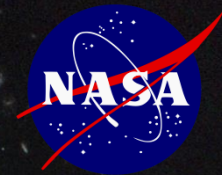
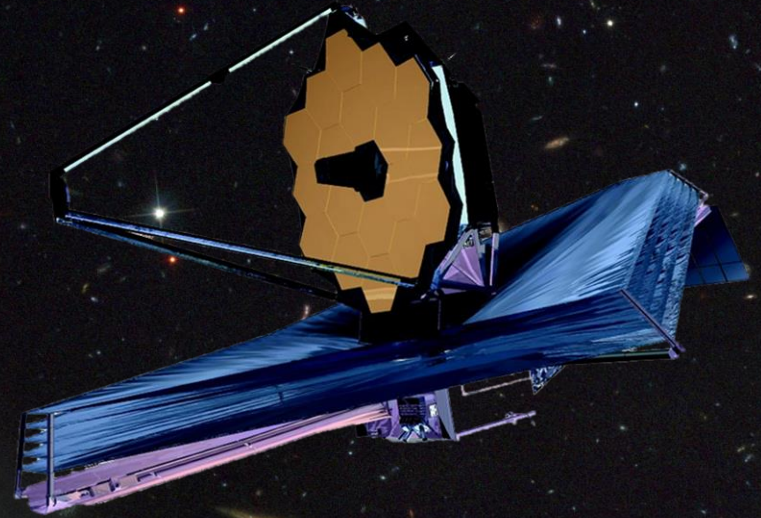


The James Webb Space Telescope



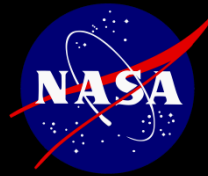
Jonathan P. Gardner

NASA's Goddard Space Flight Center

<http://jwst.nasa.gov>

Space Science Reviews, 2006, 123/4, 485

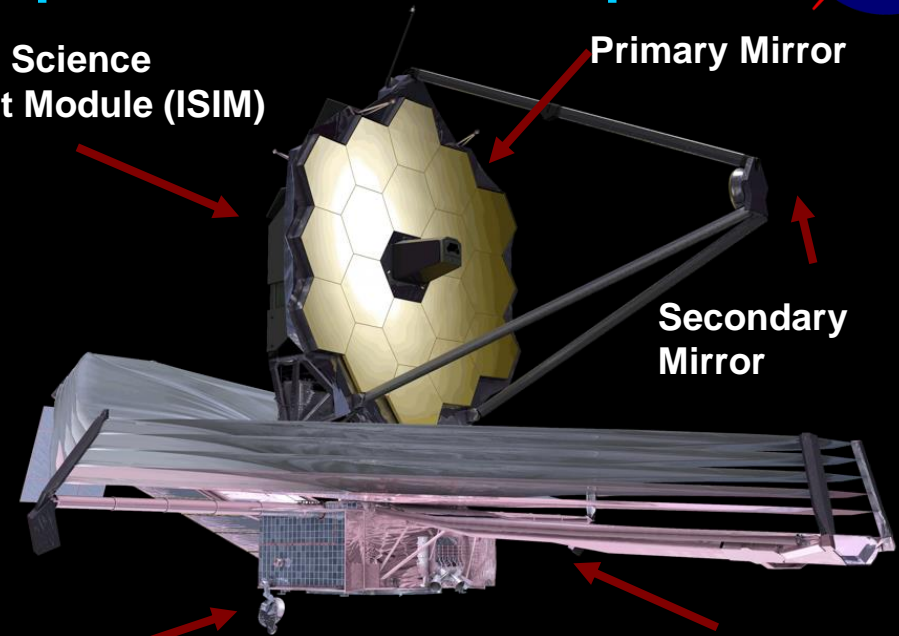
James Webb Space Telescope



Integrated Science
Instrument Module (ISIM)

Primary Mirror

Secondary
Mirror

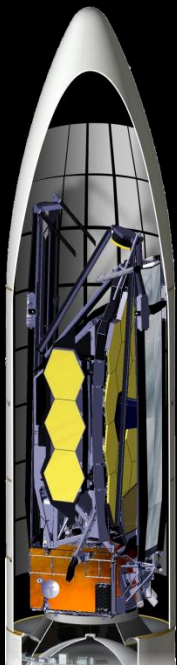
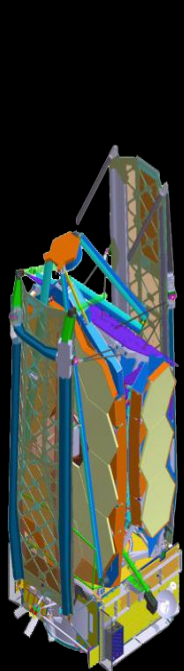


