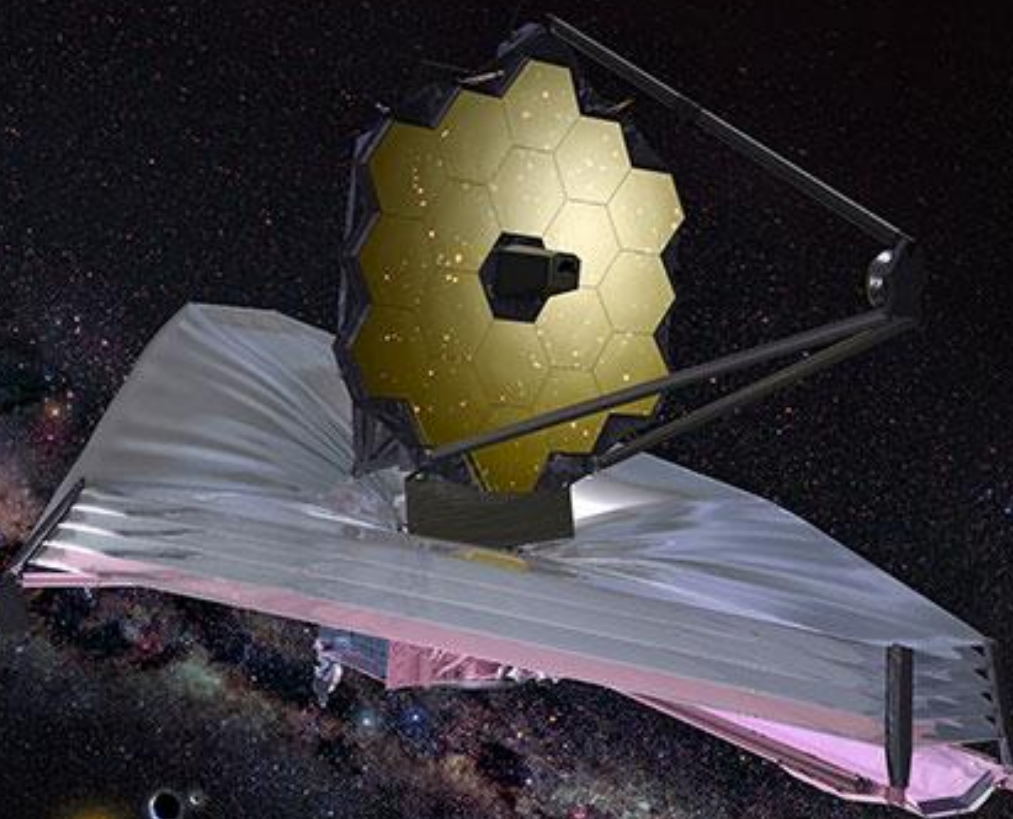


Getting Ready for JWST: Science Opportunities and Challenges



Christine Chen

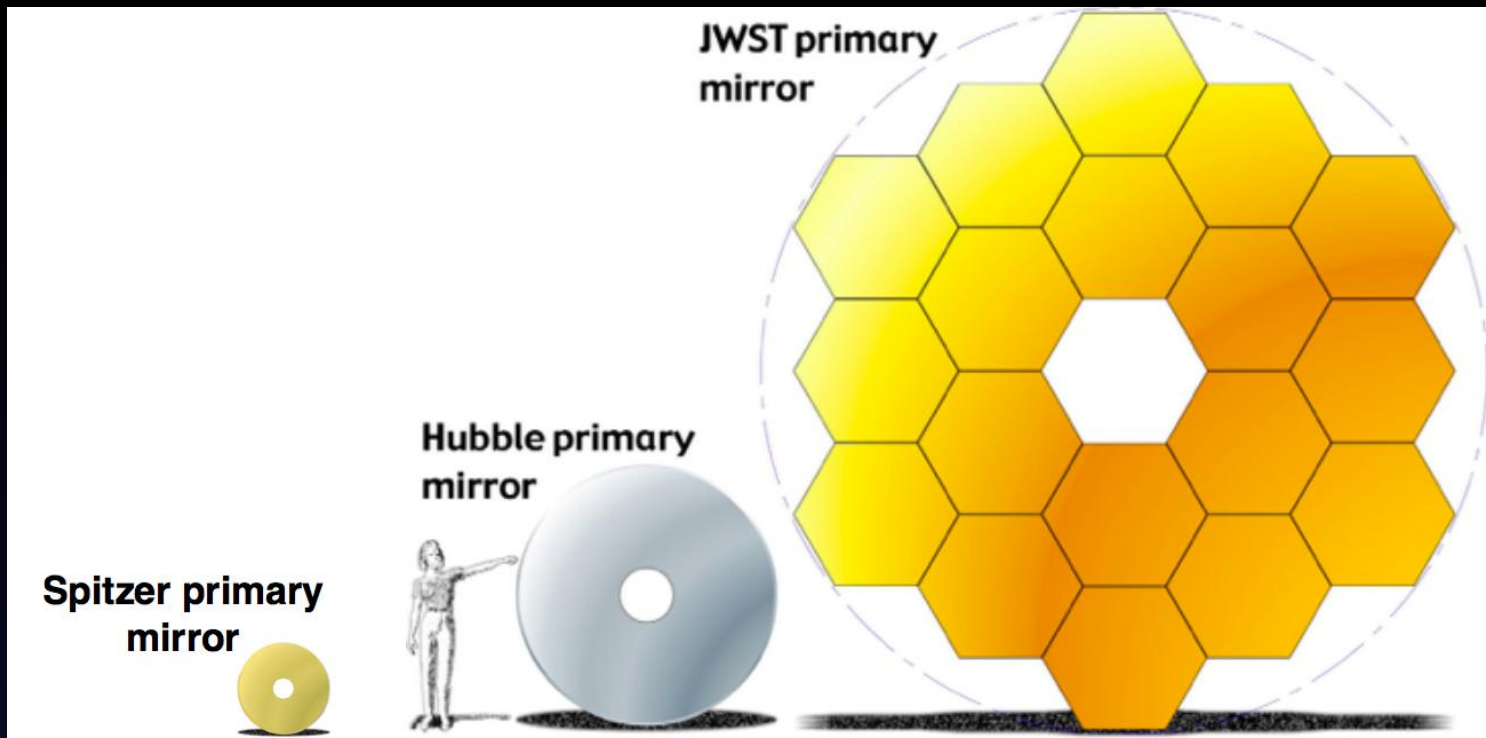
Janice Lee

Space Telescope Science Institute
JWST & Science Mission Offices

Based on work by *many* people
across the JWST project

Outline

- JWST:
 - *Observatory Design*
 - *Project Status*
- Science Opportunities:
 - *Observatory Timeline*
 - *Early Release Science (ERS) Program*
- Observer Support:
 - *User Tools*
 - *Additional Educational Opportunities*



	Hubble	Spitzer	JWST
Primary diameter	2.4	0.85	6.6
Collecting Area (m ²)	4.24	0.5	26.3
Observatory Mass (kg)	11,000	860	6,300
Observatory Volume, when stowed (m ³)	190	13	155
Orbit Location	LEO	Earth-trailing solar	Sun-Earth L2

JWST Observatory Design

Optical Telescope
Element (OTE)

Integrated Science
Instrument Module
(ISIM)

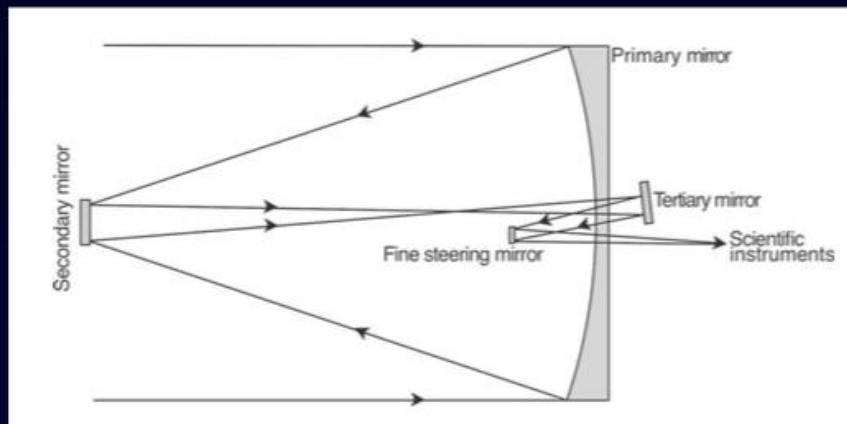
Cold side (40 K)

Sunshield

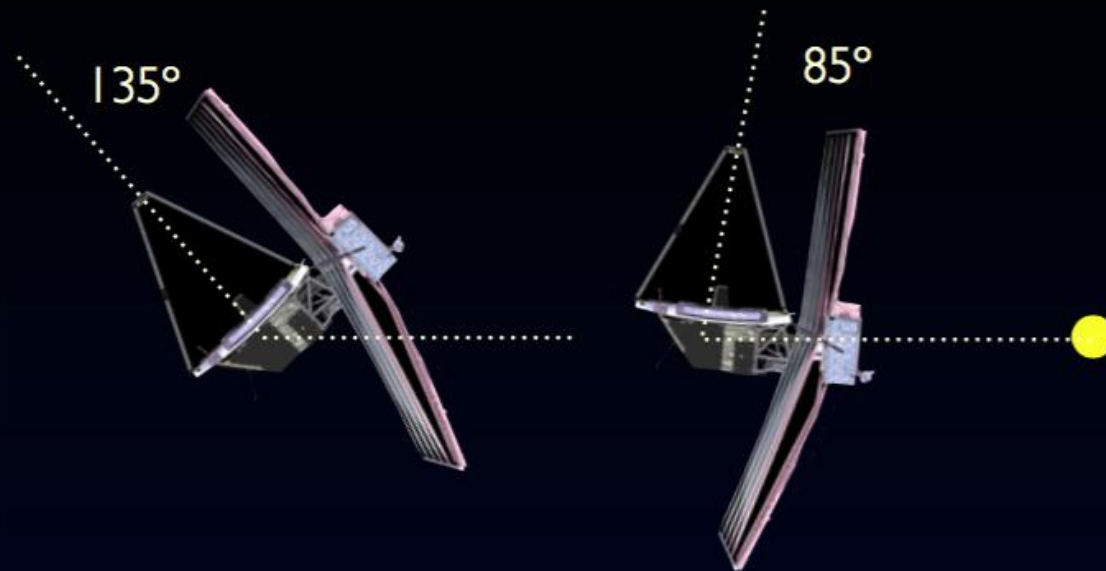
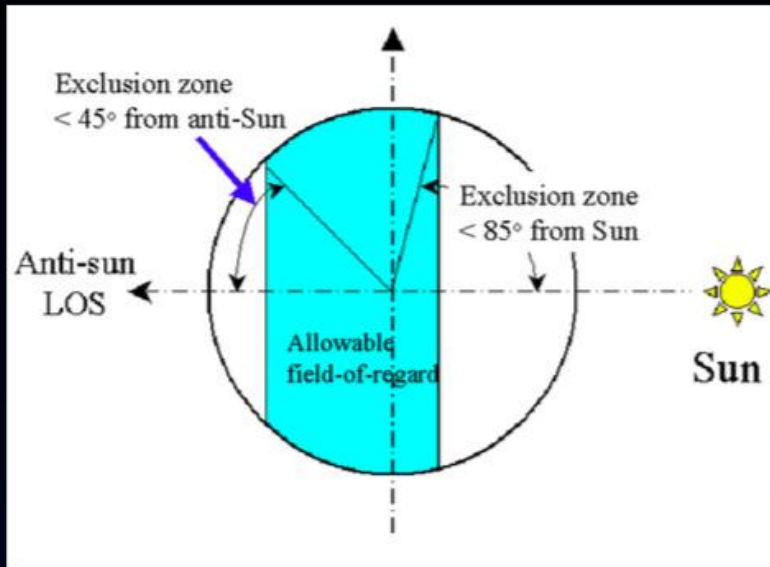
Hot side (270 K)

Spacecraft

- Passively cooled, open telescope
- Beryllium optics, gold coated
Lightweight and stiff, very low CTE
- Three Mirror Anastigmat
Relatively wide field diffraction limited performance.
- Fine steering mirror driven by FGS at 15 Hz
7 mas rms pointing control
- Baffles for stray light at intermediate image and focal planes.



Field of Regard and Orientation are constrained



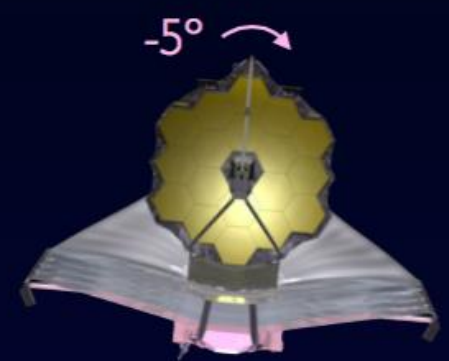
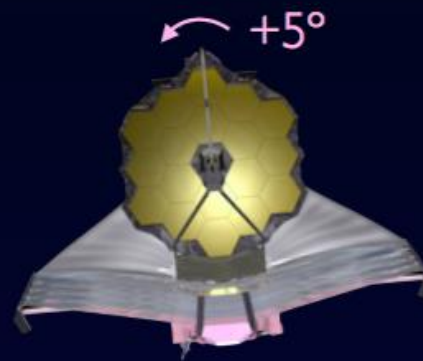
49.8% of the sky at a time

Pitch: 85°-135° from the sun

*Continuous Viewing Zone
above ±85° at ecliptic poles*

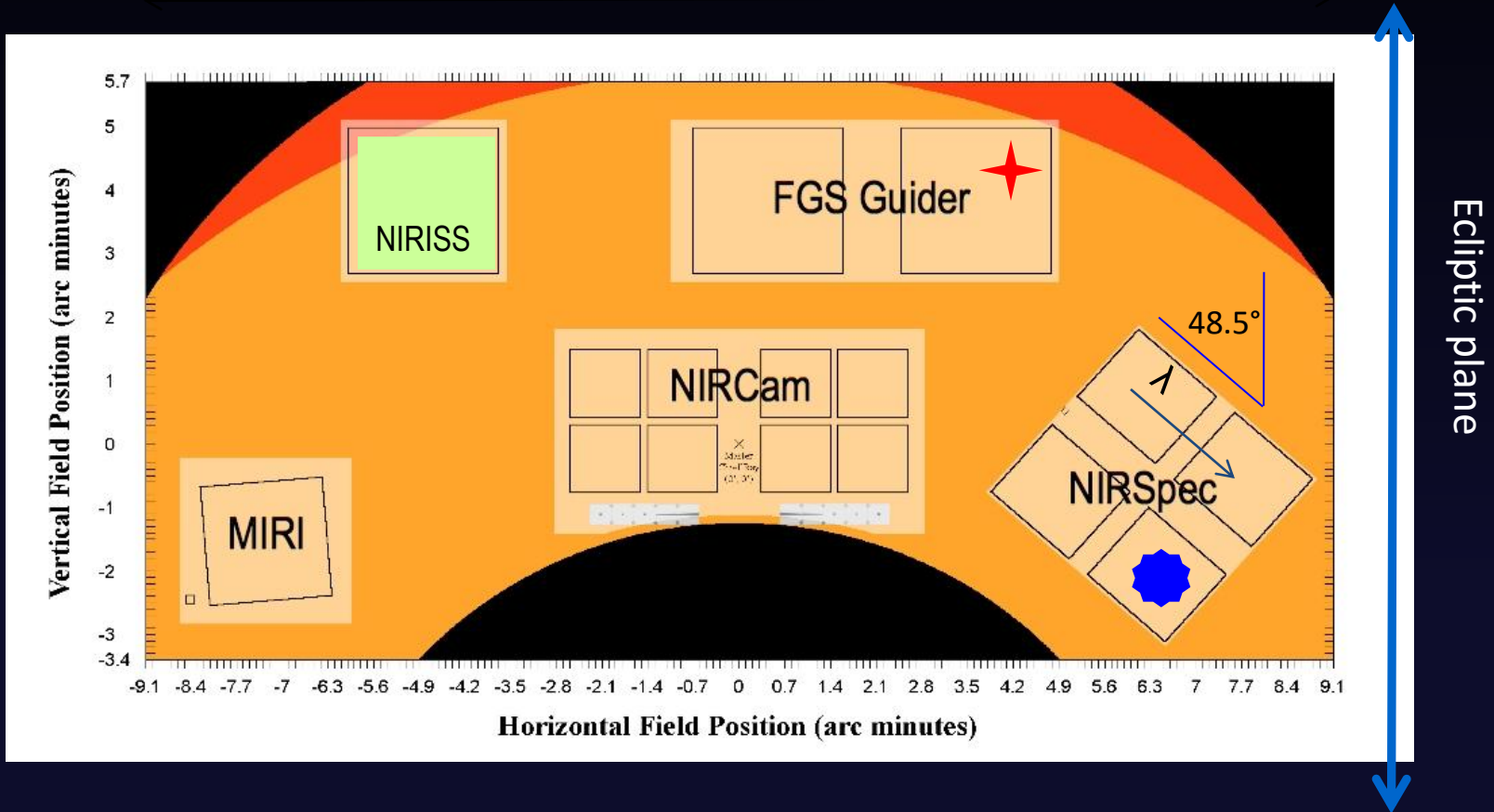
Roll: Only ±5° at any one time

*non-instantaneous roll depends on ecliptic latitude.
0-360 range at poles; only 0 & 180 at equator.*



