STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

JWST User Tools and Resources Update

Klaus Pontoppidan

JSTUC - September 9, 2019

JWST User Tools roster

- Core Tools (used by all?)
  - Astronomer's Proposal Tool (APT – apt.stsci.edu)
  - Exposure Time Calculator (ETC – jwstetc.stsci.edu)
- Ancillary Proposal Tools (used by some)
  - Visibility tools (General and coronagraphic)
  - JWST Backgrounds Tool
  - Interactive sensitivity plots
  - Pandeia (ETC engine library)
  - Space Telescope Image Product Simulator (STIPS)
  - WebbPSF (Point Spread Function simulator)
- Data Analysis Tools (ecosystem under development – Ferguson talk)
  - JWST data pipeline
  - Core python modules (astropy)
  - Visualisation tools (specviz, cubeviz, mosviz)
  - Hosted data analysis and MAST
- "External" tools (community/external funds)
  - ExoCTK (exoctk.stsci.edu)
    - Pandexo (exoplanet performance tool)
    - Optimize groups/integrations
    - Limb darkening
    - Atmospheric models
  - MIRISim
    - Developed by the European Consortium
    - Available to the community
- Support
  - JWST User Documentation (JDox)
  - JWST Help Desk
  - JWST Observer Ecosystem (see Talk by Bonnie Meinke).
  - Training activities (Meinke)

Lessons-learned refresher

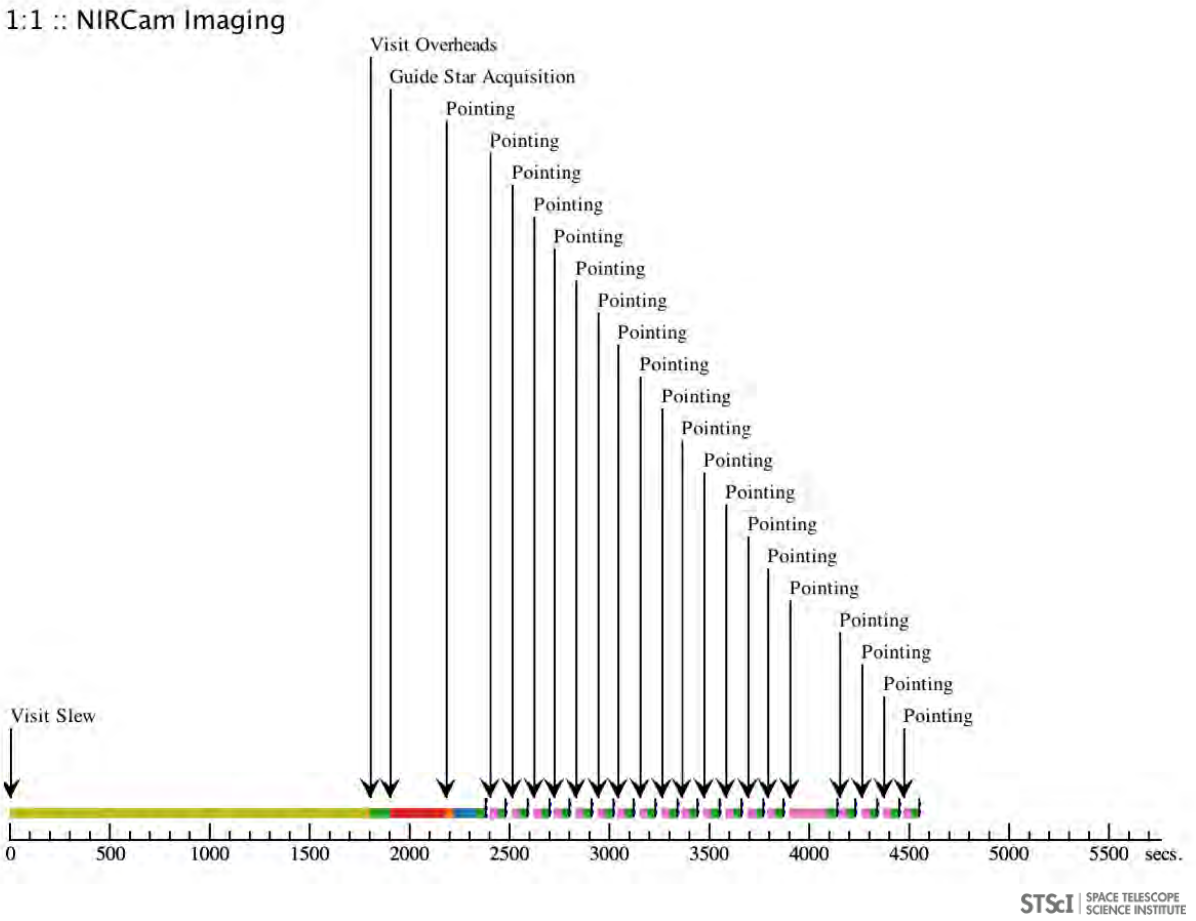
- After the delayed cycle 1 we gathered feedback on the usage of the JWST proposal planning tools, systems and documentation.
  - External and internal (to STScI) user surveys.
  - Analytics of JDox, ETC and APT usage.
  - Discussions with NASA, the JSTUC, and the SWG.
- Then we gathered specific proposals for enhancements.
- Some lessons learned enhancements included in launch delay proposal.
- Planning to conduct similar surveys at the end of each proposal cycle.