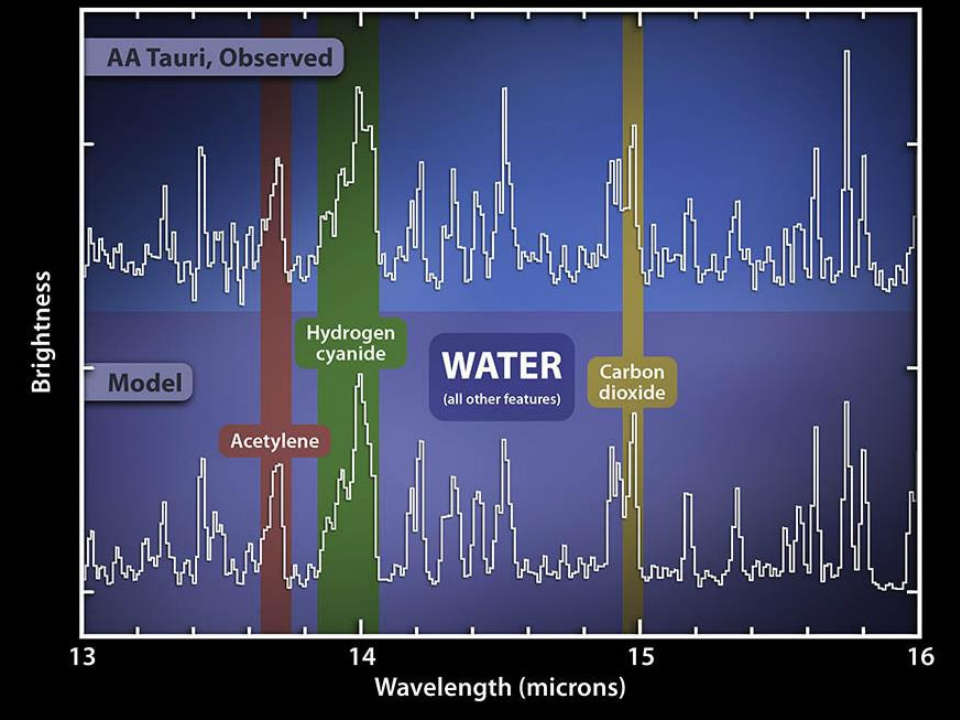
Spacecraft Bus

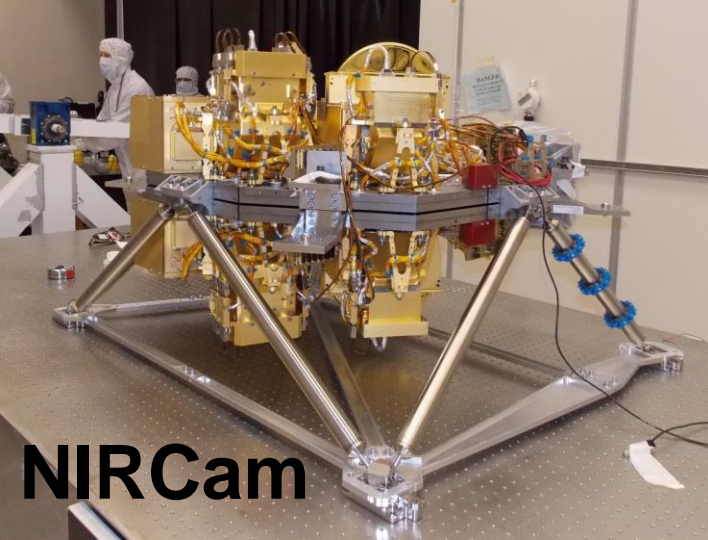
5 Layer Sunshield

- Complementary: 30m, ALMA, WFIRST, LSST
- NASA + ESA + CSA: 14 countries
- Lead: Goddard Space Flight Center
- Prime: Northrop Grumman
- Operations: STScI
- Senior Project Scientist:
Nobel Laureate John Mather
- Launch date: October 2018

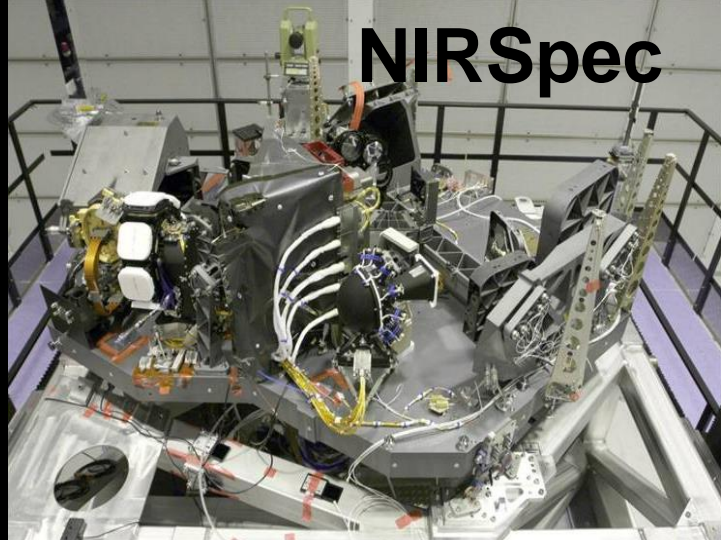
- 6.6m Telescope
- Successor to Hubble & Spitzer.
- Demonstrator of deployed optics.
- 4 instruments: 0.6 to 28.5 μm
- Passively cooled to $< 50 \text{ K}$.
- Named for 2nd NASA Administrator







NIRCam:
Imaging 0.6 – 5.0 μm
Broad, med & narrow
10 sq. arcmin FOV
65 mas resolution
Coronagraphy



NIRSpec

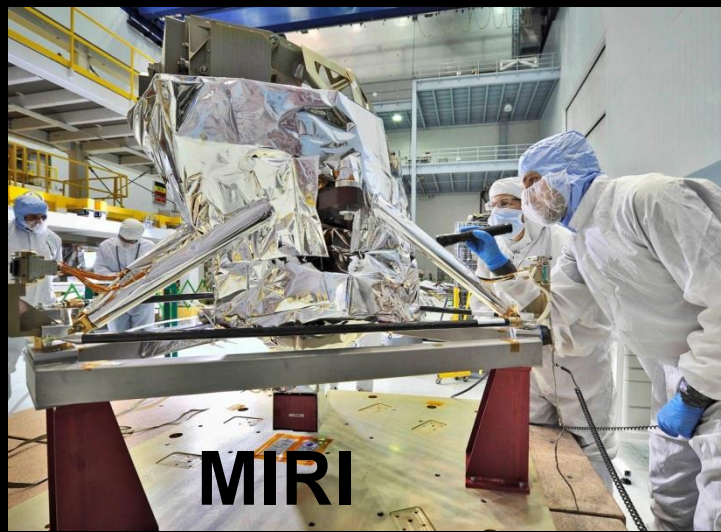
NIRSpec:
Multi-object: 10 sq. arcmin
IFU: 3x3 arcsec
R~100, R~1000, R~3000

FGS/NIRISS:
Guiding
Slitless spectroscopy (R~150)
Exoplanet transits (R~750)
Non-redundant mask



FGS/NIRISS

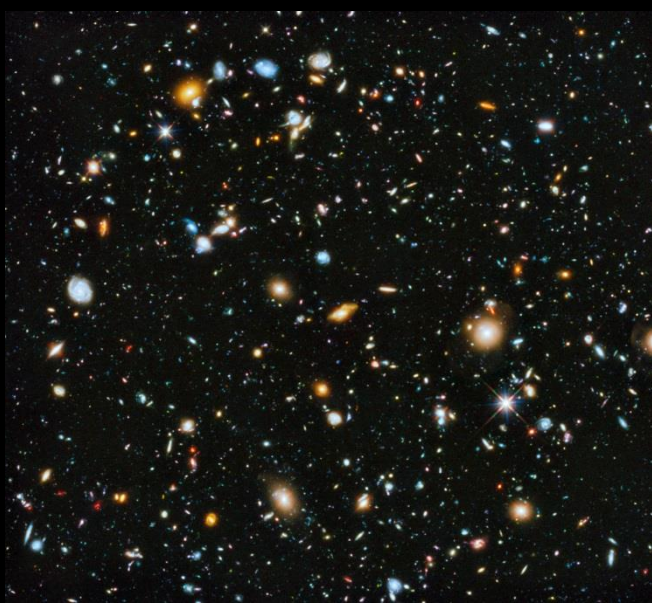
MIRI:
5 – 28.5 μm
2 sq. arcmin FOV
IFU R~3000
Coronagraphy



MIRI

Model-Dependent Rule of Thumb: Deep NIR Surveys

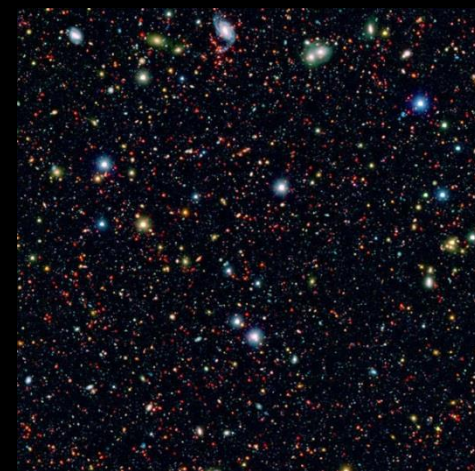
- Ultra-deep, deep and deep-wide imaging surveys:
 - JWST will do at $z \sim 12$ what HST is doing at $z \sim 6$
 - JWST will do at $z \sim 17$ what HST is doing at $z \sim 9$