JWST Focal Plane

18 arc minutes



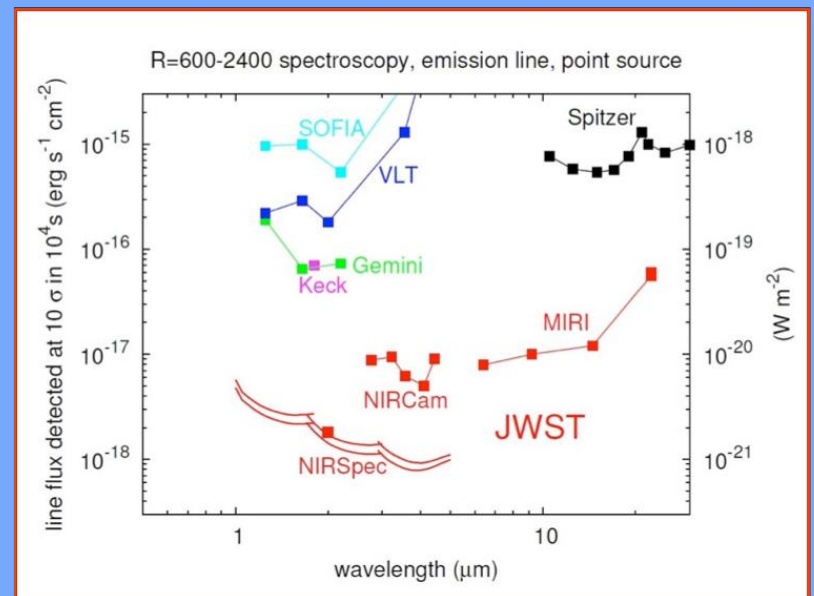
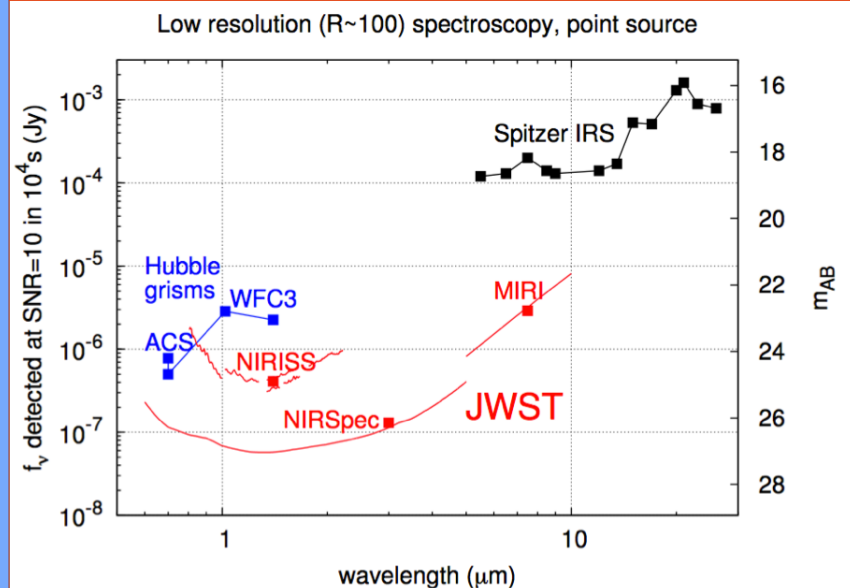
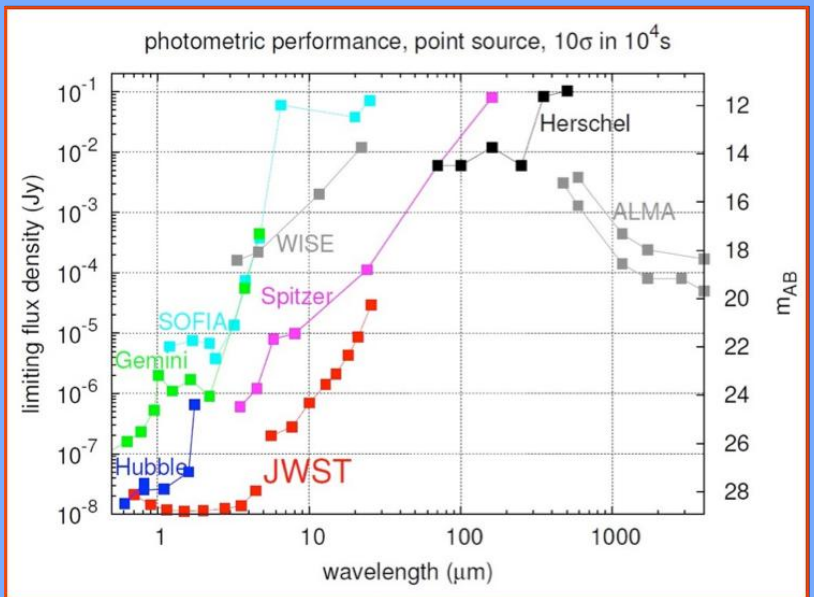
JWST will have exquisite sensitivity

100× Gemini at 2 μm

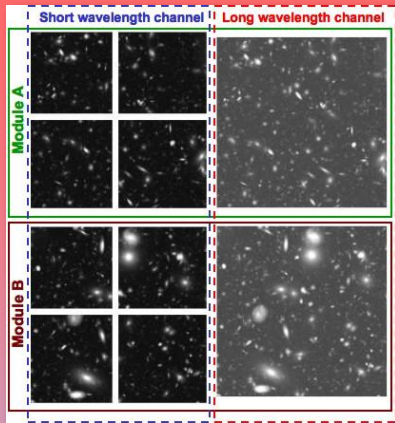
Low infrared background in space

50× Spitzer at 8 μm

Large aperture cryogenic telescope

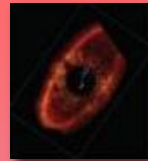
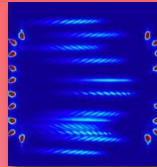


JWST Science Instruments

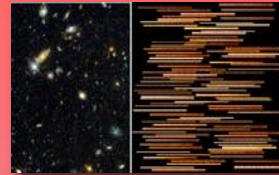


Deep, wide field broadband-imaging

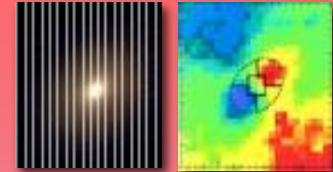
Wavefront Sensing & Control (WFSC) Coronagraphic Imaging



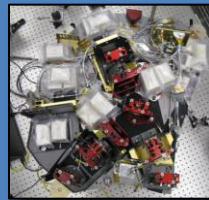
Multi-Object, IR spectroscopy



IFU spectroscopy



NIRCam



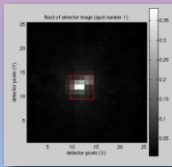
NIRSpec



Long Slit spectroscopy



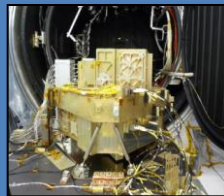
Fine Guidance Sensor



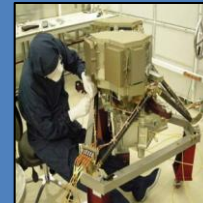
Moving Target Support



FGS/NIRISS



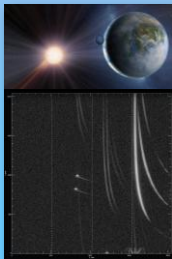
MIRI



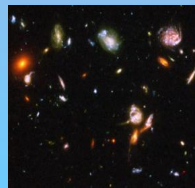
Mid-IR, wide-field Imaging



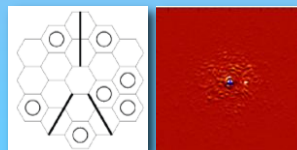
Slitless Spectroscopy



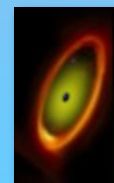
Near-IR imaging



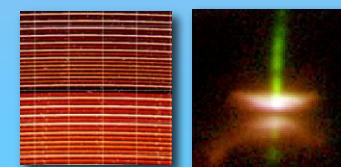
High Contrast Closure Phase Imaging



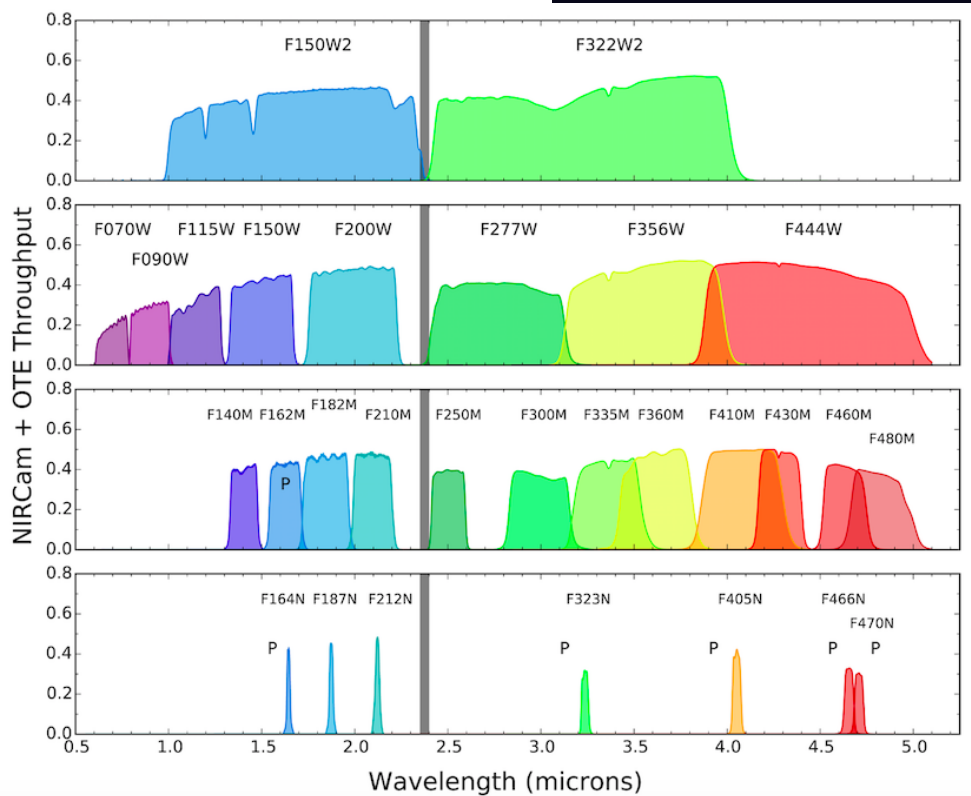
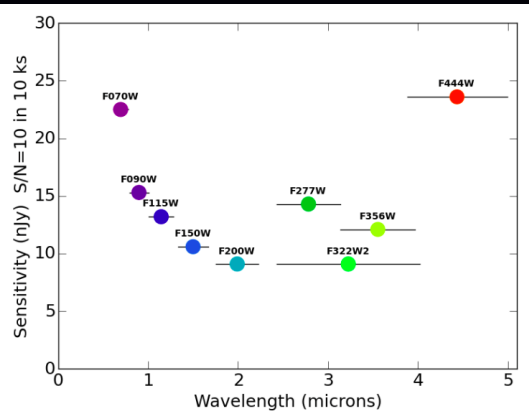
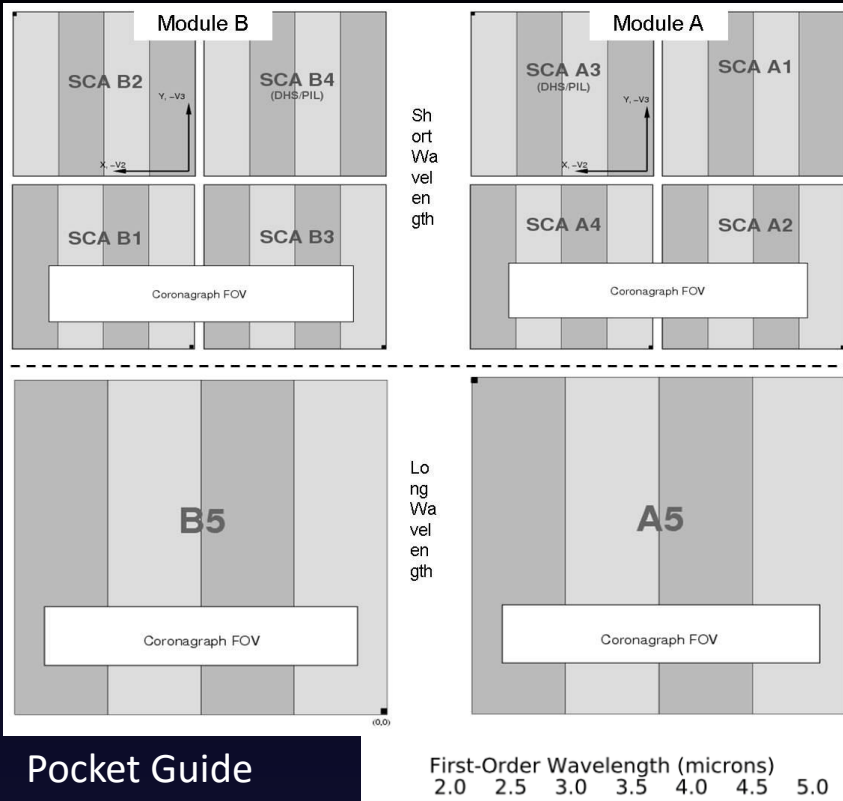
Mid-IR Coronagraphic Imaging



IFU spectroscopy

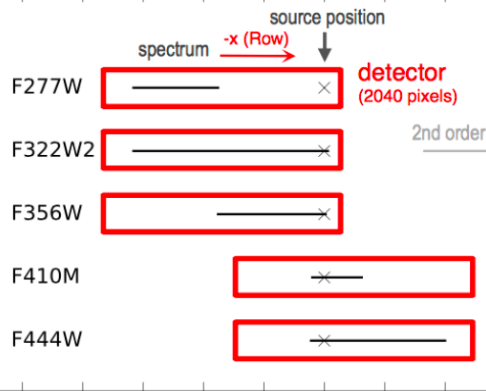


The Near-Infrared Camera (NIRCam)



Pocket Guide

<http://www.stsci.edu/jwst/instruments/nircam/docarchive/NIRCam-pocket-guide.pdf>

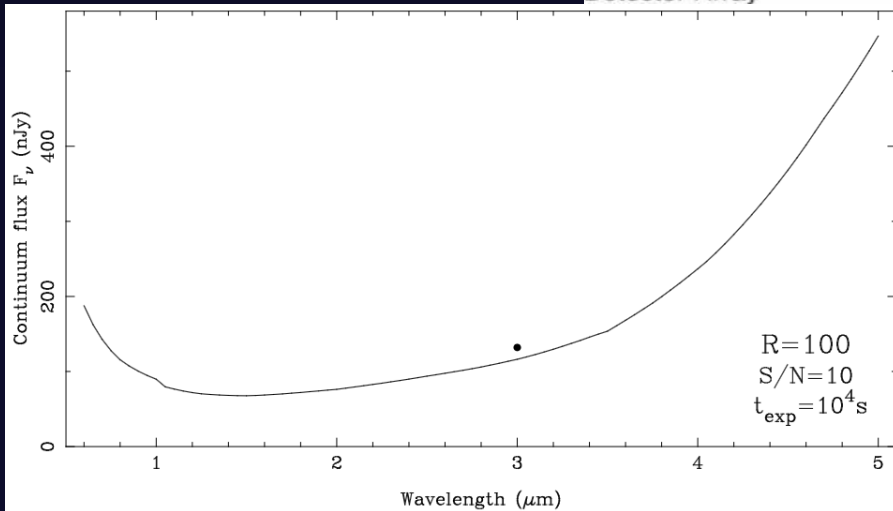
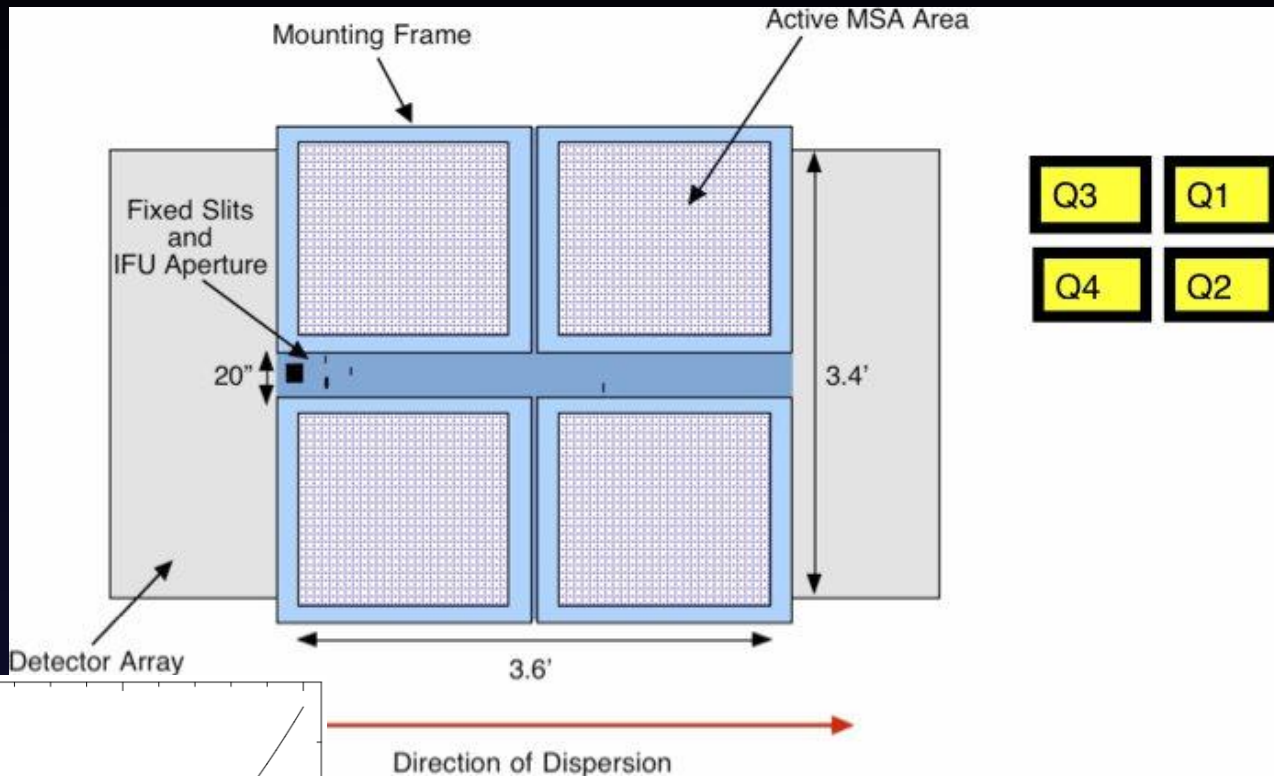