Lessons learned included

1. Inspire/enable the community to start proposals earlier
2. Make it easier to discover resources (JDox and beyond)
3. Create training resources with potential to reach larger audience (at the same or lower cost)
4. Make it easier to estimate the sensitivity of JWST for simple cases
5. Improve usability, stability, and speed of core tools (APT, ETC, Aladin, MPT)
6. Make it easier to use Ancillary tools (TVTs, Pandeia, JBT, ExoCTK, …)
7. Make it easier to perform duplication checking

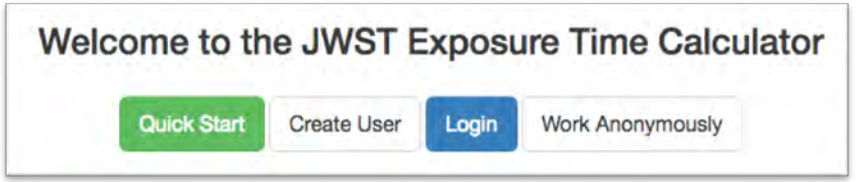
Astronomers Proposal Tool

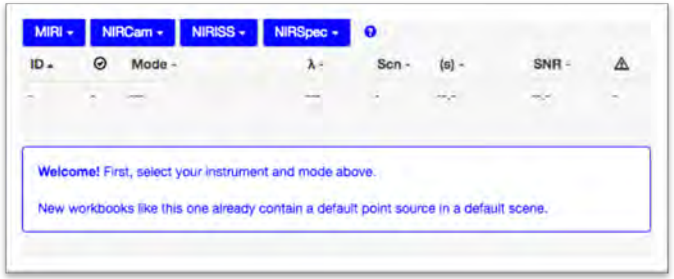
- Current version 27.2
- New timeline visualization
  - A new view of APT's model of observation timing
- Anonymization of TAC PDF
  - First for HST, but relevant for JWST
- JWST Parallels:
  - JWST Pure Parallel support and Slot Assignment Tool
  - NIRISS WFSS Pure Parallels
- Optional links to JWST ETC calculations for tracking
- Upcoming (next few months, in dev):
  - Major MSA Planning Tool Rewrite
  - Timing Model updates (Valenti presentation)

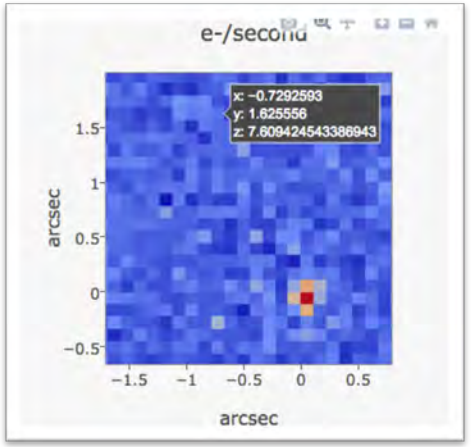


Exposure Time Calculator

- ETC 1.3 released in November 2018
  - **"Quick Start" option added.**
  - **Context-sensitive help (CSH) links added to web application**
  - APT-ETC connectivity: access ETC workbook from APT.
  - Images are now interactive (zooming, hover-over for values, etc.).
  - **New "Groups Before Saturation" image** shows maximum number of groups before each pixel saturates
  - $1/r^n$ flux distribution added as an option to support solar system community.