UDF

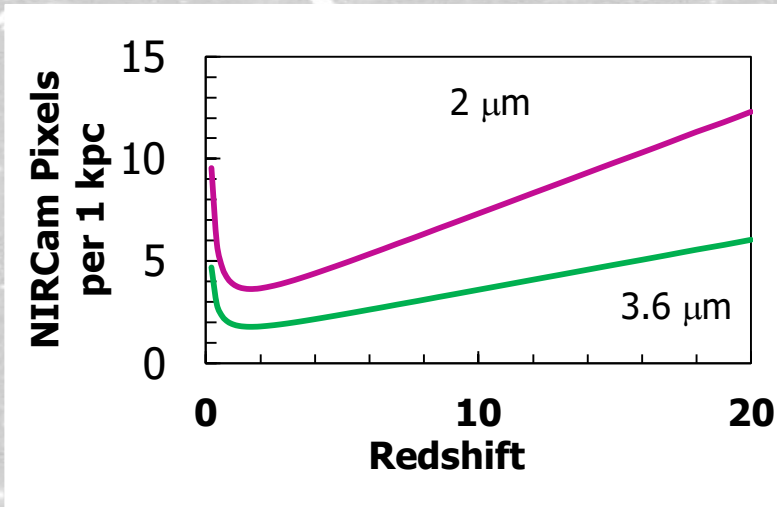


CANDELS

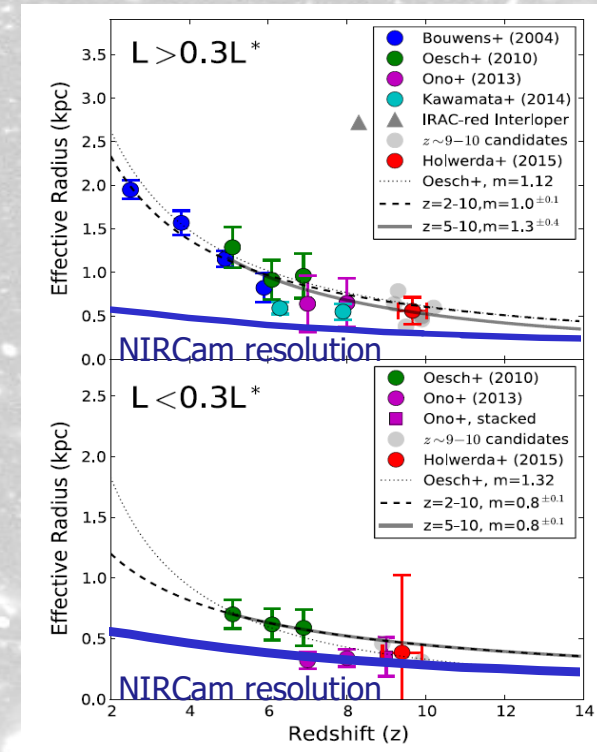


COSMOS

Angular Resolution



JWST + NIRCams have enough resolution to study the structure of distant galaxies. The plots at right show the two-pixel resolution at 2 microns. NIRSPEC MSA slit at 0.2"x0.4" is well-matched to galaxy sizes.

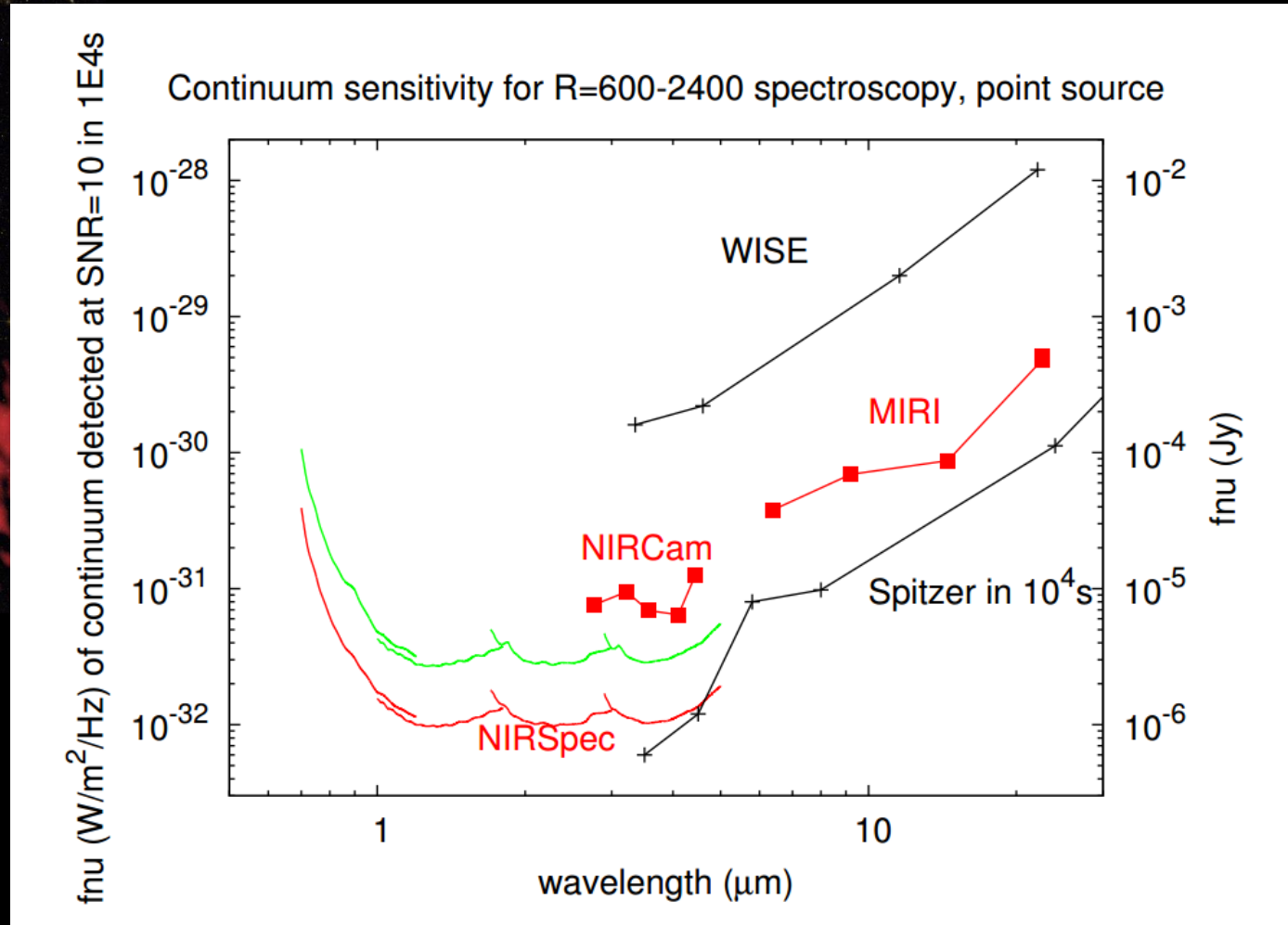
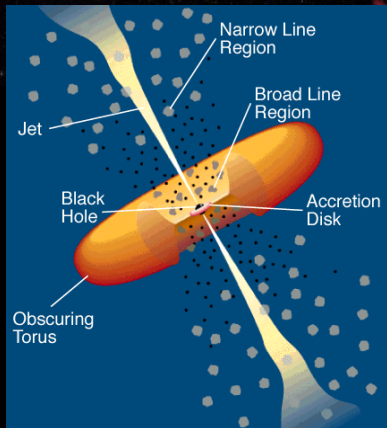


Holwerda et al. 2015 ApJ, 808,6



Model-Dependent Rule of Thumb: MIR spectroscopy

- JWST can easily get an $R \sim 3000$ IFU spect of any WISE source
- JWST can get a spectrum of almost any Spitzer detection