The Near-Infrared Spectrograph (NIRSpec)



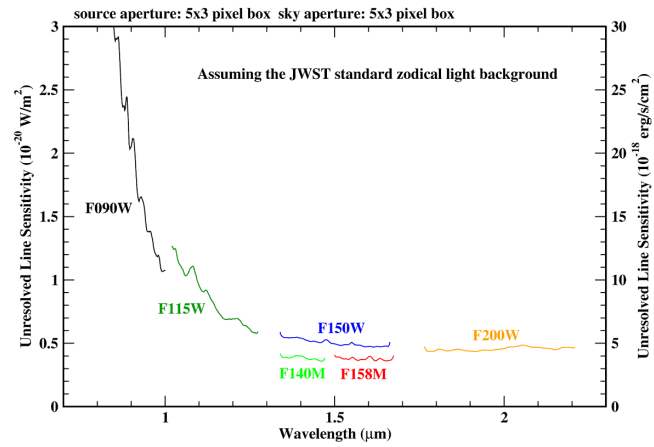
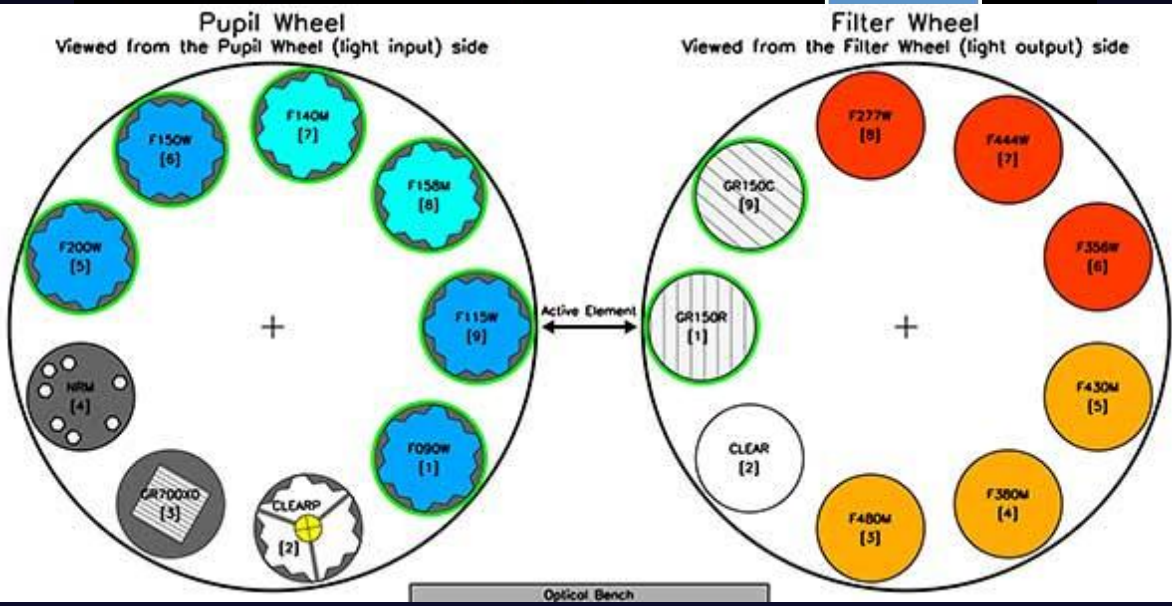
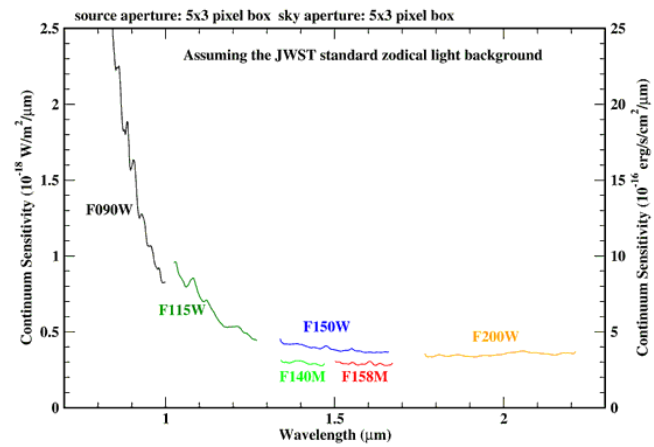
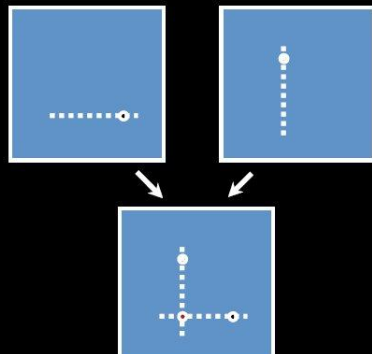
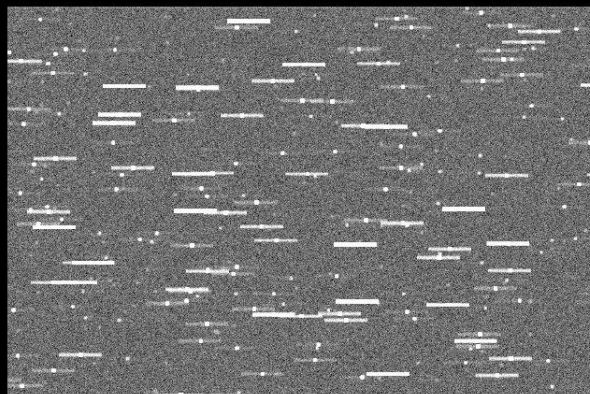
Pocket Guide

<http://www.stsci.edu/jwst/instruments/nirspec/docarchive/NIRSpec-pocket-guide.pdf>

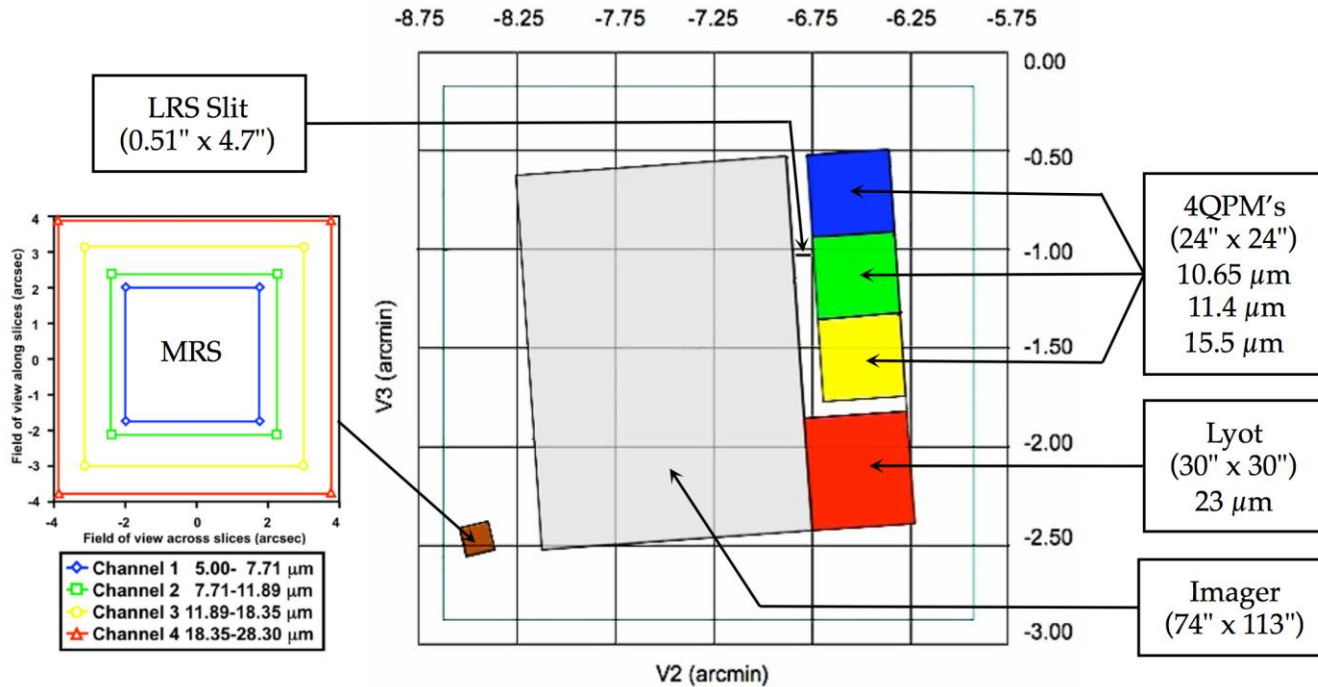


	Aperture Mask	Spectral Resolution
MSA	Any configuration of 0.2"×0.46" microshutters	100 (single prism), 1000 (three gratings), 2700 (three gratings)
Fixed Slit	0.1"×1.9", 0.2"×3.3", 0.4"×3.8"	100, 1000, 2700
Integral Field	3.0"×3.0" IFU	100, 1000, 2700

The Near-Infrared Imager and Slitless Spectrograph (NIRISS)



The Mid-Infrared Instrument (MIRI)

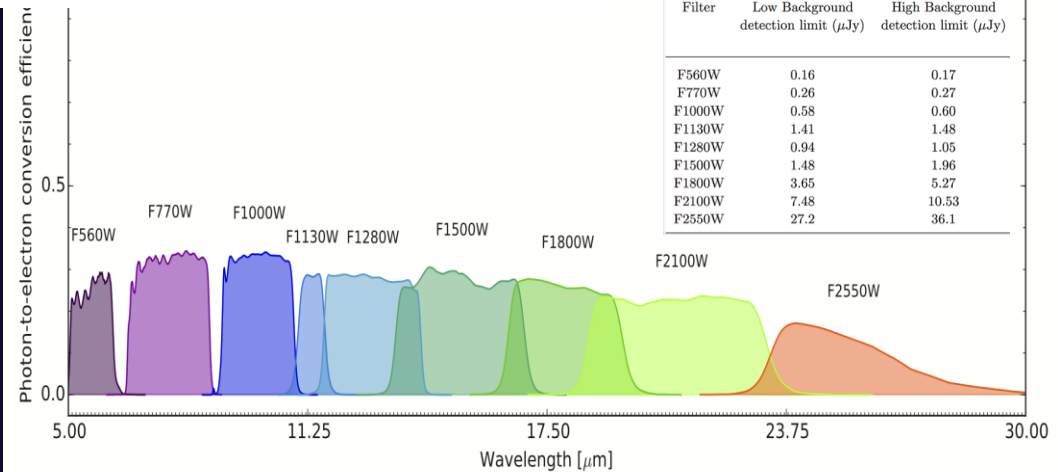
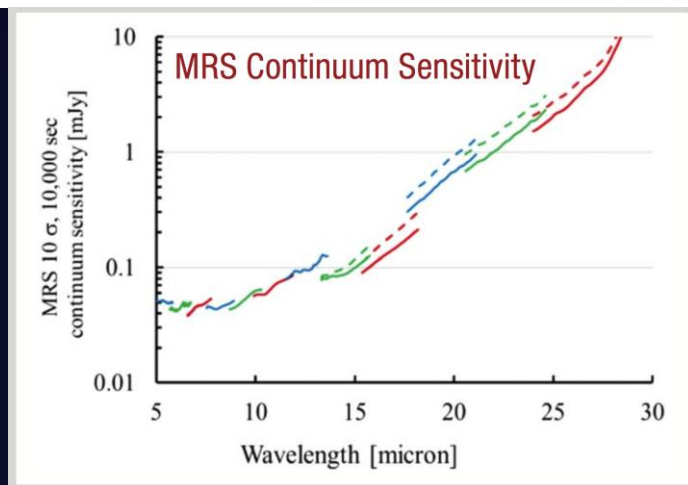


Pocket Guide

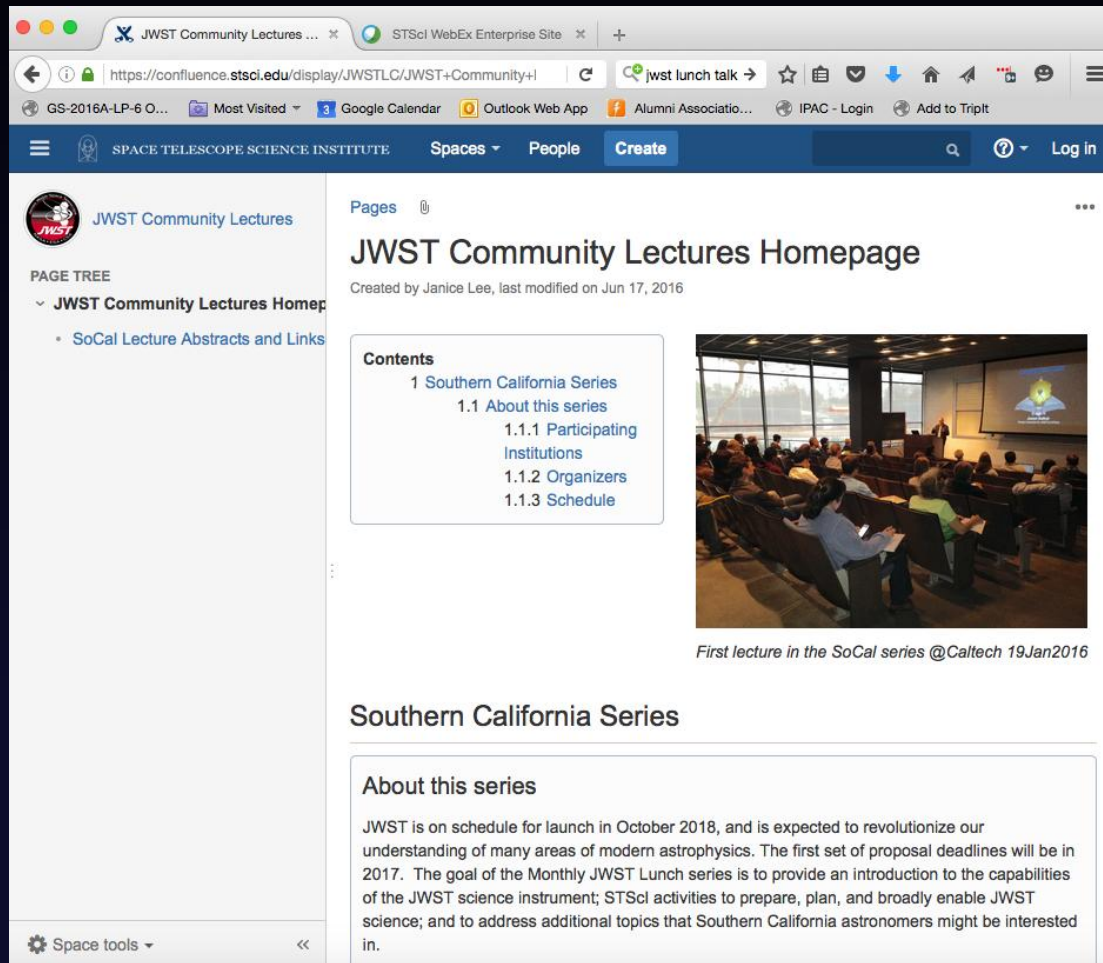
<http://www.stsci.edu/jwst/instruments/miri/doc/archive/miri-pocket-guide.pdf>

Encyclopedia

<http://ircamera.as.arizona.edu/MIRI/encyclopedia.htm>



JWST SoCal Lunch Talk Series

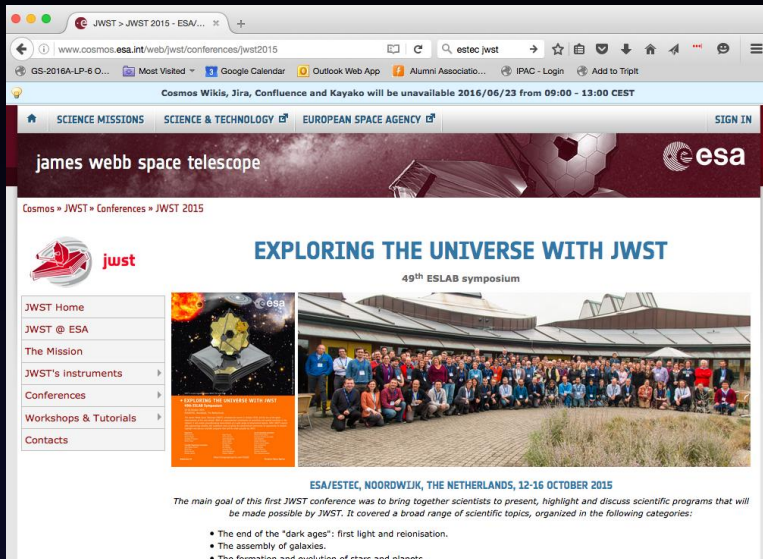


The screenshot shows a web browser displaying the JWST Community Lectures homepage. The page title is "JWST Community Lectures Homepage" and it was created by Janice Lee, last modified on Jun 17, 2016. The page features a "Contents" section with a tree structure: "1 Southern California Series" containing "1.1 About this series", which further includes "1.1.1 Participating Institutions", "1.1.2 Organizers", and "1.1.3 Schedule". There is a photograph of a lecture hall with an audience seated in rows, facing a stage with a large screen displaying a JWST image. Below the photo is the caption "First lecture in the SoCal series @Caltech 19Jan2016". The "Southern California Series" section includes an "About this series" paragraph: "JWST is on schedule for launch in October 2018, and is expected to revolutionize our understanding of many areas of modern astrophysics. The first set of proposal deadlines will be in 2017. The goal of the Monthly JWST Lunch series is to provide an introduction to the capabilities of the JWST science instrument; STScI activities to prepare, plan, and broadly enable JWST science; and to address additional topics that Southern California astronomers might be interested in."