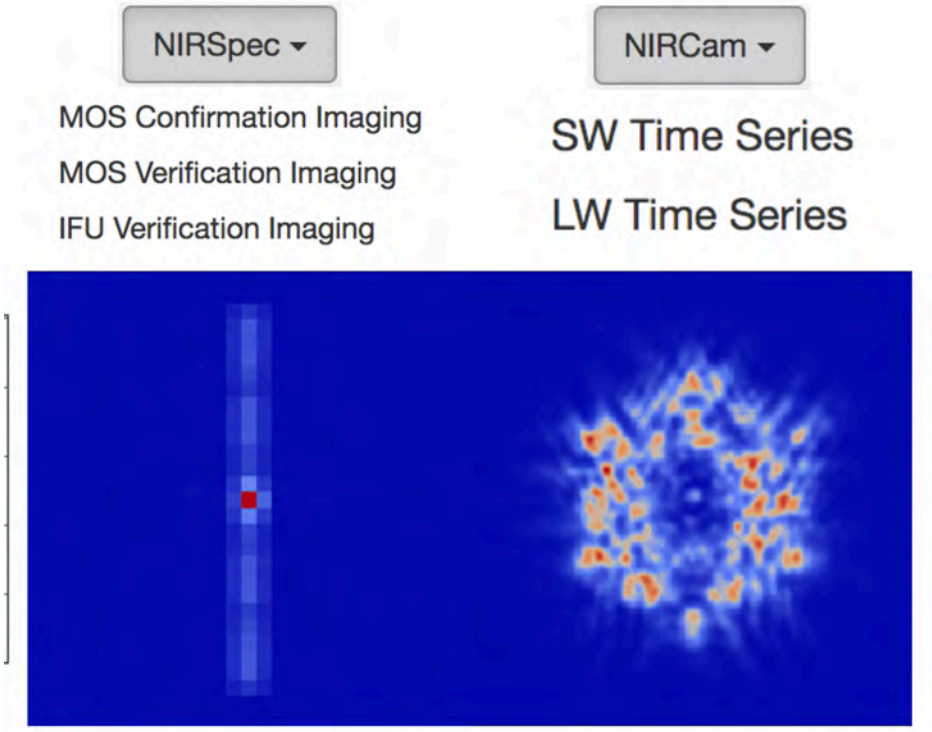


Exposure Time Calculator (current)

- ETC 1.4 current version
  - Many small updates
  - Subarrary-dependent wavelength ranges for NIRSpec Fixed Slit/BOTS
  - Expansion over all wavelength ranges for MIRI MRS
- Updated the sample workbooks, which were originally prepared in 2017
  - Some new sample workbooks were created to fill gaps

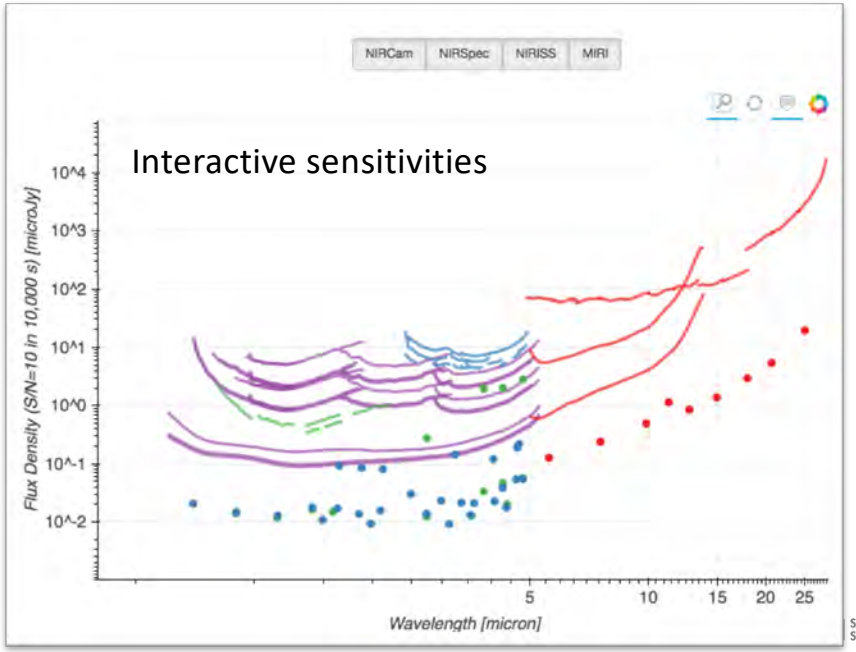
Exposure Time Calculator (Final release before Cy1)