The Eagle Nebula
as seen in the infrared

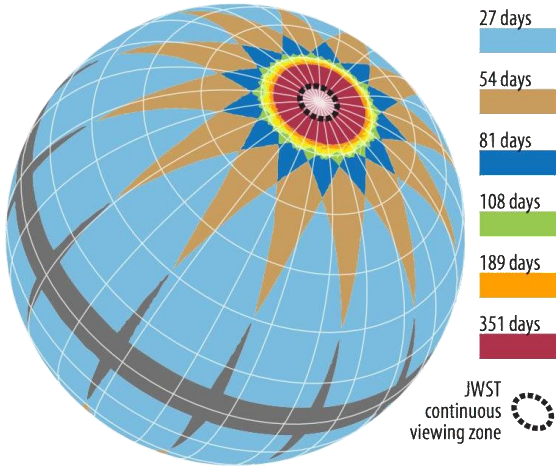


Exoplanet Factory:



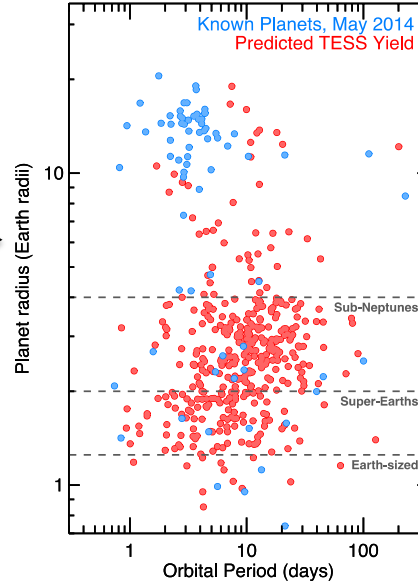
TESS Identification, JWST Characterization