Talk abstracts, slides, and recordings archived on-line

- Jason Kalirai (STScI), *Preparing for JWST, an Overview*
- Marcia Rieke (U Arizona), *NIRCam, Your Next Near-Infrared Camera*
- Pierre Ferruit (ESA), *NIRSpec*
- Rene Doyon (U de Montreal), *NIRISS*
- Susan Kassin (STScI), *Data Analysis Tools*
- George Rieke (U Arizona), *The Mid-infrared Instrument for JWST*

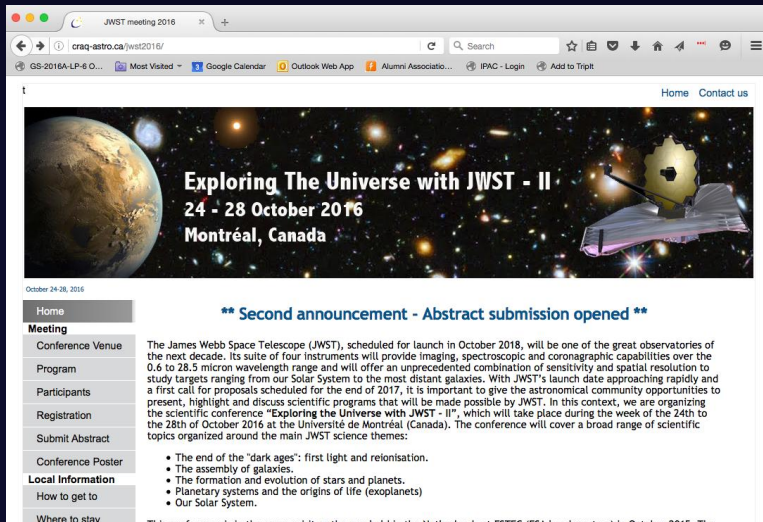
Major International Science Conferences



October 2015 at ESTEC: “Exploring the Universe with JWST”

<http://www.cosmos.esa.int/web/jwst/conferences/jwst2015>

Website includes archived talks with presentations from GTOs on planned GTO programs



October 2016 in Montreal: “Exploring the Universe with JWST II” <http://craiq-astro.ca/jwst2016/>

JAMES WEBB SPACE TELESCOPE

An Early Release Science Program

Janice C. Lee
STScI Science Mission Office
Molecules and dust as fuel for star formation
KITP, 24 June 2016

Motivation

to maximize the science return of JWST within its required-5yr, expected-10yr lifetime.

Janice C. Lee
STScI Science Mission Office
Molecules and dust as fuel for star formation
KITP, 24 June 2016

Principle

to realize JWST's science potential, the community must rapidly understand and use its capabilities.

Janice C. Lee
STScI Science Mission Office
Molecules and dust as fuel for star formation
KITP, 24 June 2016

Strategy

provide open access to a broad suite of JW science observations as early as possible in Cy1 to seed initial discovery and inform Cy2 proposals.

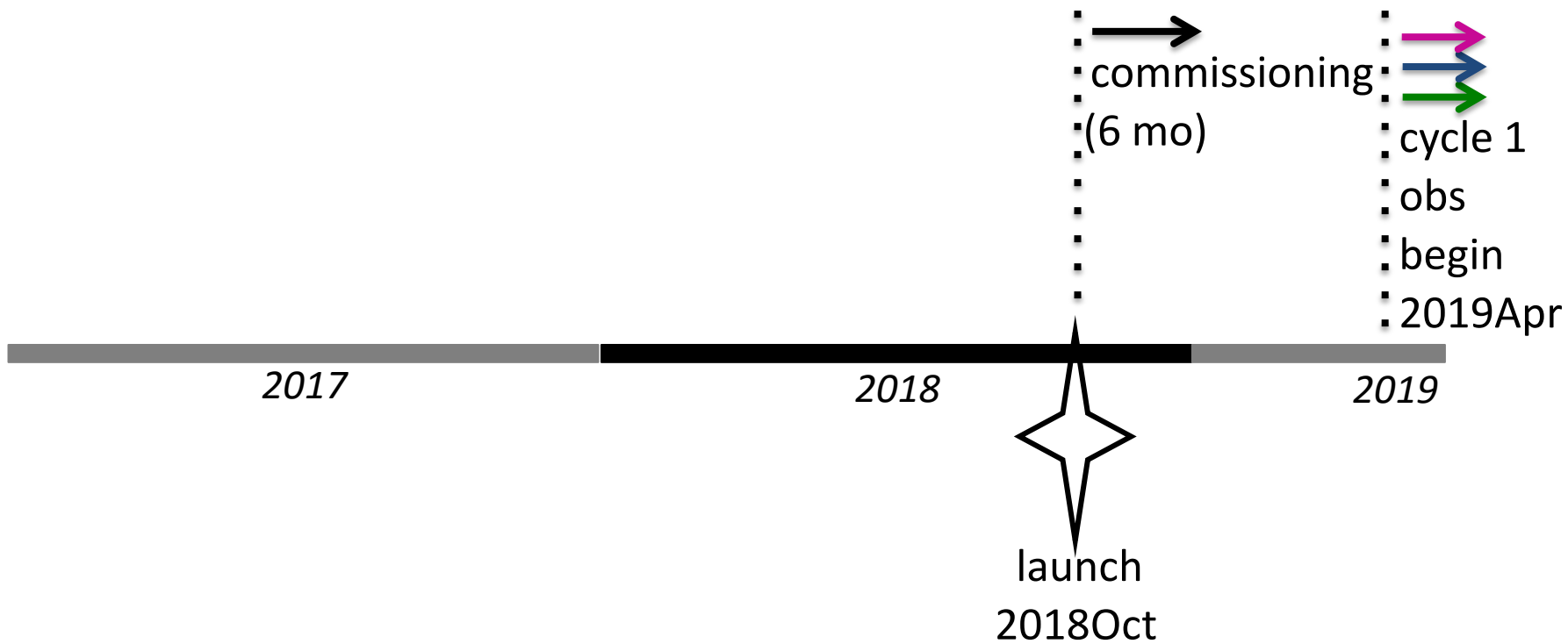
Janice C. Lee
STScI Science Mission Office
Molecules and dust as fuel for star formation
KITP, 24 June 2016

Outline

- Overall JWST science timeline: what's happening when?
- Motivation for a JWST Early Release Science Program
- Current JWST ERS concept

Janice C. Lee
STScI Science Mission Office
Molecules and dust as fuel for star formation
KITP, 24 June 2016





GTO CP release

2017Jan

GTO
props due
2017Apr

GTO Cy1
obs release
by 2017Jun

commissioning
(6 mo)

cycle 1
obs
begin
2019Apr

2017

2018

2019

launch
2018Oct



Classes of Observations

Commissioning [6 mo: 2018 Oct-2019 Apr]

- full schedule of deployment & check-out activities*
- limited set of science calibration obs possible*
- science obs begin after commissioning*

Guaranteed Time Observation Program [2019 Apr -]

- 3,960 hr total allocation in first 30 mo. after commissioning*
- ~10% of time available in nominal 5 yr lifetime*

GTO CP release

2017Jan

GTO
props due
2017Apr

GTO Cy1
obs release
by 2017Jun

commissioning
(6 mo)

cycle 1
obs
begin
2019Apr

2017

2018

2019

launch
2018Oct



GTO CP release
2017Jan

GO CP
2017Nov

GO Cy1
deadline
2018Feb

GO TAC
2018May

commissioning
(6 mo)

cycle 1
obs
begin
2019Apr

GTO
props due
2017Apr

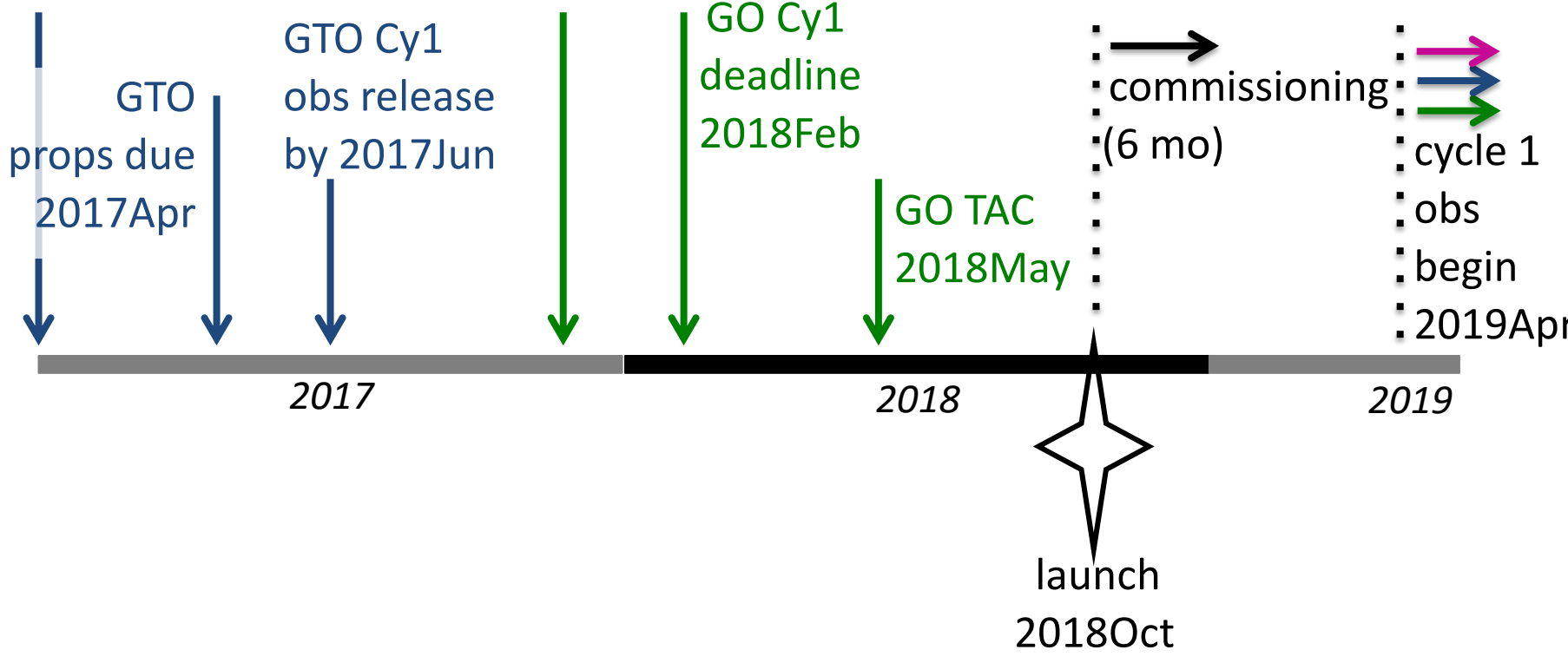
GTO Cy1
obs release
by 2017Jun

2017

2018

2019

launch
2018Oct



Classes of Observations

Commissioning [6 mo: 2018 Oct-2019 Apr]

- full schedule of deployment & check-out activities*
- limited set of science calibration obs possible*
- science obs highly unlikely*

Guaranteed Time Observation Program [2019 Apr -]

- 3,960 hr total allocation in first 30 mo. after commissioning*
- ~10% of time available in nominal 5 yr lifetime*

Guest Observer Program [2019 Apr -]

- use GO programs from HST, Spitzer, Chandra, etc. as models*
- flexible to accommodate programs with range of sizes*
- support archival research*
- details TBD, consultations with JSTAC*

JSTAC: JWST Advisory Committee

Roberto Abraham (Toronto)

Neta Bahcall (Princeton)

Stefi Baum (Rochester)

Roger Brissenden (Chandra/SAO)

Hashima Hasan (NASA, ex-officio)

Tim Heckman (Johns Hopkins)

Garth Illingworth (Santa Cruz, Chair)

Malcolm Longair (Cavendish)

John Mather (NASA, ex-officio)

Mark McCaughrean (ESA, ex-officio)

Chris McKee (Berkeley)

Brad Peterson (Ohio State)

Alain Ouellet (CSA, ex-officio)

Joseph Rothenberg (JHR Consulting)

Sara Seager (MIT)

Eric Smith (NASA, ex-officio)

Lisa Storrie-Lombardi (Spitzer/Caltech)

Monica Tosi (Bologna)



Garth Illingworth (UCSC)
JSTAC Chair

Committee of community representatives charged with advising the STScI Director on optimum strategies for maximizing the science productivity of JWST.

Convened in 2009. Meets twice annually. Next meeting Dec 2016.

<https://jwst.stsci.edu/science-planning/jwst-advisory-committee-jstac>

JSTAC: JWST Advisory Committee

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Malcolm Longair (Cavendish)

John Mather (NASA, ex-officio)

Mark McCaughrean (ESA, ex-officio)

Chris McKee (Berkeley)

Kelsey Johnson (U. Virginia)

Alain Ouellet (CSA, ex-officio)

Natalie Batalha (NASA Ames)

Heather Knutson (Caltech)

Eric Smith (NASA, ex-officio)

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Garth Illingworth (UCSC)
JSTAC Chair

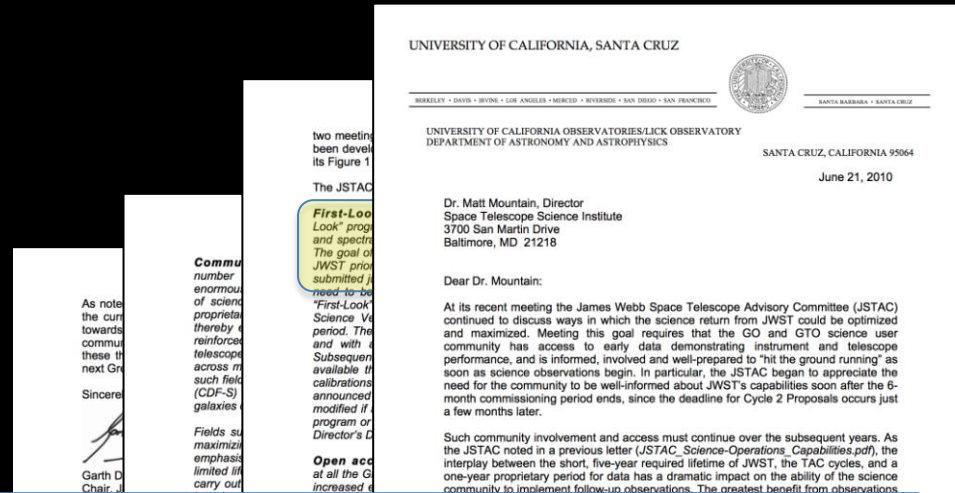
Committee of community representatives charged with advising the STScI Director on optimum strategies for maximizing the science productivity of JWST.

Convened in 2009. Meets twice annually. Next meeting Dec 2016.

<https://jwst.stsci.edu/science-planning/jwst-advisory-committee-jstac>

Science Timeline Realities

- addressed by JSTAC
06-2010



The JSTAC recommends an Early Release Science Program:

“..to obtain images and spectra that would be used to demonstrate key modes of the JWST instruments. The goal of this program is to enable the community to understand the performance of JWST prior to the submission of the first post-launch Cycle 2 proposals that will be submitted just months after the end of commissioning.”

“The JSTAC recommends that... data be released both in raw form and with any initial calibrations as soon as possible; the key aspect is speed.”

Science Timeline Realities

04-2019

Cy1 science obs begin

04-2020

Cy2 science obs begin

Science Timeline Realities

04-2019	Cy1 science obs begin
07-2019	GTO Cy2 deadline
09-2019	GO Cy2 CP released
12 (early)-2019	GO Cy2 deadline
04-2020	Cy2 science obs begin

Availability of non-proprietary data is quite limited at time of Cy2 proposal preparation.

Science Timeline Realities

- addressed by JSTAC
06-2010

ERS concept discussions

- *JSTAC 2014 Dec*
- *AAS 2015 Jan*
- *SWG 2015 Apr*
- *JSTAC 2015 May,
2015 Dec, 2016 Jun*

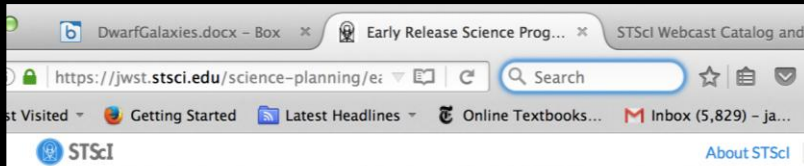
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“..to obtain images and spectra that would be used to demonstrate key modes of the JWST instruments. The goal of this program is to enable the community to understand the performance of JWST prior to the submission of the first post-launch Cycle 2 proposals that will be submitted just months after the end of commissioning.”

“The JSTAC recommends that... data be released both in raw form and with any initial calibrations as soon as possible; the key aspect is speed.”

How has the ERS-DD program framework been communicated?

STScI JWST Website



NASA's James Webb Space Telescope

Developed in partnership with ESA and GSA. Operated by AURAS Space Telescope Science Institute.

ABOUT NEWS EVENTS MULTIMEDIA SCIENCE PLANNING

SCIENCE PLANNING > Early Release Science Program

Early Release Science Program

The scheduled October 2018 launch of the James Webb Space Telescope is steadily approaching, and the first Call for Proposals will be released in November 2017. The Space Telescope Science Institute (STScI) is now defining the parameters for an Early Release Science (ERS) program.

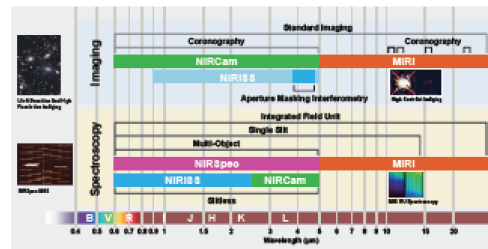
The primary objective of the Early Release Science (ERS) program is to provide observations as early as possible in Cycle 1. The observing programs will be chosen to address technical challenges related to the major instrumental modes available for discovery and to inform Cycle 2 proposals, which will be submitted just months before the telescope's launch.