- ETC 1.5 to be released in late **September 2019**
  - **New NIRCam SW and LW Time Series modes that include support for weak lens observations**
  - **New NIRSpec modes for MOS Confirmation Imaging, MOS Verification Imaging, and IFU Verification Imaging**
  - New FASTGRPAVG readout pattern options for longer MIRI target acquisitions
  - Replacement of the NRS readout pattern with the new NRSRAPIDD6 for NIRSpec target acquisition for improved handling of cosmic rays
  - Elimination of flat field errors for MIRI, NIRCam, and NIRISS time series modes
  - Changing the full-well depth for the NIRISS AMI mode to help users avoid the regime where charge can spill over between pixels
  - Addition of the neutral density filter to MIRI Imaging to support LRS Verification Imaging
  - Updates to Example Science Program Workbooks
  - Implementing a fix for a bug where the NIRSpec Multi-object Spectroscopy strategy offset the target in the wrong direction
  - Implementing a fix for incorrectly labeled Phoenix stellar model options



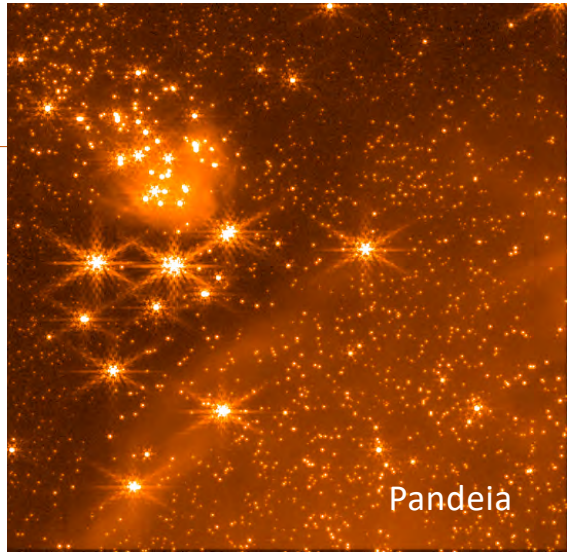
Ancillary proposal tools

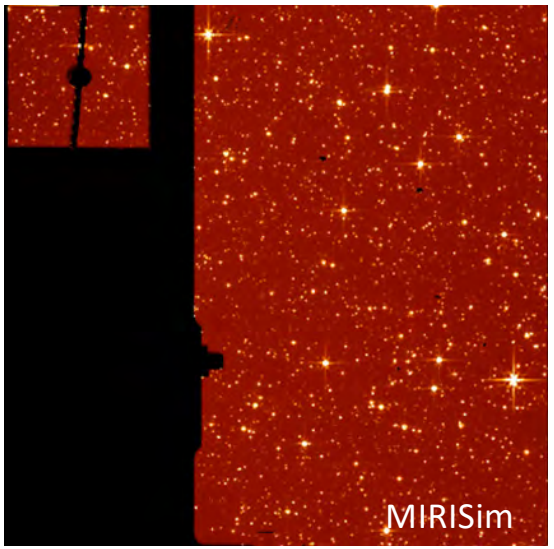
- Target visibility tools
  - General target visibility tool
  - Coronagraphic target visibility tool
  - Moving target visibility tool
  - JWST Backgrounds Tool
  - No major updates, minor maintenance
- Interactive sensitivity plots
  - Basic sensitivities and saturation limits currently available on jwst.stsci.edu.
  - New ETC sensitivity explorer plot (JIST)
  - JIST Demo



Ancillary/external tools

- Pandeia (ETC engine library)
  - Released concurrently with new ETC web releases
  - JDox documentation available
- MIRAGE
  - NIRCam + NIRISS simulator
  - Public release late September
- WebbPSF
  - Current version 0.8
  - Continuous updates/maintenance
  - New field-dependent distortion
- MIRISim
  - Developed+supported by the European Consortium
  - Available to the community
  - Recent JWSTObserver new item
- ExoCTK (exoctk.stsci.edu)
  - Pandexo (exoplanet performance tool)
  - Optimize groups/integrations/Limb darkening/Atmospheric models
  - **Developed and owned by the exoplanet community**
    (not paid for by the JWST project)