TESS Sky Coverage



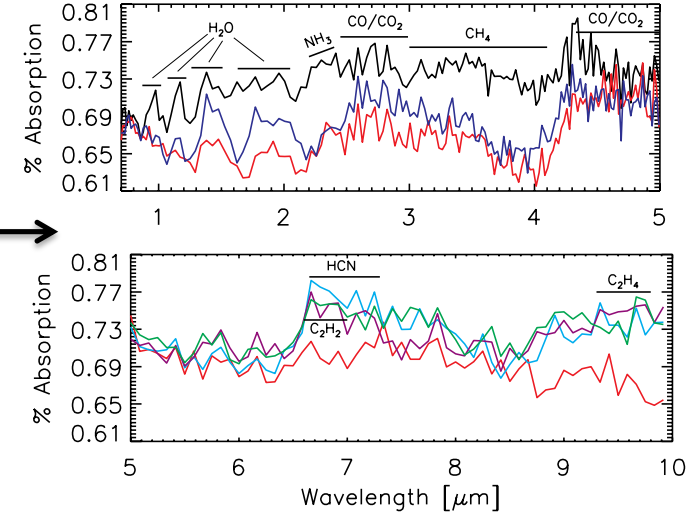
Ricker et al., 2014

TESS Exoplanet Yield
Stars Brighter than J=10



Ricker et al., 2014

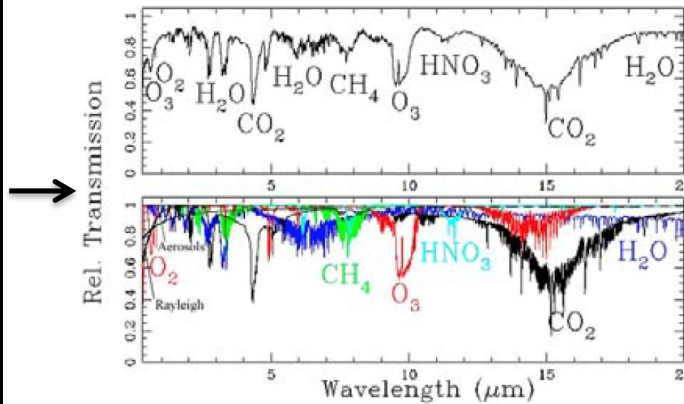
JWST Characterization



Shabram et al., 2011



Image Credit: NASA



Kaltenegger & Traub, 2009

Earth Spectroscopic Features

O ₃	0.6	9.6
H ₂ O	1.9	18.9
CO ₂	2.8	43.4
H ₂ O	3.3	60.2
CH ₄	7.7	13.8
O ₃	9.8	43.2
CO ₂	15.2	42.6