JWST Science Capabilities

jwst.stsci.edu/science-planning/early-release-science-program

Meeting Fliers

James Webb Space Telescope: Early Release Science Program



The planned Oct 2018 launch of the James Webb Space Telescope is steadily approaching, and the Cycle 1 General

On-line Survey

An Early Release Science Program for JWST - Gauging Community Interests

Survey Closes Friday, 2016 January 15

The scheduled October 2018 launch of the James Webb Space Telescope is steadily approaching, and the first Call for Proposals will be released in November 2017. The Space Telescope Science Institute, following the recommendations of the JWST Advisory Committee (http://www.stsci.edu/jwst/advisory-committee/JSTAC-Recommendations_ERS_CF.pdf), is now defining the parameters for an Early Release Science (ERS) program. The primary objective of the ERS program is to furnish open access to a broad suite of JW science observations as early as possible in Cycle 1 to inform the preparation of Cycle 2 proposals, seed initial discovery, and build community experience with JWST. ERS will provide the first opportunity for the community at-large to propose for science observations with JWST, and programs will be selected to span key observing modes, technical challenges, and science areas. JWST offers 14 distinct imaging, coronagraphic, and spectroscopic observing modes from the optical to the mid-infrared (0.6 - 28.3 microns). Approximately 500 hours of director's discretionary time will be made available. Your input through this brief survey will be used to inform our preparations for the program.

The survey consists of four pages which should take 10-15 minutes to complete. The first three pages are designed to query users about their background and familiarity with JWST capabilities. More information on the general framework and timeline for the ERS program and questions to gauge community interest in the program follow on the last page. This information is also provided at: <http://www.stsci.edu/jwst/science/ers>

The survey will be open from October 10, 2015 through January 15, 2016. Participation at your earliest convenience would be greatly appreciated – through the survey period, the general demographics of respondents will be examined, and we will reach out to various segments of the community as needed to facilitate broad participation.

Questions and comments are welcome at jwst_ers@stsci.edu. Interested parties may also contact the following STScI science staff members:

The key elements of the Early Release Science program currently are as follows:

1. JWST ERS programs will be designed and executed by community investigators, and selected by peer-review.
2. ERS will be a director's discretionary program, which will provide a total of ~500 hours of time.
3. ERS programs will be selected to span key JWST observing modes (summarized in the top figure), data analysis and science areas.
4. ERS will be comprised of substantive, science-driven programs, which have the potential to enable community and beginning in Cycle 1, and/or to be building blocks with which the community can use to design larger JWST programs in the future.
5. ERS observations will have no proprietary period.
6. ERS observations will be among the first observations to execute after commissioning in Cycle 1.
7. ERS teams will be responsible for the delivery of science enabling products to the community in coordination with the Archive for Space Telescopes. The delivery timescale should be sufficiently rapid to support community preparation of proposals.
8. ERS proposals will be reviewed, selected, and published near the time of release of the GO Cycle 1 Call for Proposals. The proposal deadline is currently planned for August 2017, and each prospective ERS team must submit a Notice of Intent by February 2017. Updates on the ERS program will be provided at: <https://jwst.stsci.edu/science-planning/early-release-science-program>. An ERS Call for Proposals will be available in January 2017. (see below)

JWST Science Timeline

Updates on the ERS program will be provided at: <https://jwst.stsci.edu/science-planning/early-release-science-program>
An ERS Call for Proposals will be available in January 2017.

ERS Letters

JAMES WEBB SPACE TELESCOPE

Survey to Gauge Community Interests

Goals

Inform development of ERS program, selection criteria, proposal review.

- Estimate number of ERS proposals, size distribution
- Estimate usage of JWST observing modes
- collect feedback on ERS program boundary conditions
- collect feedback on resources needed for ERS teams to produce science-enabling products for community.

Concomitant goals

- Announce ERS program
- Gauge familiarity with JW capabilities
- Provide basic education (overview) on JW capabilities

JAMES WEBB SPACE TELESCOPE

Survey to Gauge Community Interests

Status

- Survey development and testing (Sept-Oct 2015)
- Survey open Oct 2015 – Jan 2016 (after AAS).
- 589 respondents completed entire survey; strong expressions of support and interest from respondents
- Summary of analysis to be provided to community in STScI newsletter article.

ERS program framework iterated with Director and JSTAC

1. Designed, executed by teams with broad representation of community investigators; selected by peer-review.
2. Director's discretionary program, total ~500 hours.
3. Data have no proprietary period.
4. Spans key JWST observing modes and science areas. Coherent programs in multiple modes encouraged. (14 distinct JWST imaging, coronagraphic, spectroscopic observing modes.) *10-15 medium sized (30-70 hr) programs.*
5. Substantive, science-driven programs of broad community interest (enable archival research in Cy1, prep for Cy2, and/or be building blocks for community to design more challenging JWST future program).
6. Among first obs to execute after commissioning in Cy1. *Must be schedulable early Cy1; CVZ targets preferred.*
7. ERS teams responsible for delivery of science enabling products to community in coordination with MAST. Delivery timescale to support community preparation of Cycle 2 proposals.
8. Reviewed, selected, publicized prior to release of GO Cy1 Call for Proposals. NOI deadline 2017Feb. Proposal deadline 2017Aug.

GTO CP release
2017Jan

GO CP
2017Nov

GO Cy1
deadline
2018Feb

GO TAC
2018May

commissioning
(6 mo)

cycle 1
obs
begin
2019Apr

GTO
props due
2017Apr

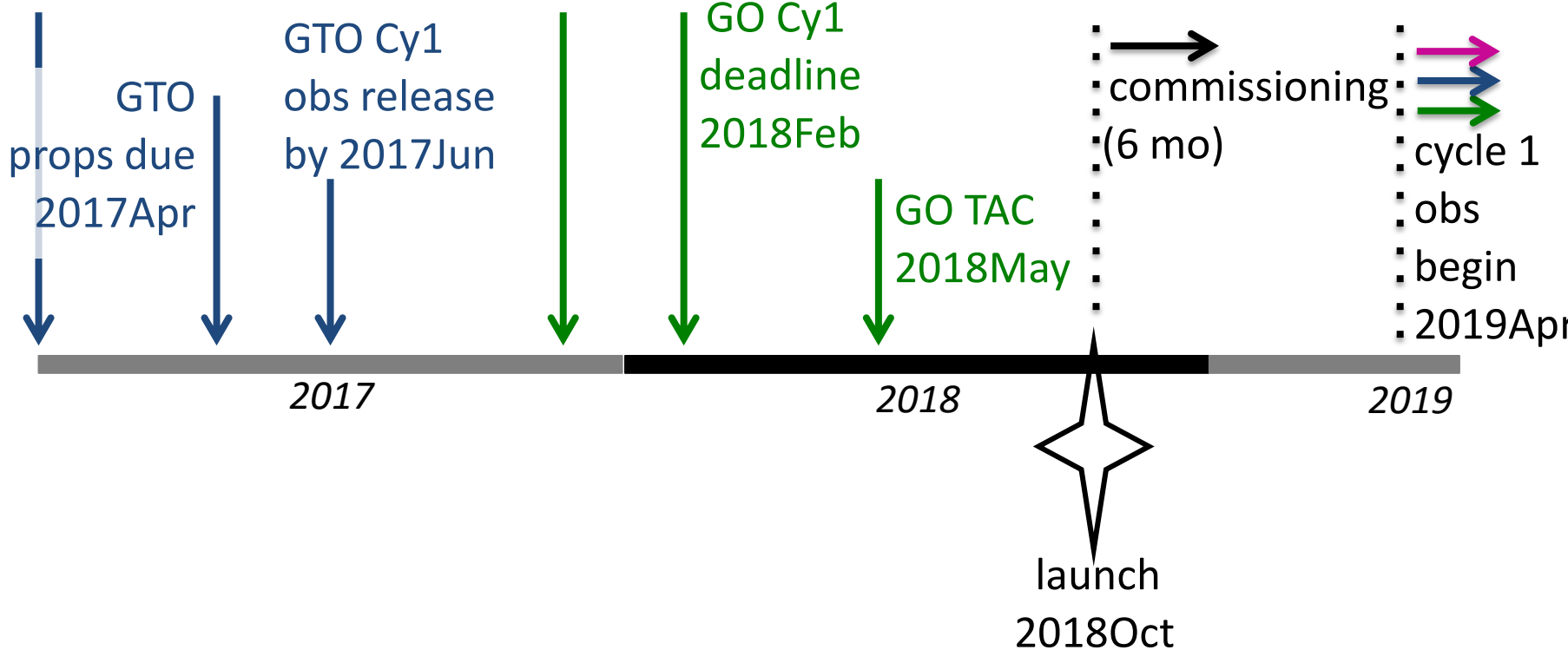
GTO Cy1
obs release
by 2017Jun

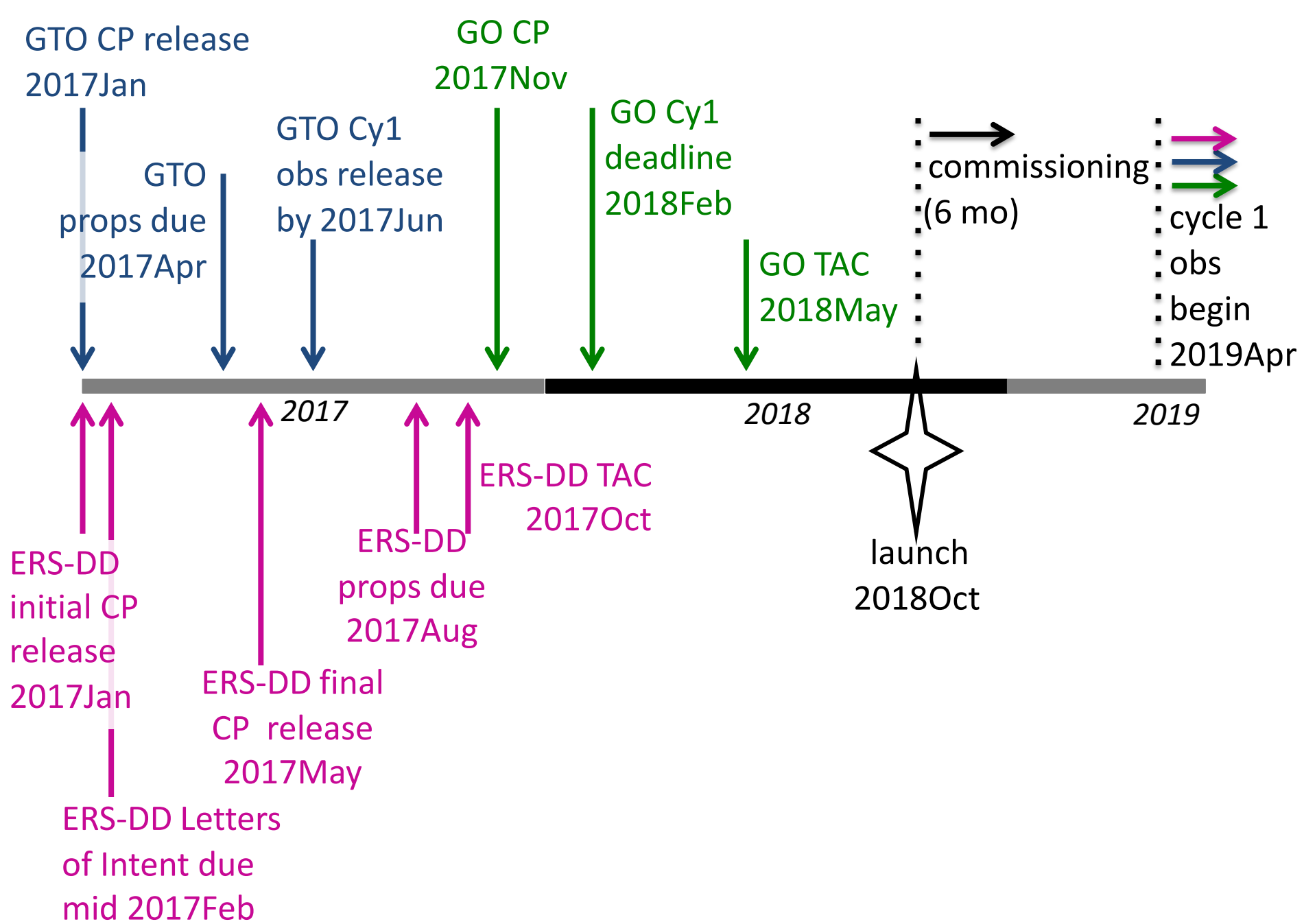
2017

2018

2019

launch
2018Oct





ERS proposal requirements (distinguishing elements from GO Cy1)

1. Justification for ERS time

How will your program help the community learn to do science with JWST and prepare for Cy2? What science-enabling products are proposed for development and release? How will your program demonstrate baseline JW science capabilities.

2. Scientific Justification

Why are the observations scientifically compelling.

3. Team Diversity

Demonstration of how the proposing team represents and has input from diversity of experts with broad demographics within sub-discipline.

4. Description of the Observations

Establish feasibility for early execution, and flexibility in target selection to accommodate any change to start date for Cy1 science obs.

5. Project Management Plan & Budget

Describe data processing and analysis plan, roles, responsibilities, work schedule, budget.

ERS proposal requirements (distinguishing elements from GO Cy1)

6. Mandatory Notice of Intent to Propose (due 2017Feb)

Enables STScl to identify community members well-suited for review (appropriate expertise, w/o conflict).

“Material in a Nol is deemed confidential. The purpose for requiring the submission of Nols is not to be restrictive, but rather to enable STScl to prepare for the proposal review.”

The Nol must include:

- project title,*
- brief (~few paragraphs) description of the proposed science project, including JWST instruments and modes to be used, to the best of the proposing team’s knowledge at the time of Nol submission,*
- name(s) and affiliation(s) of the PI (or co-PIs),*
- name(s) and affiliation(s) for as many of the Co-Is as are known at the time of NOI submission.*
- a brief description of how proposing team broadly represents relevant experts and demographics of sub-discipline.*