JWST User Documentation (JDox)

- Lessons learned feedback + analytics
  - Difficult to navigate.
  - Important content often overlooked.
- Response
  - Major reorganization to improve navigation
  - Page tree hierarchy now always visible
  - New content–now over 700 articles
  - New observing mode roadmaps and example science programs (imaging mosaics, high contrast imaging, IFU spectroscopy, moving targets, slitless spectroscopy)
  - Include documentation in JDox and sample APT files and ETC workbooks matching the roadmap and example science programs.
  - Pocket guide updated for every AAS

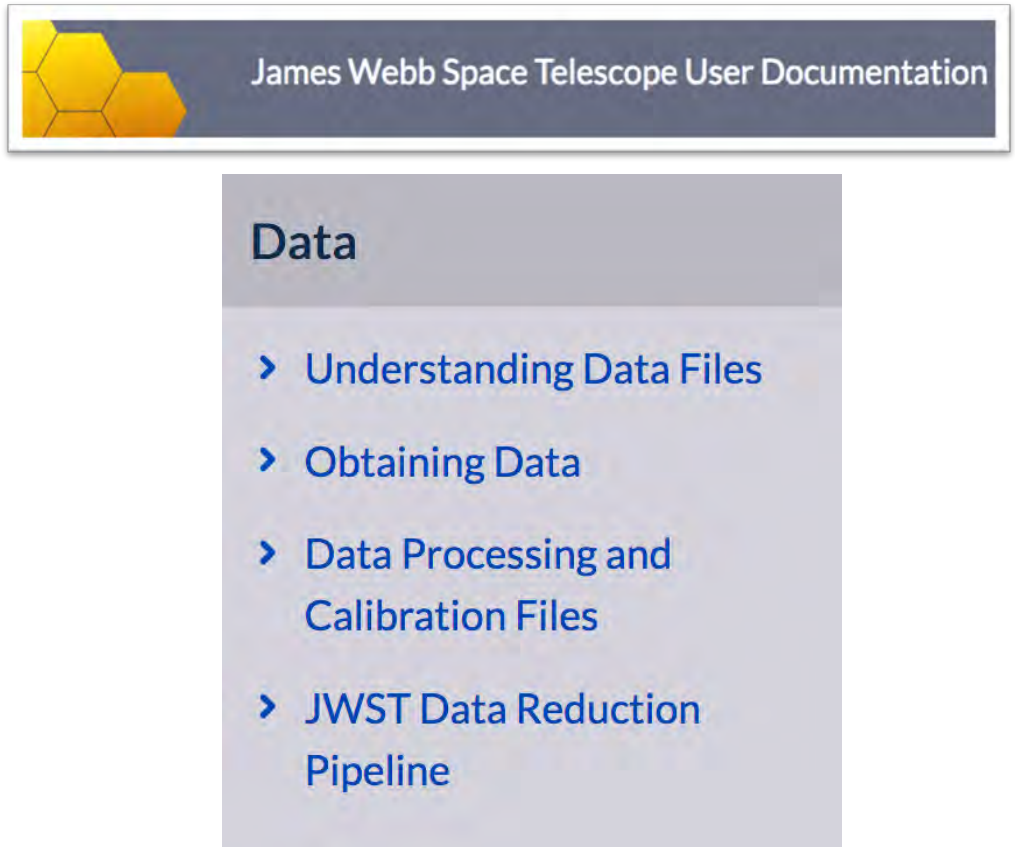
Example Science Programs by Instrument

Program reference #	Prime Instrument(s) and Template(s)	Parallel Instrument and Template (if any)	Example Science Program Title
MIRI			
28	MIRI MRS	---	MIRI MRS Spectroscopy of a Late M Star
NIRCam			
22	NIRCam Imaging	MIRI Imaging	NIRCam Deep Field Imaging with MIRI Imaging Parallels
NIRISS			
23	NIRISS AMI	---	NIRISS AMI Observations of Extrasolar Planets Around a Host Star
31	NIRISS SOSS	---	NIRISS SOSS Time-Series Observations of HAT-P-1
33	NIRISS WFSS	NIRCam Imaging	NIRISS WFSS with NIRCam Parallel Imaging of Galaxies in Lensing Clusters
NIRSpec			
34	NIRSpec IFU+FS	---	NIRSpec IFU and Fixed Slit Observations of Near Earth Asteroids -- Moving Target Example
Multi-Instrument			
26	MIRI MRS, NIRSpec IFU	---	MIRI MRS and NIRSpec IFU Observations of Cassiopeia A