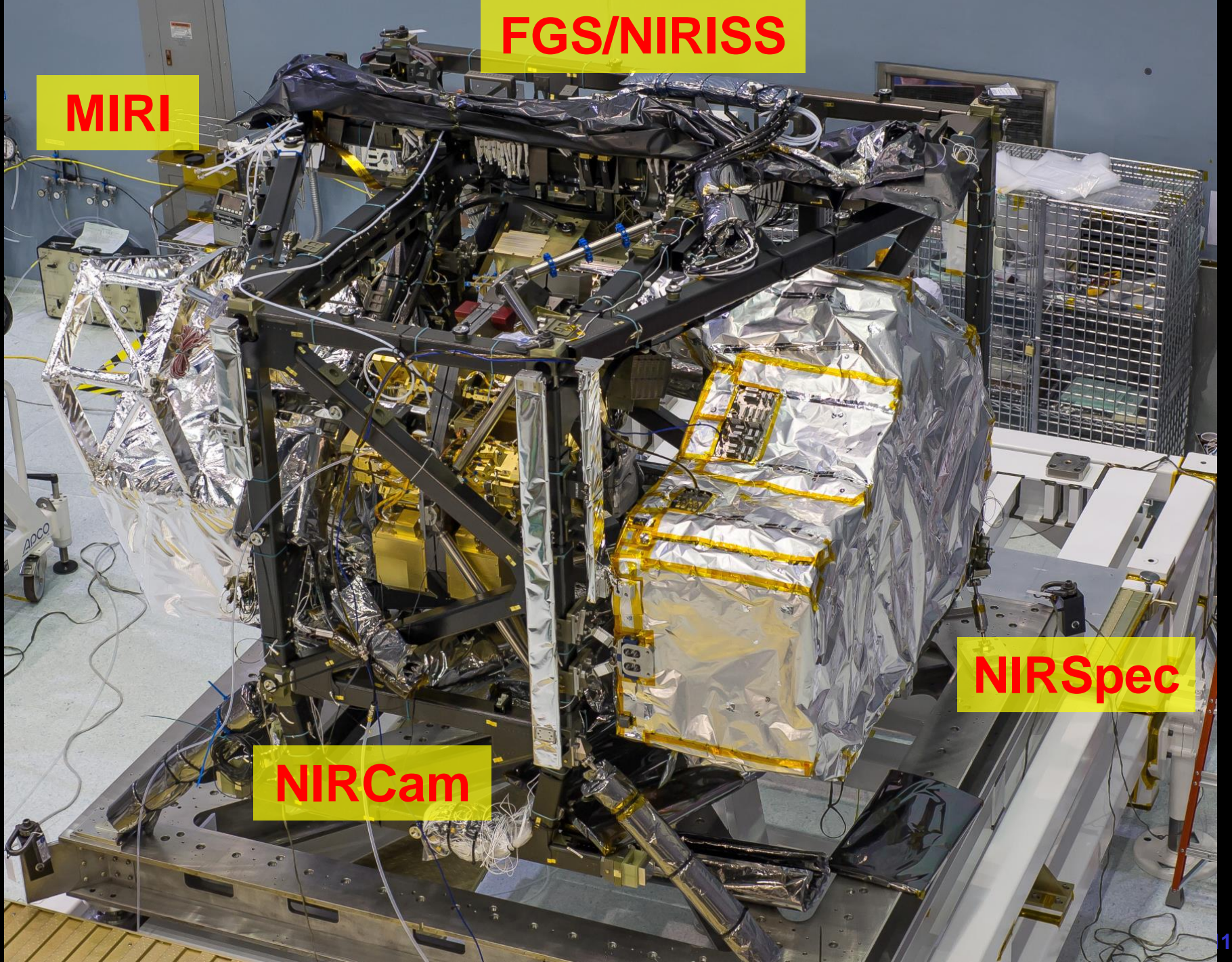
Adapted from Kaltenegger & Traub, 2009

FGS/NIRISS

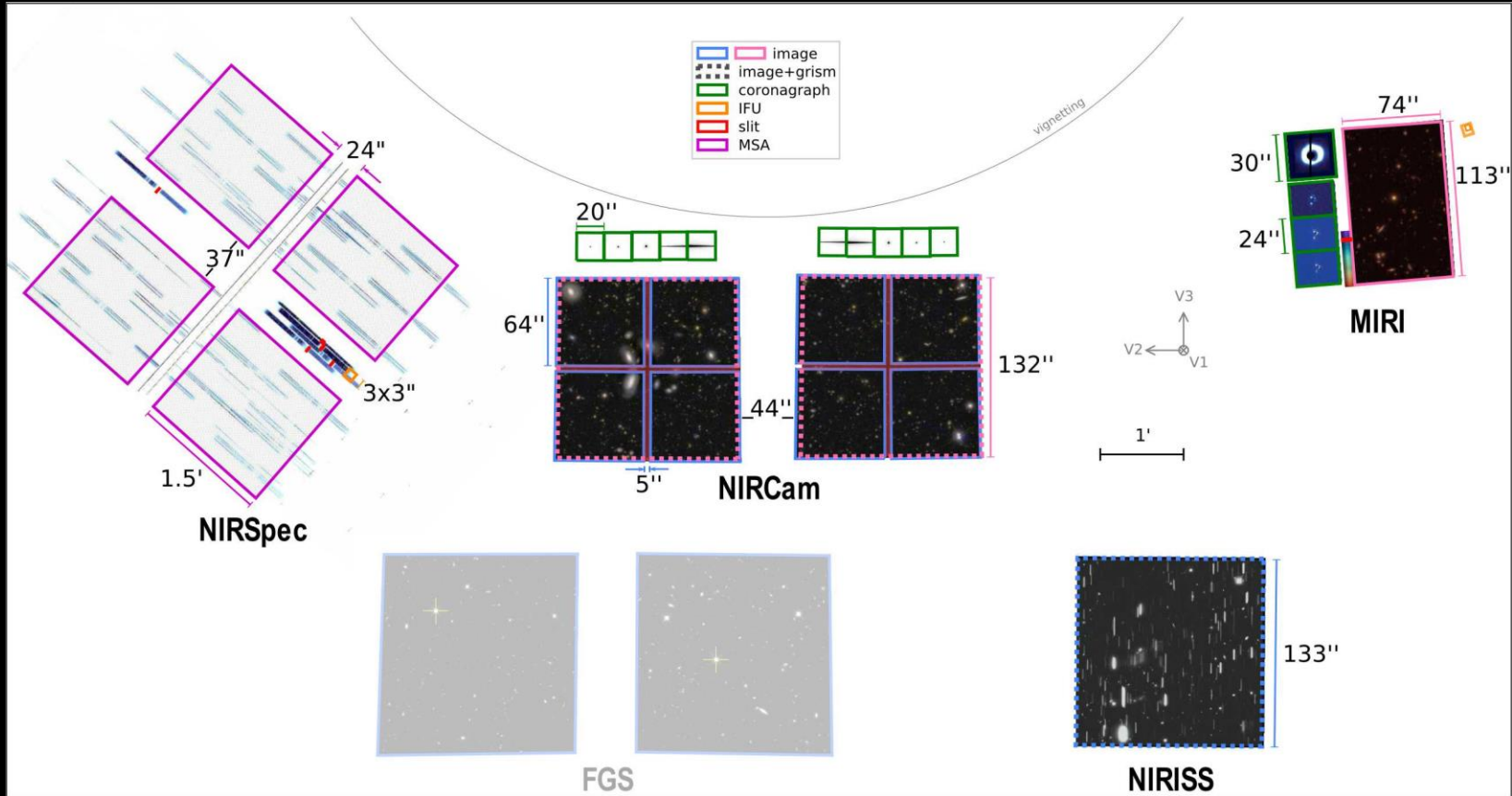
MIRI

NIRCam

NIRSpec



Parallels

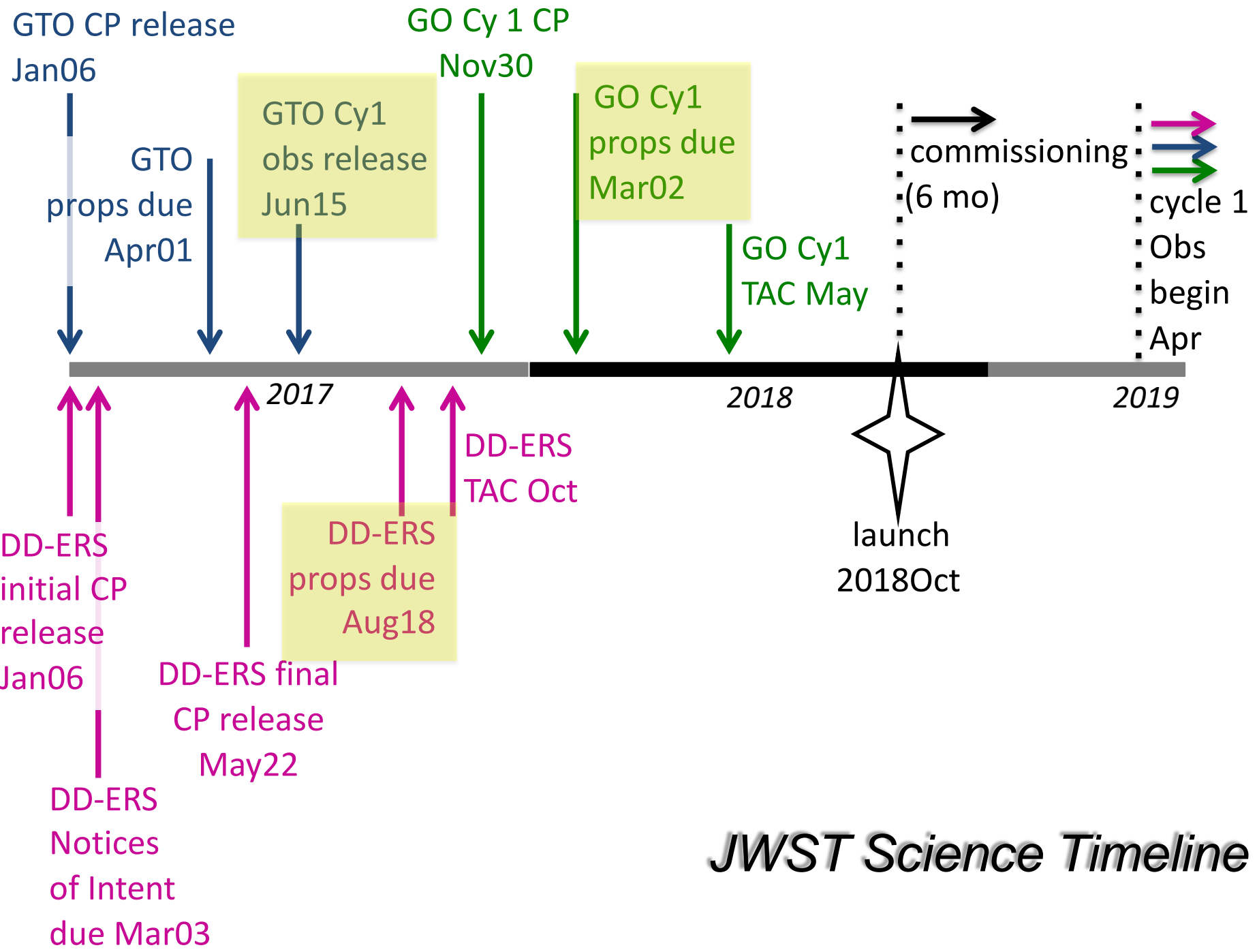


ERS & Cycle 1

- Cy1: Pure parallels with any instrument
- NIRCам imaging + MIRI imaging
- NIRCам imaging + NIRISS WFSS
- MIRI imaging + NIRISS WFSS
- NIRCам imaging + NIRISS imaging
- NIRSpec MOS + NIRCам imaging