JAMES WEBB SPACE TELESCOPE

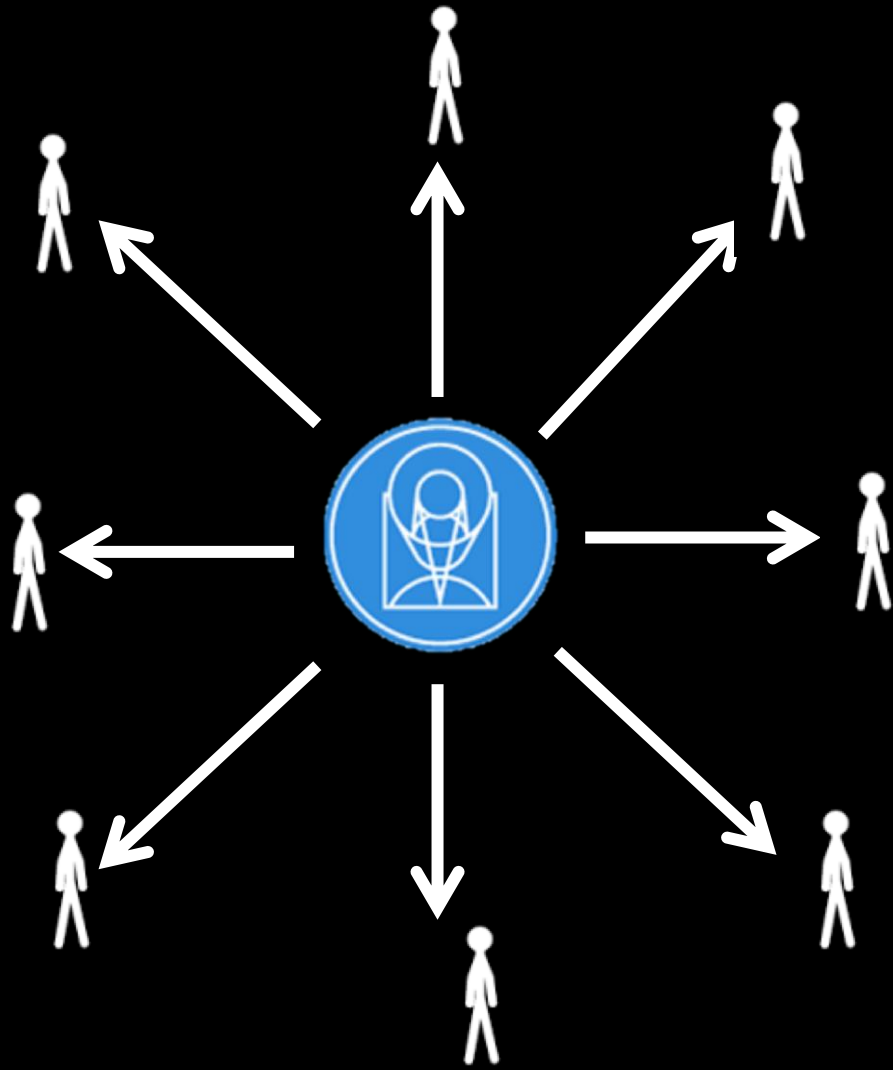
An Early Release Science Program

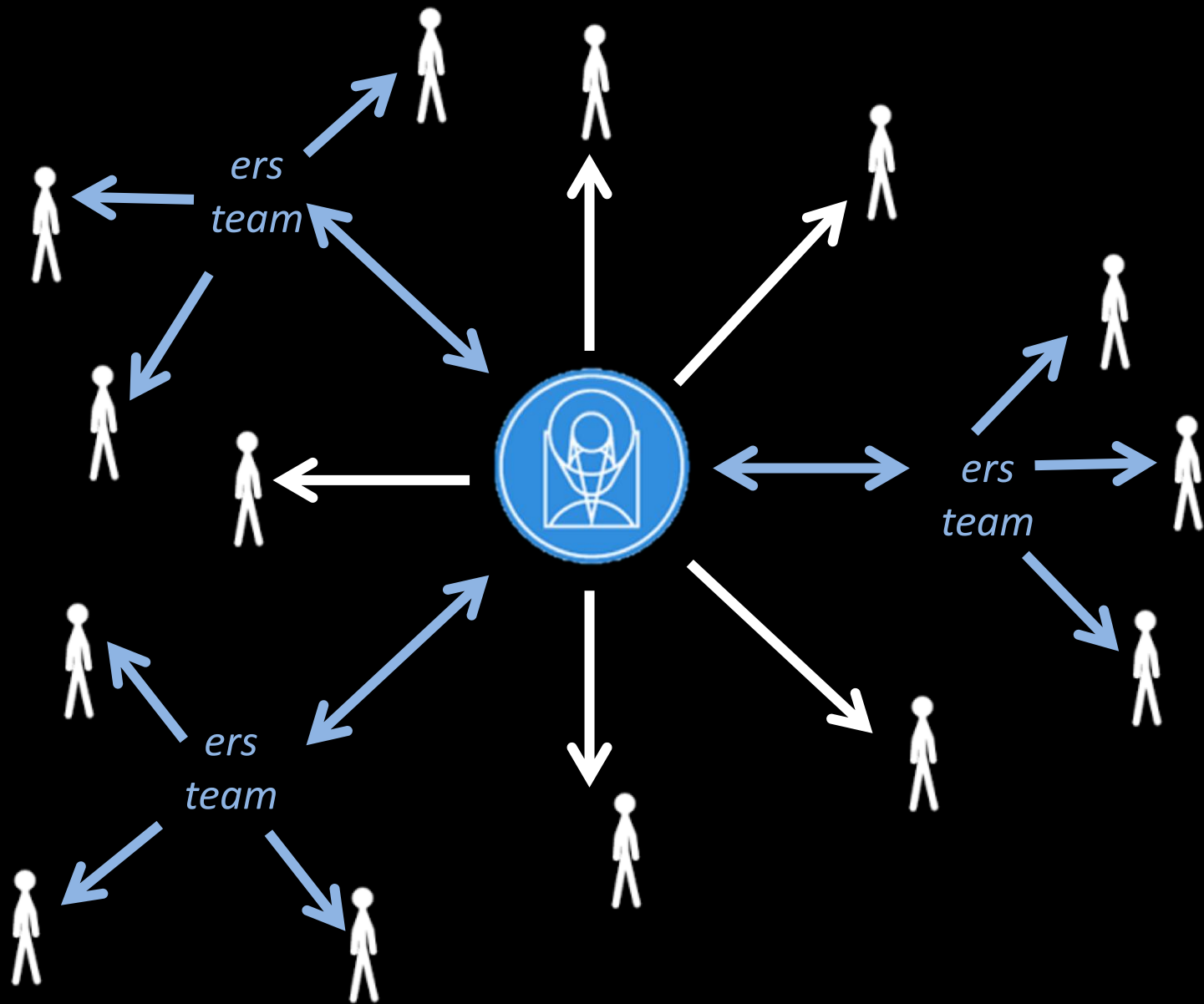
Products

- Building blocks for Cy1+ GO programs
 - APT files available at Cy1 CP release
 - Data & science-ready products available as early as possible in Cy1
 - Enables Cy1 archival programs
- Provides kernels for cohesive science-based training sets
 - Observation & proposal planning
 - Data reduction and analysis cookbooks
- Increased community familiarity about JW capabilities for Cy1 GO proposal review

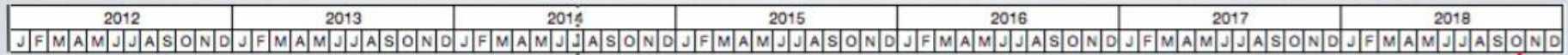
In addition to immediate release of data, ERS activities provide focal point for organization of GO user support, and dissemination of information on JWST performance and results.

Accelerate dissemination of JWST know-how with 5-yr required, 10-yr anticipated lifetime.





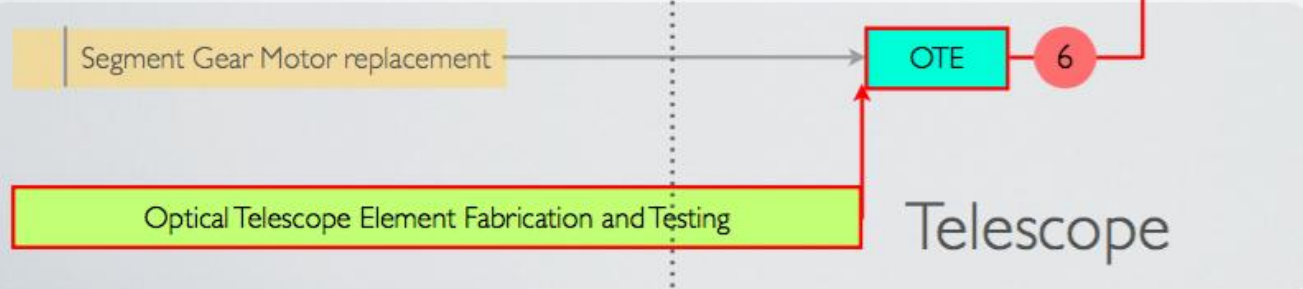
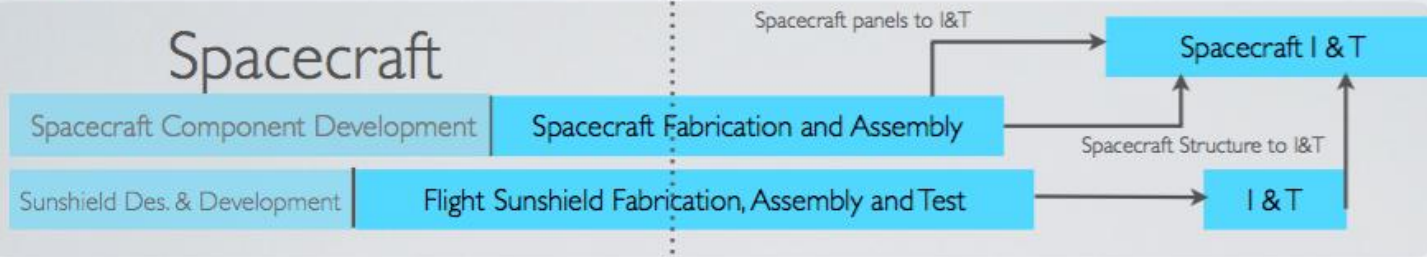
JWST Schedule



OTE = Optical Telescope Element
 OTIS = Optical Telescope + ISIM

k months of project funded critical path (mission pacing) schedule reserve

Spacecraft

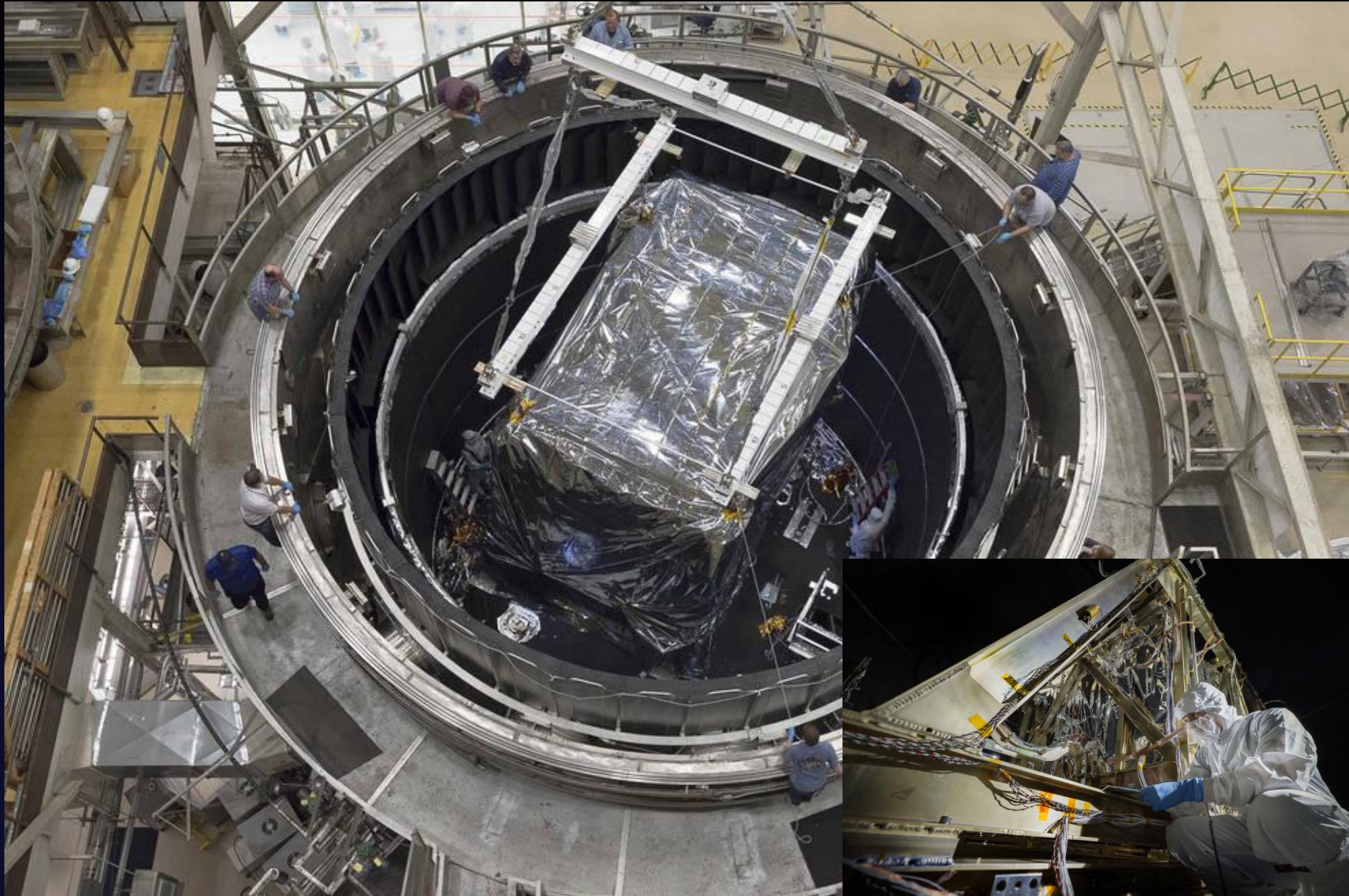


- Northrop-Grumman
- Goddard Space Flight Center
- Ball Aerospace
- ATK
- Johnson Space Center
- Guiana Space Center

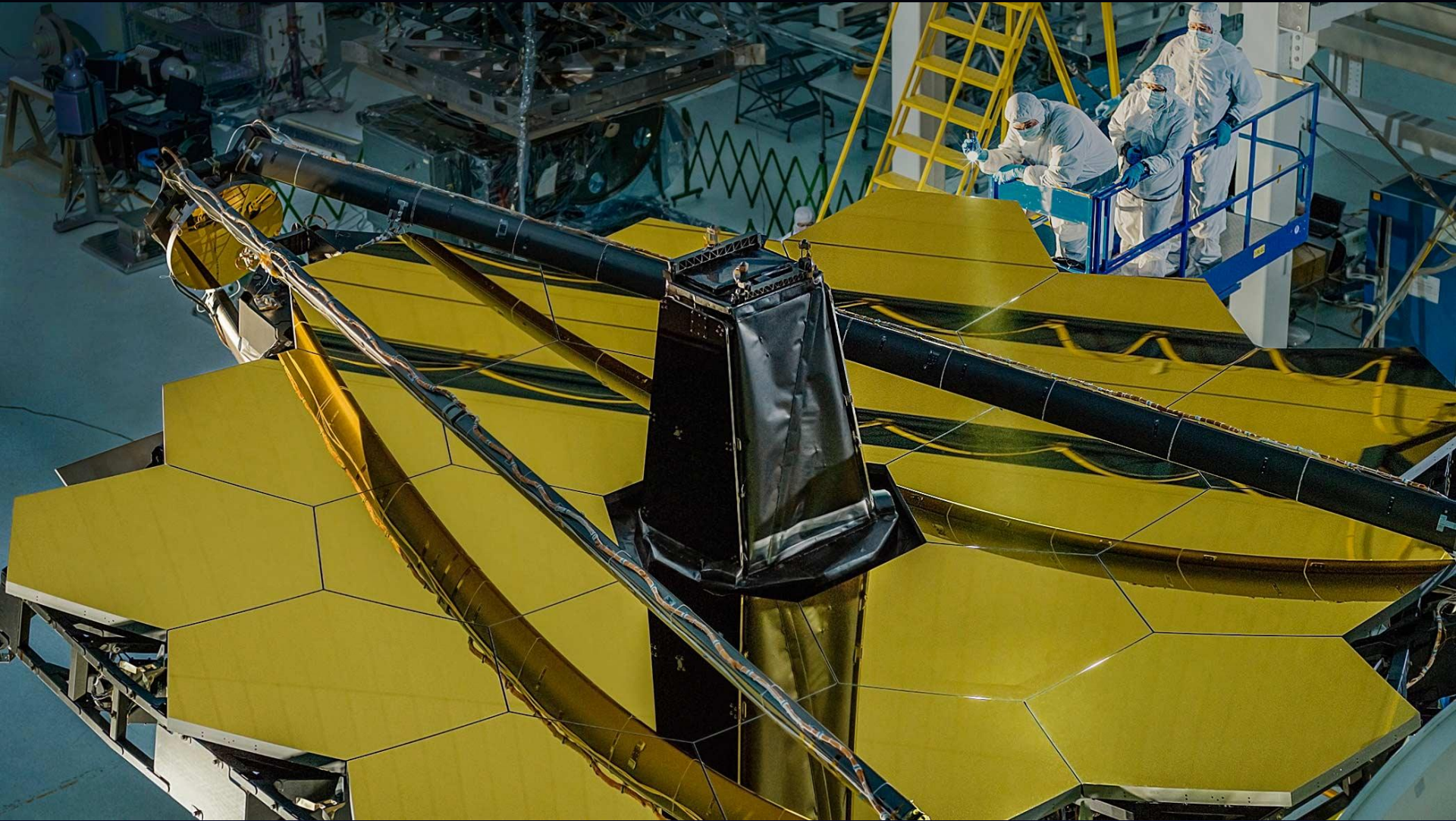
Faded areas are completed

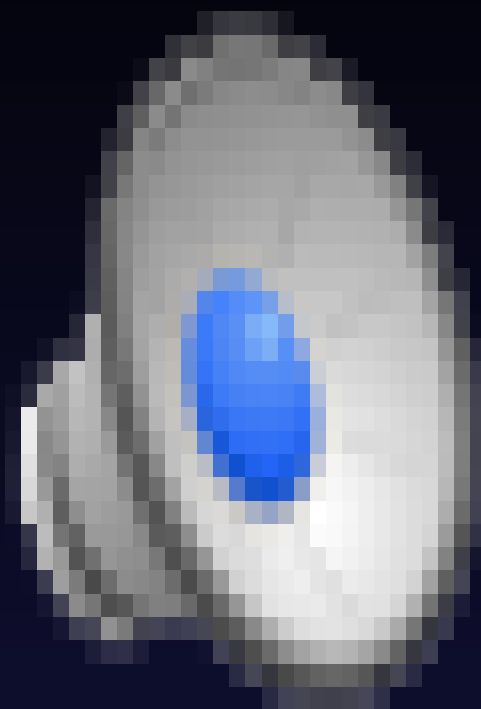
slide adapted from Eric Smith, JWST town Hall, Jan '14

ISIM CryoVac 3 Testing Completed (January 2016)



Installed 18 primary mirror segments, secondary mirror and Aft Optics System, including Fixed Tertiary mirror and Fine Steering Mirror (February – April 2016)

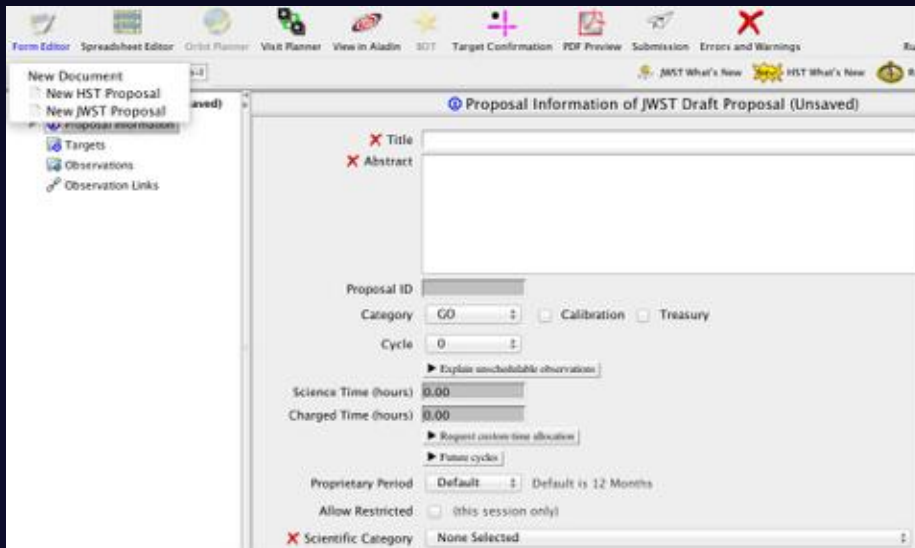
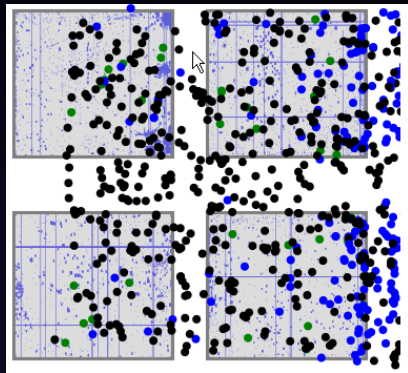






*Installed Science Instrument
package into Optical
Telescope Element (May
2016)*

JWST User Tools



- User Documentation (Handbooks, etc.)
- Space Telescope Imaging Product Simulator (STIPS)
- WebbPSF
- Exposure Time Calculator (ETC)
- Astronomer's Proposal Tool (APT)
- Calibration Pipeline
- Data Analysis Tools
- Archives

New Website and Documentation

A New Paradigm for JWST User Documentation (coming 2016)

New JWST website will contain higher level mission information and JWST science content

New documentation system: “Every page is page one” (Mark Baker)

- Short articles
- Self-contained, one-level information
- Hyperlinked network rather than monolithic handbook

Think Wikipedia (but it's not a wiki)

Multiple conceptual spaces: Background articles, planning cookbooks, science policy, engineering specs

Incremental releases (as articles are written and reviewed), beginning with instruments, APT, ETC articles

The image shows two screenshots of the James Webb Space Telescope website. The top screenshot is the main website, featuring a navigation bar with links for 'About', 'News', 'Events', 'Multimedia', 'Instrumentation', 'Science Planning', and 'Documentation'. The main content area is titled 'Preparing for Science' and includes a timeline from 2015 to 2025. Below this are three boxes: 'Science Corner', 'Performance & Simulation', and 'Advisory Committee'. The bottom screenshot is the 'JAMES WEBB SPACE TELESCOPE USER DOCUMENTATION' page, which has a navigation bar with 'About', 'Instruments', 'Proposing', 'Data', and 'Reference'. The main content area is titled 'MIRI Imaging' and includes a section for 'Basic Properties' with diagrams and text describing the instrument's capabilities.

