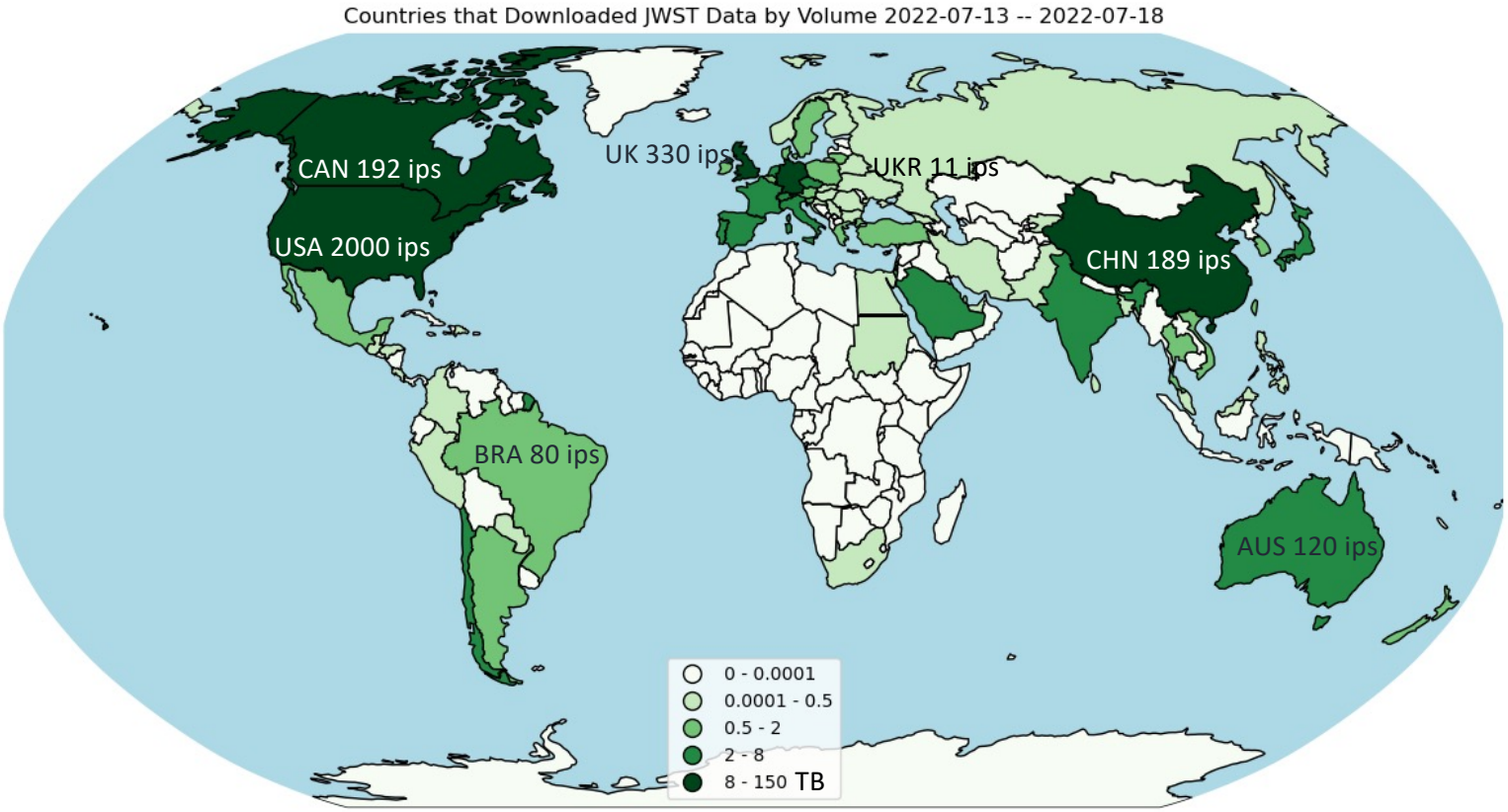
MAST put data on AWS public bucket with download scripts

- ERO: 1.6 TB see First Image Scripts
- Commissioning: 7 TB from JWST commissioning data highlights

More than 260 TB of science data were served in 5 days (13 Jul – 18 Jul)

- Includes ~150 TB delivered through AWS public buckets (rest download from MAST/Baltimore)
- Includes ~50TB to the Canadian and European archives from Baltimore
- Data requested from >100 different countries (see next slide)
- Carina Nebula data was PID requested by most unique IP addresses (2x that of the deep field)