Cycle 2+

- More combinations
- 3 instruments



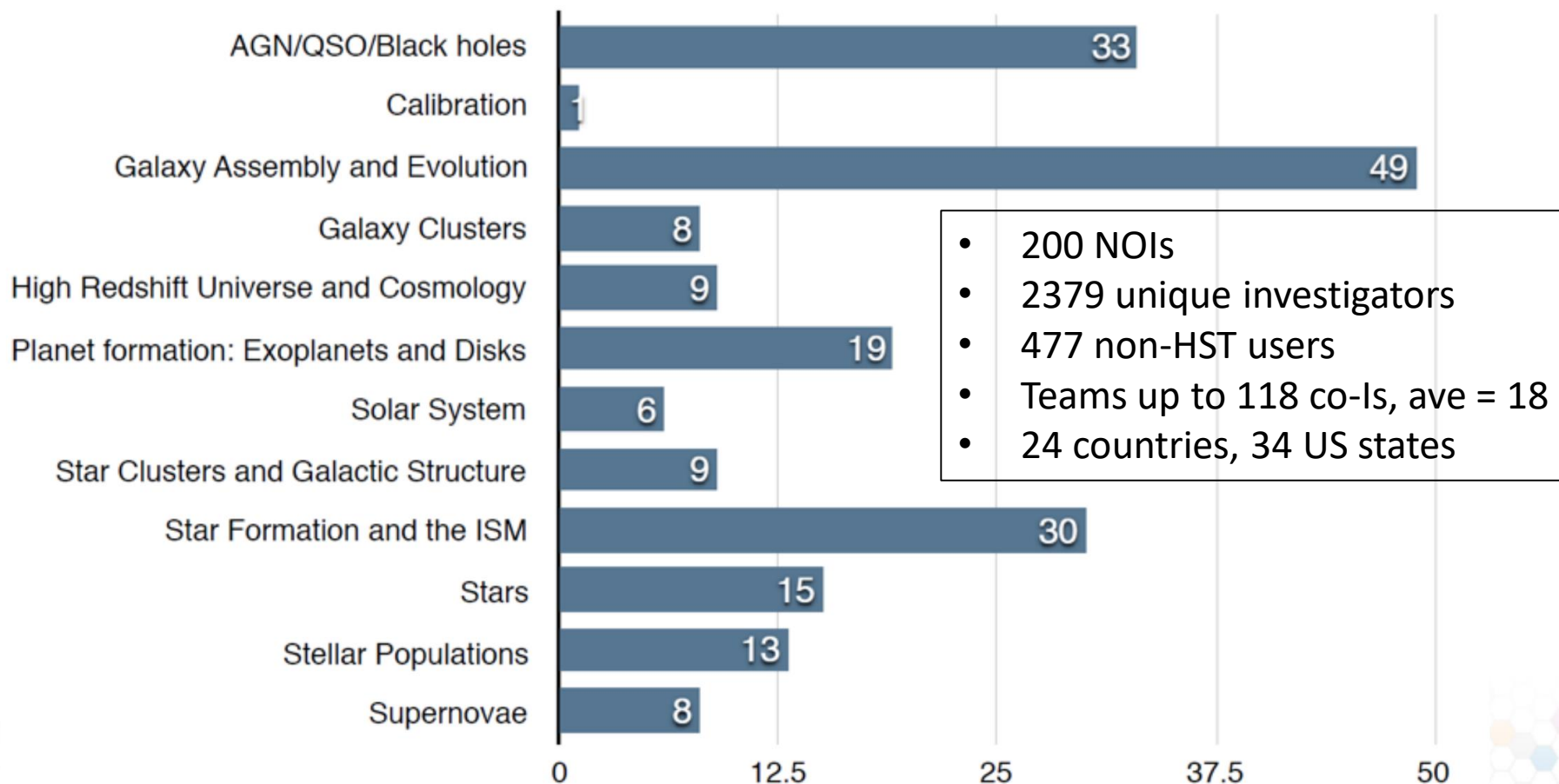
JWST Science Timeline



DD ERS NOI Topics



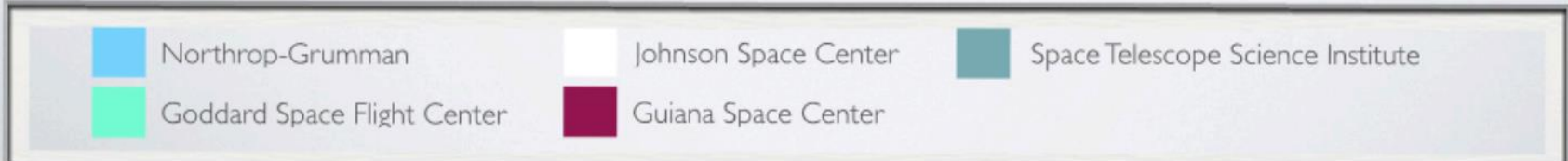
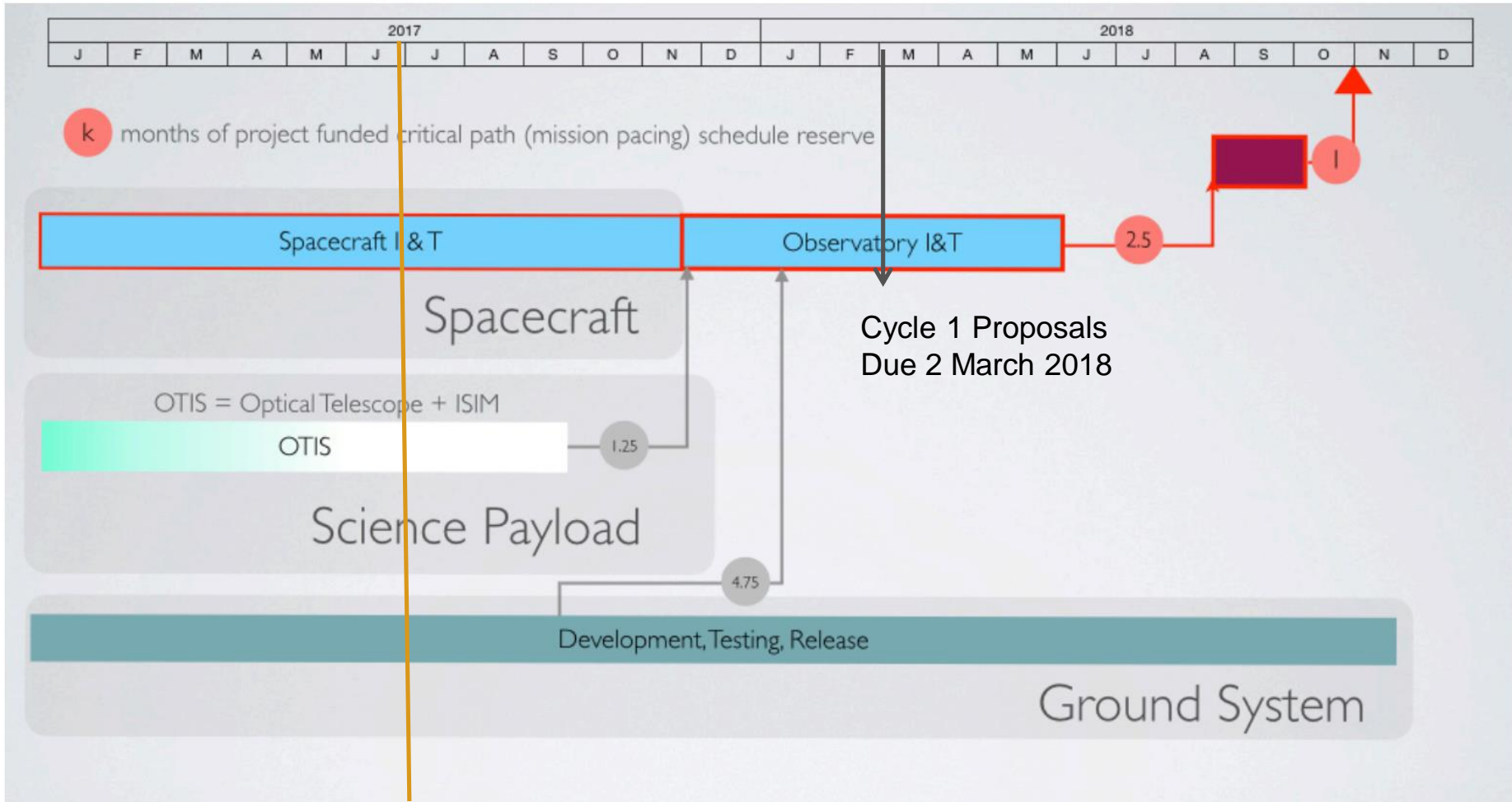
JWST DD-ERS Science Categories (Notices of Intent)