Space Telescope Image Project Simulator (STIPS)

JWST Simulator

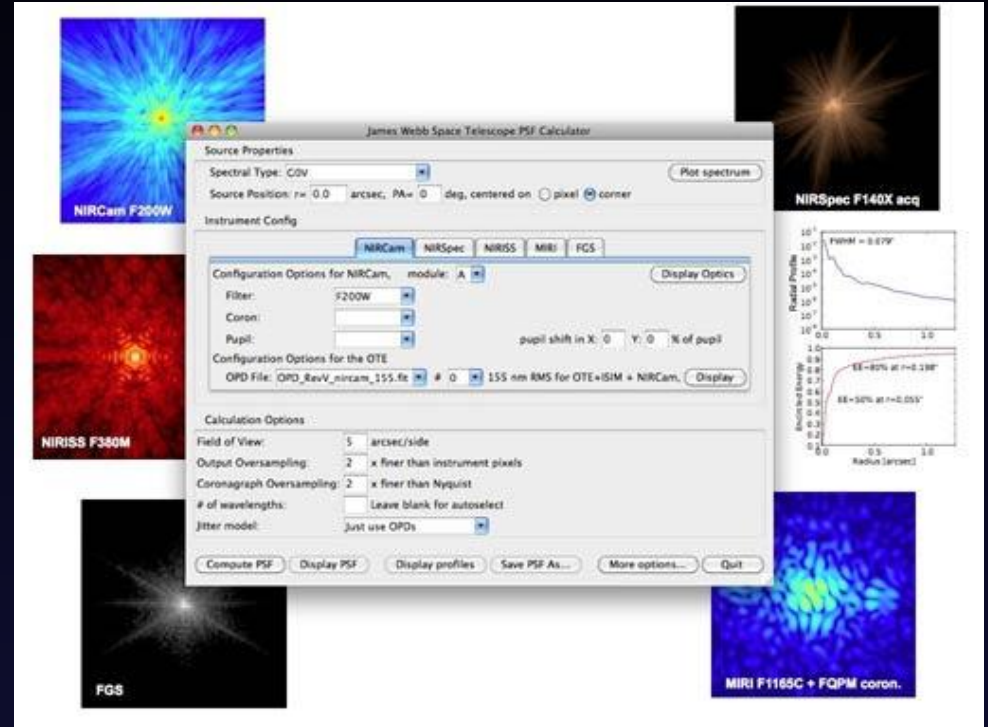


- Simulators needed to model full fields of view, complex observing sequences, dithers, and simulated data products
- STIPS
 - Web tool
 - Initial release includes JWST imaging modes
 - Different astrophysical models: stellar populations, galaxy populations
 - Full FOV, WebbPSFs
- Initial Release in 2016

Website <https://jwst.stsci.edu/science-planning/performance--simulation-tools-1/image-and-spectroscopy-simulator>

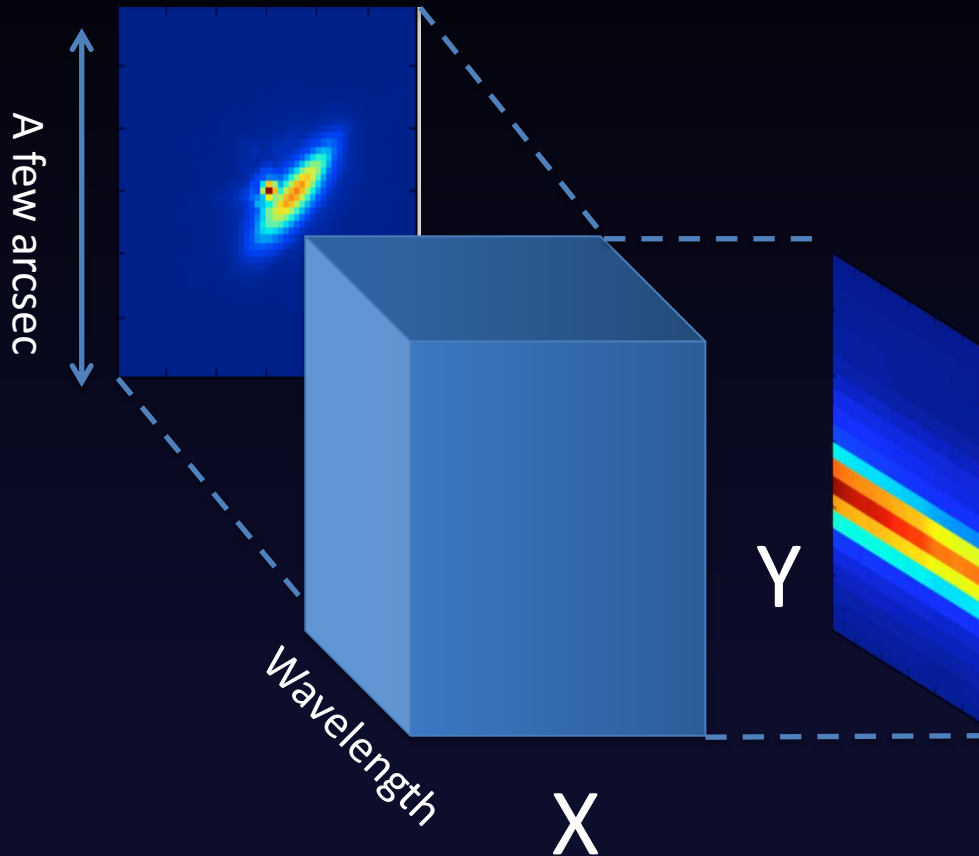
WebbPSF

- PSF simulation tool
- Includes a library of Optical Path Difference (OPD) files, consistent with the optical error budget, including wavefront errors in the OTE
- Assumes Fraunhofer (far-field) propagation
- Supports Direct Imaging, Coronagraphy, and Non-Redundant Mask modes
- Includes normalized filter throughputs, detector pixel scales, and orientations for all instruments
- Arbitrary sampling of output PSFs



Website <https://jwst.stsci.edu/science-planning/performance--simulation-tools-1/psf-simulation-tool-webbpsf>

JWST Exposure Time Calculator (Pandeia)



- Reference Files
 - *Throughput, PSFs, noise parameters*
- Engine
 - *General Python Library*
- Server
 - *Stores your calculations*
- User Interface
 - *Web application accessed through your browser*

Release Schedule

ETC engine development release: **Spring 2016**

ETC WebApp release: **January 2017**

Available Workbooks

#	Name	Load	Description	Options
1024	Imaging workbook	[Load]	Imaging observations of a 1 microJy flat spectrum source.	[Copy] [Remove] [Sharing]
1025	High-resolution spectroscopy workbook	[Load]	High-resolution spectroscopy observations of a 1 mJy flat spectrum source.	[Copy] [Remove] [Sharing]
1026	Medium-resolution spectroscopy workbook	[Load]	Medium-resolution spectroscopy observations of a 1 mJy flat spectrum source.	[Copy] [Remove] [Sharing]
1027	Multiple extended source workbook	[Load]	Multiple extended sources observed in imaging and spectroscopy.	[Copy] [Remove] [Sharing]
1028	Sample NIRSpec MSA Calculations	[Load]	Sample of NIRSpec MSA calculations showing the effects of shutter location, source location within the shutter, and the impact of multiple sources within a scene.	[Copy] [Remove] [Sharing]
1029	Example Source Flux Distributions	[Load]	Example imaging calculations for each of the supported source geometries: point, flat, 2D gaussian, and sersic	[Copy] [Remove] [Sharing]
1030	Sample Coronagraphy Calculations	[Load]	Coronagraphy calculations using three faint sources, one central star, and one reference source	[Copy] [Remove] [Sharing]
1031	Sample NIRISS WFSS Calculations	[Load]	Sample NIRISS WFSS Calculations	[Copy] [Remove] [Sharing]
1032	Sample backgrounds	[Load]	Same calculation for five different background options	[Copy] [Remove] [Sharing]
1033	IFU starter sample workbook	[Load]	Modified, to be edited	[Copy] [Remove] [Sharing]

[Create New Workbook](#)[Get a Copy of the Sample Workbooks](#)

User Access Permissions for ???

User	Read	Write	Grant	Revoke
------	------	-------	-------	--------

Astronomer's Proposal Tool (APT)

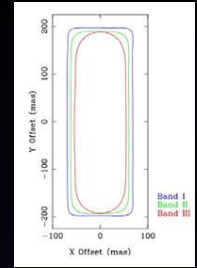
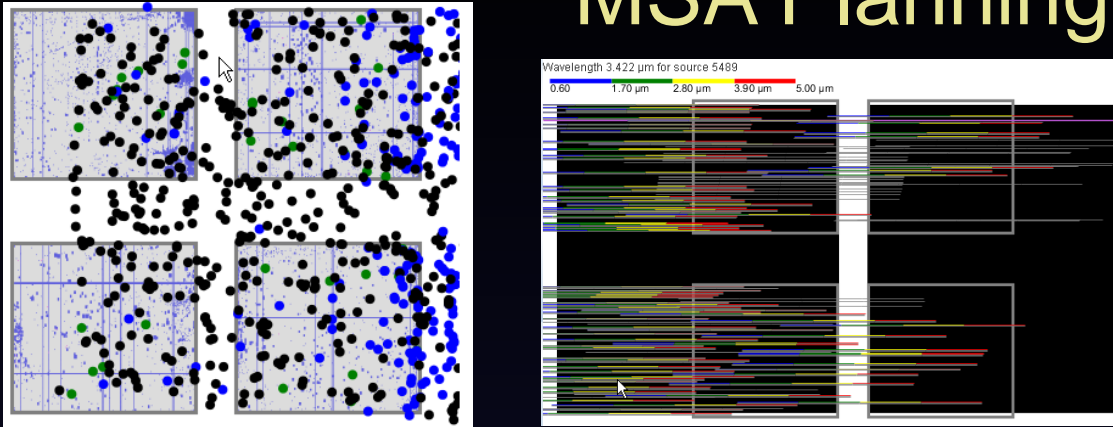
- Tool used to define observing programs and submit observing proposals
- Developmental releases already available in current HST APT release,
<http://www.stsci.edu/hst/proposi ng/apt>

The screenshot shows the APT interface for NIRCAM Coronagraphic Imaging. It includes fields for Number, Label, Instrument (NIRCAM), Template (NIRCAM Coronagraphic Imaging), and Target (None Selected). It also shows Visit Splitting (20.0 Arcsec), Number of Visits (1), Duration (secs) (126), and Total Charged (3325). The data volume is 3 MB. The interface has tabs for Mosaic Properties, Special Requirements, and Comments. The Mosaic Properties tab is active, showing Coronagraphic Mask (MASK210R), Acq Target (Same Target as Observation), Acq Filter (F102M), and Acq Flux. The Acq Exposure Time is RAPID (3). A table shows the Acq Readout Pattern (RAPID), Acq No. of Groups (3), Acq No. of Integrations (1), Acq Photon Collect Duration (32.538), and Total Photon C. (115.018).

#	Filter	Readout Pattern	No. of Groups	No. of Integrations	Acq Photon Collect Duration	Total Photon C.
1	F102M	RAPID	3	1	32.538	115.018

- Uses **template** concept developed for other observatories
- One template per Instrument mode (e.g. MIRI Imaging, NIRSpec IFU)
- Automatically splits observations into **visits** (sequences using a single guide star) and **exposures**

MSA Planning Tool



- Within APT
- Input source catalog, primary and filler candidate lists, slitlet set-up, dither set-up, exposure set-up, number of configurations
- Calculates configurations based on slit throughput
- Displays configurations, lists sources, shows layout of spectra on the detector

Astronomer's Proposal Tools Version 21.4.1 pr76481 (Thu Nov 21 2013) - Unsubmitted JWST Phase I Proposal (msa_demo_AAS.aptx)

File Edit Tools Form Editor Help

Form Editor Spreadsheet Editor Orbit Planner Visit Planner View in Aladin BOT Target Confirmation PDF Preview Submission Errors and Warnings Run All Tools Stop

New Document Phase I-II New JWST Readme What's New? Roadmap Feedback

Unsubmitted JWST Phase I Proposal

- Proposal Information
- Targets
- Data Requests
- MSA Observation Folder
- Observation Links

MSA Observation Folder of Unsubmitted JWST Phase I Proposal (msa_demo_AAS.aptx)

Catalogs **Planner** Plans

Import Catalog...

UDF-Catalog.txt (18700 sources)
z>5 (529 sources)
Fillers (5674 sources)

Name z>5

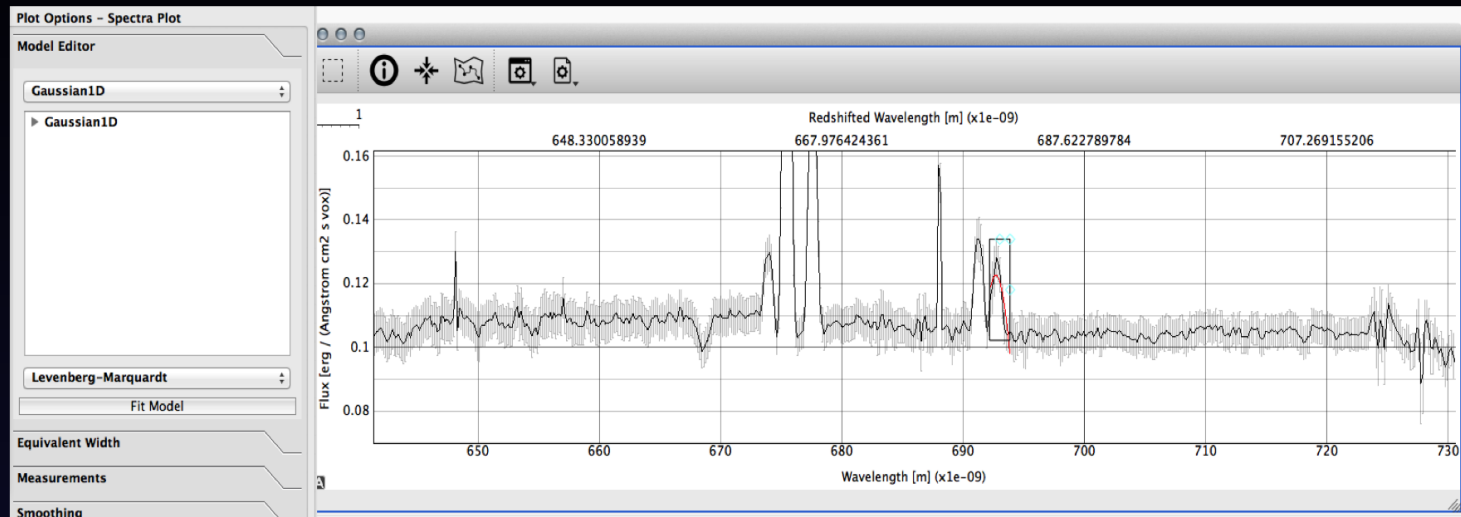
Contains 529 sources selected from UDF-Catalog.txt (18700 sources) which fit the following criterion:
Redshift greater than 5.0

ID	RA	Dec	Size	Redshift	Bmag	Vmag	zmag
227	03 32 41.1612	-27 49 20.57	0	5.1	99	32.064	29.957
279	03 32 38.8879	-27 49 17.14	0	5.23	99	99	30.124
322	03 32 41.1859	-27 49 14.82	0	5.86	99	30.523	26.794
366	03 32 42.0776	-27 49 11.58	0	5.67	28.71	26.952	23.336
391	03 32 41.9925	-27 49 11.95	0	5	99	99	29.95
406	03 32 36.6028	-27 49 10.63	0	5.23	99	99	28.847
443	03 32 38.0154	-27 49 8.38	0	5.76	99	99	25.337
457	03 32 39.0491	-27 49 8.28	0	5.68	99	31.798	28.239
482	03 32 40.0598	-27 49 7.49	0	5.89	99	99	28.186
492	03 32 42.0117	-27 49 7.34	0	5.27	99	99	29.756
546	03 32 37.9285	-27 49 4.59	0	5.35	99	30.134	27.109
618	03 32 36.4078	-27 49 2.81	0	5.5	99	31.217	28.682
655	03 32 37.2684	-27 49 1.38	0	5.48	99	99	30.74
774	03 32 37.2675	-27 48 56.89	0	5.52	30.641	31.161	28.271
802	03 32 37.5082	-27 48 55.99	0	5.08	99	99	29.658
1022	03 32 43.1223	-27 48 47.15	0	5.05	99	99	29.952
1086	03 32 40.9158	-27 48 44.73	0	5.75	30.842	99	27.731
1155	03 32 34.9228	-27 48 47.62	0	5.2	99	99	29.765