JWST User Documentation

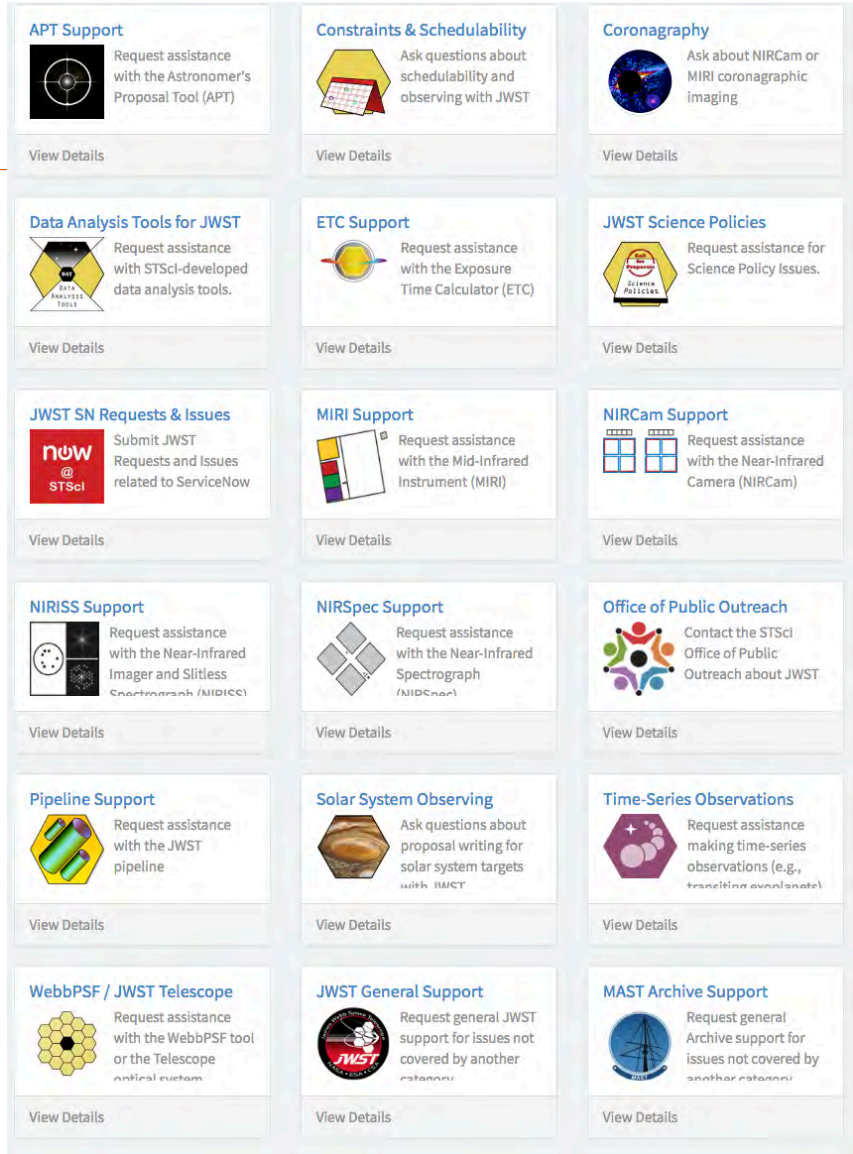
2019/20 plans

- Comprehensive article review and revision to clean up obsolete information and flesh out stubs.
- Develop data analysis + pipeline documentation
- Develop robust workflow for integrating help desk questions into JDox.
- Implement Numerical Replacement Tool (ensure that values are up-to-date and consistent across JDox).
- Include video tutorials



Other support

- Help desk
  - No significant updates
  - Currently low, but sustained activity
- JWSTObserver
  - Communication, news, and events
  - New website look-and-feel (same content as before)
  - Regular news items.



JWST Interactive Sensitivity Tool (JIST)