JWST Data Download by Country



JWST Pipeline

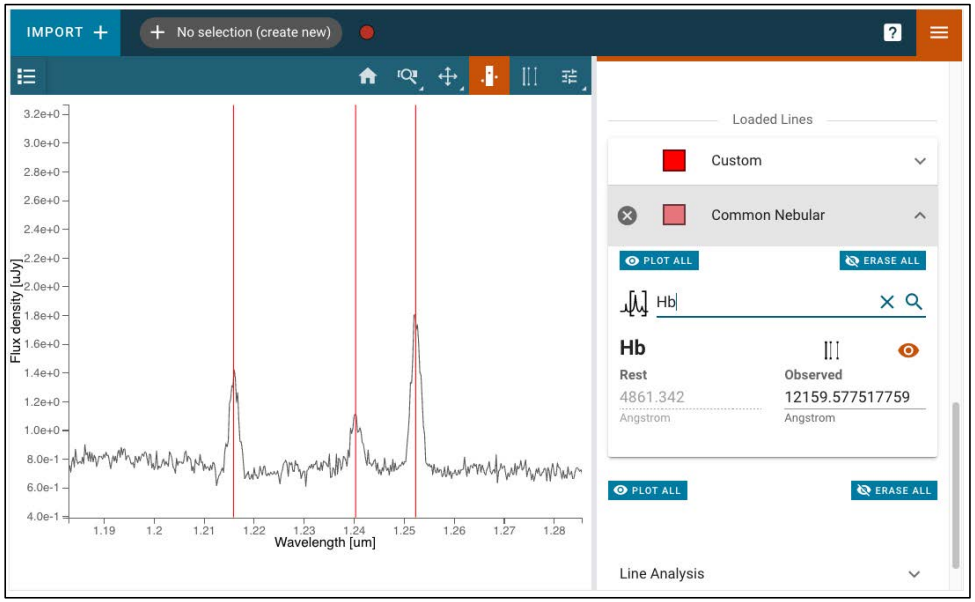
JWST Pipeline is currently v8.0.1 (06/28/2022)

- Most users will want to re-run the JWST pipeline to get optimal products.
- Current Level 2/3 products are very good for initial look at data.
- Next Build, v8.1, highlights included:
  - Speed up computation of output wavelength grid for resampled NIRSpec fixed-slit and MOS data
  - Reduce memory usage of Level 3 “outlier detection” step for large imaging observations
  - Addressing time series bug fix of Time Series Observation (TSO) data
  - Fix the combining/averaging of MIRI MRS 1-D background spectra for use in master background subtraction process

Data Analysis Tools

Jdaviz – Added functionality

- Examine Header Information
- Open App in window next to code in notebook
- Imviz – Annulus Background, radial profile, CoG
- Imviz – **>3** color WCS aligned combined images
- Imviz – Overplot Catalogs
- Specviz – Upgraded line list plugin, search for names
- Cubeviz: Tool for visualizing the spectrum at a single spaxel in the image viewer



Python Package Updates

- Specreduce v1.0 released – improve Horne Extraction and spectral tracing
  - Two new JDAT Notebooks demonstrating workflow
- Photutils overhaul – improve masking for PSF fitting, SegmentationImage for source masks, SourceCatalog for custom-sized cutout images

Community Engagement

Community JWebbinars

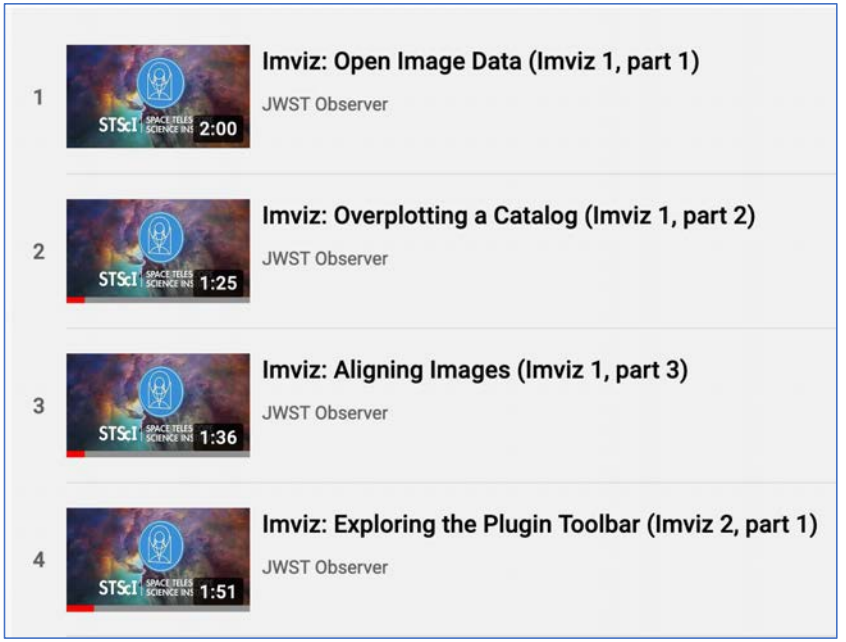
- 3 Community JWebbinars held during Commissioning (taught by ERS teams)
  - CEERS, Q3D, PDRs4all, ~30 attendees each.
- TSO JWebbinar 1 hour Seminar held after commissioning ended.
  - 106 attendees

Videos -- YouTube

- Videos demonstrating Jdaviz
  - 12 videos on Imviz, Specviz and Cubeviz
  - Mosviz videos coming soon.
- JWebbinars
  - 61 JWebbinar videos from 14 JWebbinars

AAS 240, June 2022

- Dozens of Jdaviz Demos at Booth + Poster + Talk
- JWST Townhall



Background: STScI S&OC Operations Flow

Proposal Preparation

Proposal Planning Subsystem (PPS)

Proposal Selection

Science Planning

Operations Scheduling

Flight Operations

Data Processing and User Tools

Data Archiving

On-Board Script Subsystem (OSS)
Wavefront Sensing & Control (WFSC)

Flight Operations Subsystem (FOS)

Data Management Subsystem (DMS)

Science Community and Public Outreach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