Edit Data Requests New Edit Observation 1

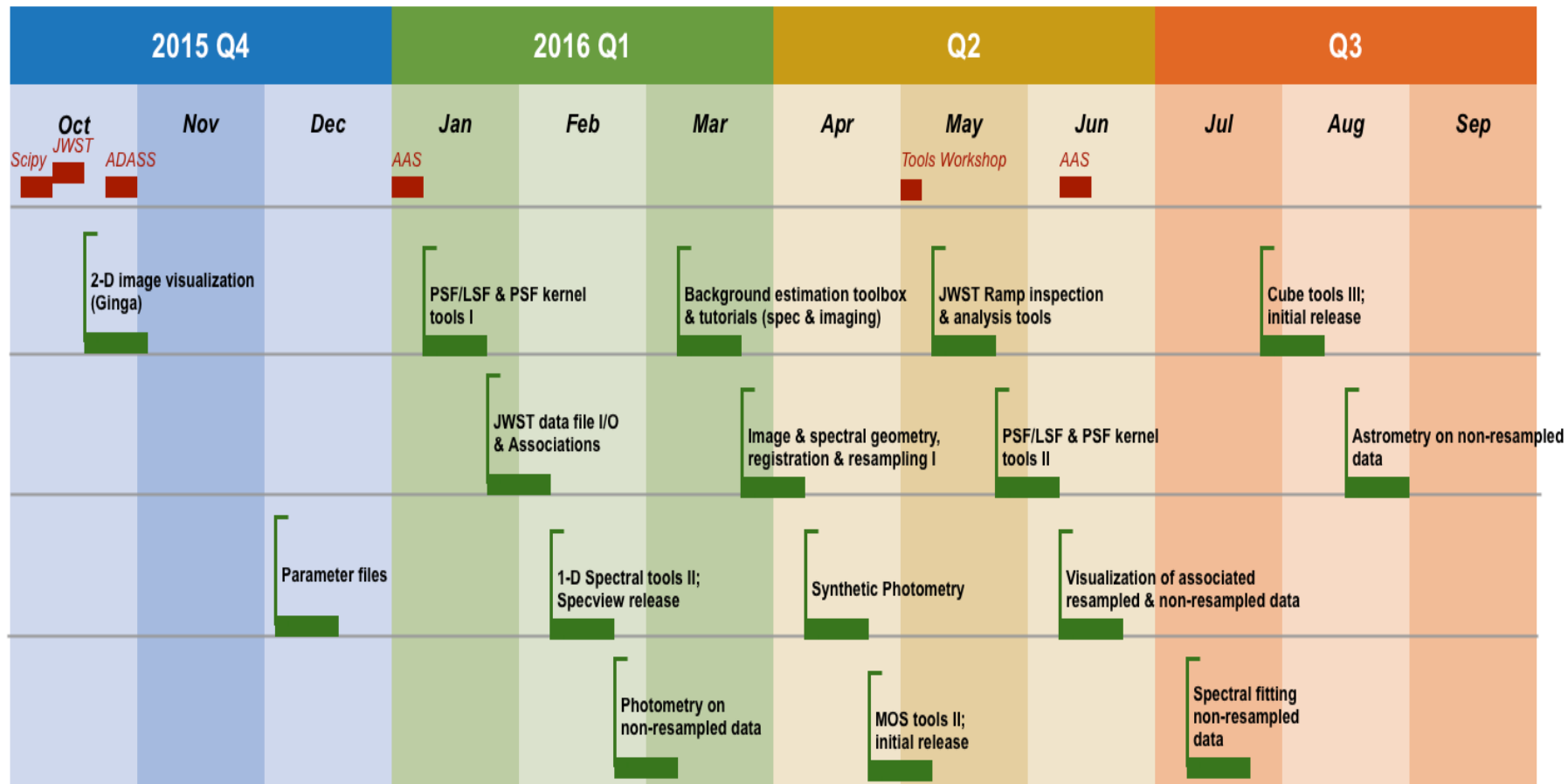
3 errors & warnings (Click for Details)

Data Analysis and Visualization Tools



- JWST users need to inspect, manipulate, and model their data
- JWST data analysis will be in [Python/Astropy](#)
- Basic capabilities familiar with users of IRAF, STSDAS, and IDL will be available (many already are)
- Visualization will be in [Ginga & Glue](#)
- Tools understand JWST data structures, including uncertainties, data associations, and data quality flags
- Extensible visualization tools are being developed for interactive workflows
- Up-to-date development code and discussion available via: bit.do/jwst

Data Analysis Tools Development Plan



Data
Subsets

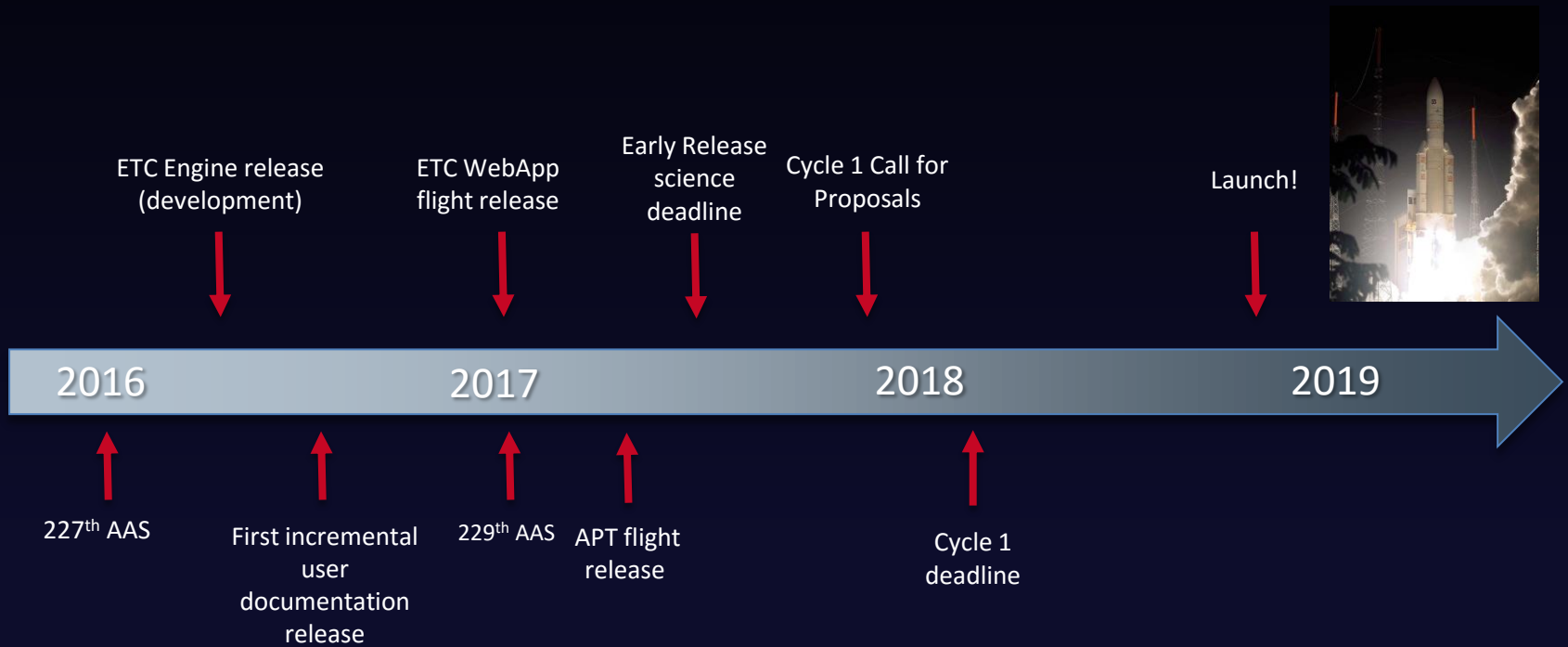


Plot Layers

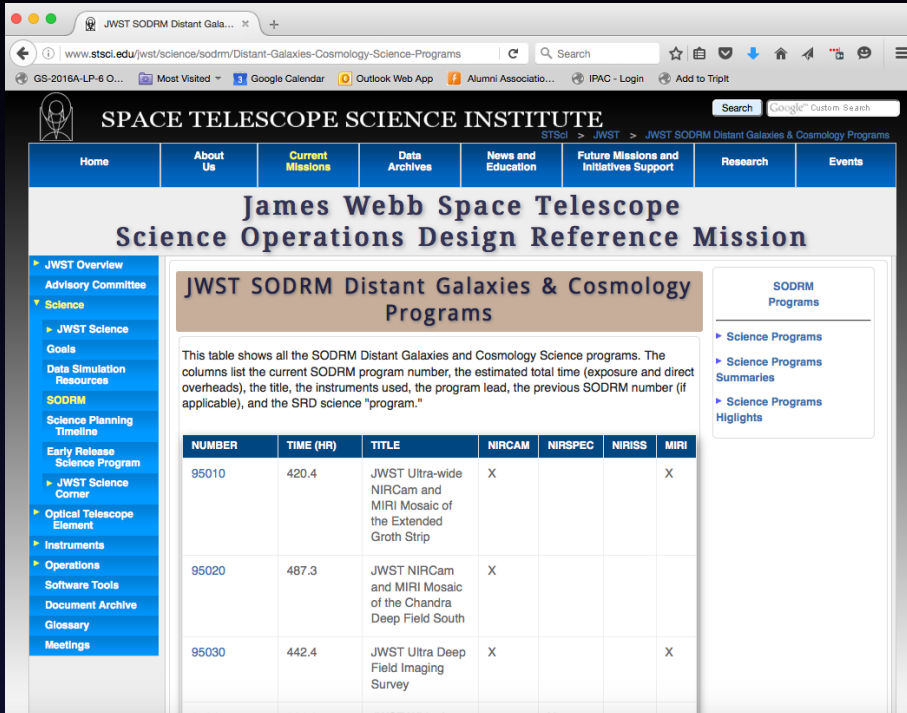
Plot Options

Drag Data To Plot

User Tools Timeline Summary



Science Operations Design Reference Mission (SODRM)



The screenshot shows the JWST SODRM website. The main heading is "James Webb Space Telescope Science Operations Design Reference Mission". Below this, there is a section titled "JWST SODRM Distant Galaxies & Cosmology Programs". A table lists three programs with their respective details.

NUMBER	TIME (HR)	TITLE	NIRCAM	NIRSPEC	NIRISS	MIRI
95010	420.4	JWST Ultra-wide NIRCam and MIRI Mosaic of the Extended Groth Strip	X			X
95020	487.3	JWST NIRCam and MIRI Mosaic of the Chandra Deep Field South	X			
95030	442.4	JWST Ultra Deep Field Imaging Survey	X			X

- Contains 112 representative science and calibration programs covering a wide range of science topics and observing modes
- Text description: Title, ID number, Science Goal, Estimated Observatory Time, Targets, Observing Templates, Description of Observations, Timing /Orientation Constraints
- Detailed Exposure Specifications
 - APT files for all NIRCam, NIRSpec, and MIRI observations
 - Spreadsheets for NIRISS observations

Website

<http://www.stsci.edu/jwst/science/sodrm>

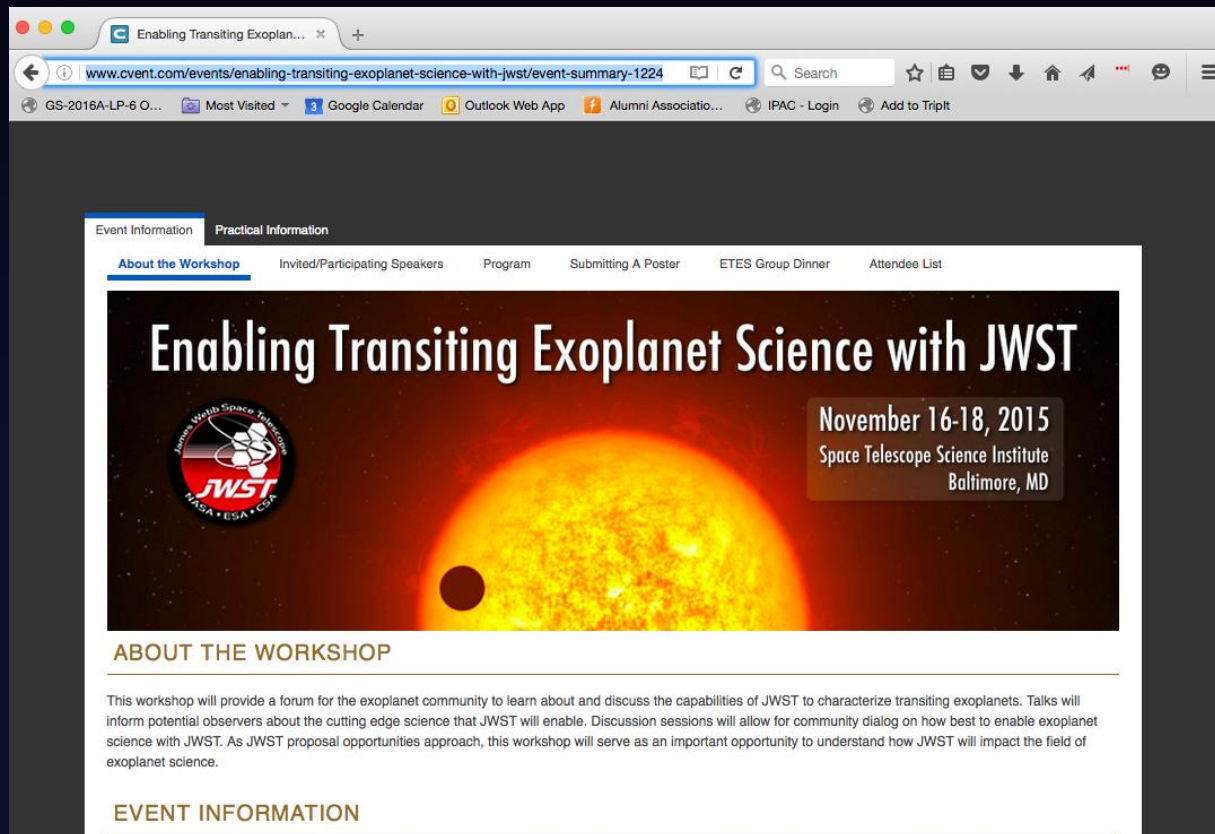
Documentation

<http://www.stsci.edu/jwst/science/sodram/SODRM-Revision-C.pdf>

Other JWST Science Meetings and Preparatory Workshops

- Topical Science Meetings

- 2-3 day workshops on major JWST science themes will be organized at STScI throughout 2016-2018, will include hands-on introduction to software and systems



The image is a screenshot of a web browser displaying the event page for "Enabling Transiting Exoplanet Science with JWST". The browser's address bar shows the URL "www.cvent.com/events/enabling-transiting-exoplanet-science-with-jwst/event-summary-1224". The page features a navigation menu with tabs for "Event Information" (selected), "Practical Information", "About the Workshop", "Invited/Participating Speakers", "Program", "Submitting A Poster", "ETES Group Dinner", and "Attendee List". The main content area has a large banner with the title "Enabling Transiting Exoplanet Science with JWST" in white text against a background of a bright yellow sun with a small black dot representing a transiting exoplanet. To the left of the banner is the JWST logo, which includes the text "James Webb Space Telescope" and "NASA • ESA • CSA". To the right of the banner, the dates "November 16-18, 2015" and the location "Space Telescope Science Institute, Baltimore, MD" are displayed. Below the banner, the section "ABOUT THE WORKSHOP" contains a paragraph of text: "This workshop will provide a forum for the exoplanet community to learn about and discuss the capabilities of JWST to characterize transiting exoplanets. Talks will inform potential observers about the cutting edge science that JWST will enable. Discussion sessions will allow for community dialog on how best to enable exoplanet science with JWST. As JWST proposal opportunities approach, this workshop will serve as an important opportunity to understand how JWST will impact the field of exoplanet science." Below this text is the section "EVENT INFORMATION".

Other JWST Science Meetings and Preparatory Workshops

- Topical Science Meetings

- 2-3 day workshops on major JWST science themes will be organized at STScI throughout 2016-2018, will include hands-on introduction to software and systems

- User Training

- Annual workshops at STScI and AAS on JWST Data Analysis Tools
- 2017 Workshops on JWST planning tools (ETCs, simulators)
- 2017-2018 Workshops on APT, single stream, documentation



The screenshot shows a web browser window displaying the Space Telescope Science Institute website. The page is titled "User Training in JWST Data Analysis" and features a large banner with the JWST logo and the text "User Training in JWST Data Analysis May 6-8, 2015 Space Telescope Science Institute • Baltimore, MD". Below the banner, there is a section titled "About The Event" with a paragraph of text. The website navigation menu includes links for Home, About Us, Current Missions, Data Archives, News and Education, Future Missions and Initiatives Support, Research, and Events. A search bar is located in the top right corner.

Website includes archived talks
http://www.stsci.edu/institute/conference/ut_jwst_da

Other JWST Science Meetings and Preparatory Workshops

- Topical Science Meetings

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- User Training

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- 2017 Workshops on JWST planning tools (ETCs, simulators)
- 2017-2018 Workshops on APT, single stream, documentation

- JWST “Colloquium Series”

- Contact us if you would like a holistic presentation about JWST and user preparation at your institution

- JWST “Community Days” (Coming Soon)

- Open call to US institutions to host hands-on JWST 1-2 day workshops (w/ optional science meeting), includes ERS program planning, JWST modes and flight capabilities, observing techniques, etc.