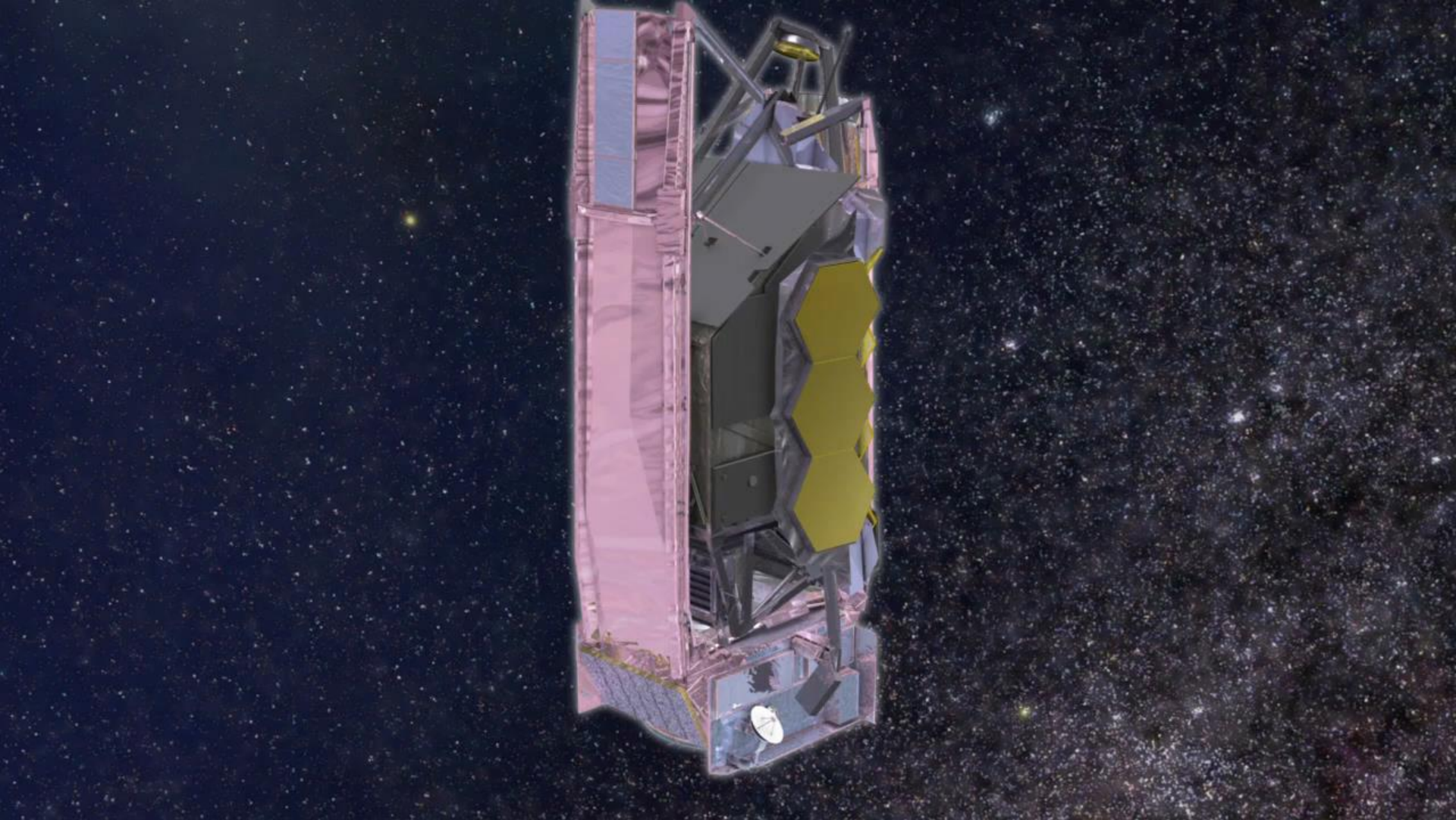


GTO reserved observation list released 15 June

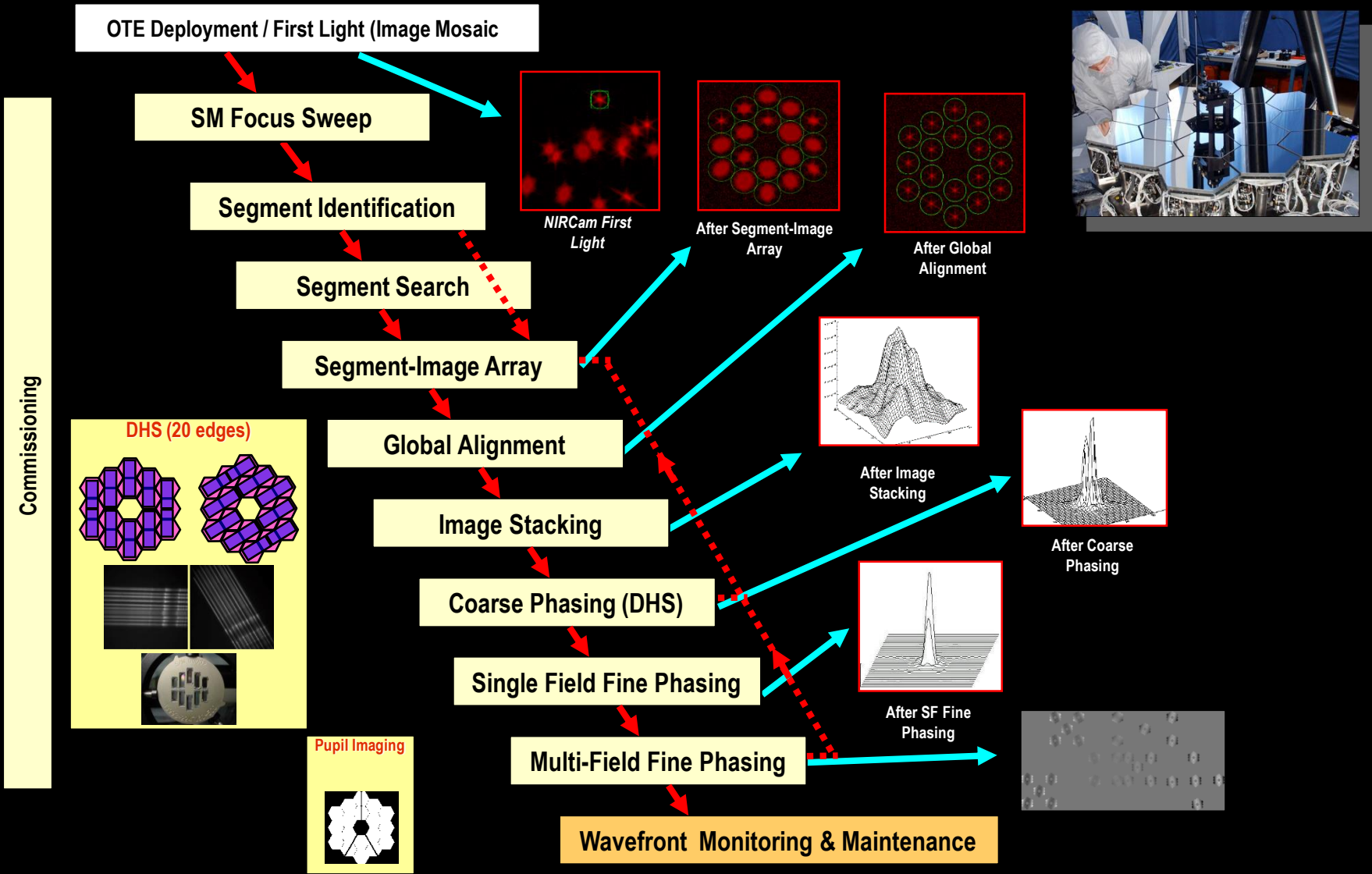
- <https://jwst-docs.stsci.edu/display/JSP/JWST+GTO+Observation+Specifications>
- Duplication policy:
 - Purpose is to not take the same data twice
 - Reserved observations, not science or targets
 - Same RA & dec and same instrument mode
 - Within a factor of x4 in exposure time
 - MSA: duplications are determined slit-by-slit. OK to propose same field center.
 - Scientifically justified duplications are OK

Simplified Schedule





Wavefront Sensing and Control

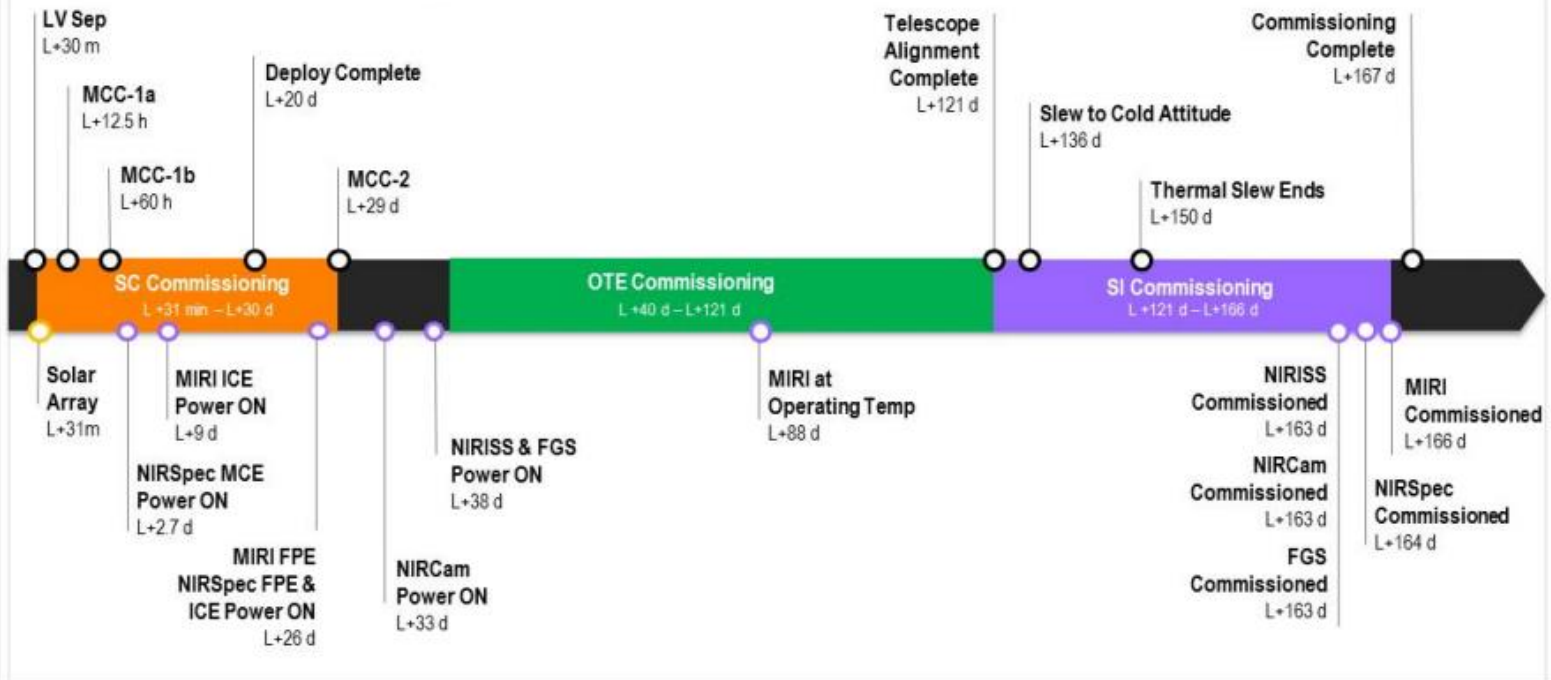


Six-Month Commissioning Overview

JWST Timeline: Commissioning Overview

June 2016

○ Observatory Milestones/ Major Activities SC Commissioning Phase OTE Commissioning Phase SI Commissioning Phase



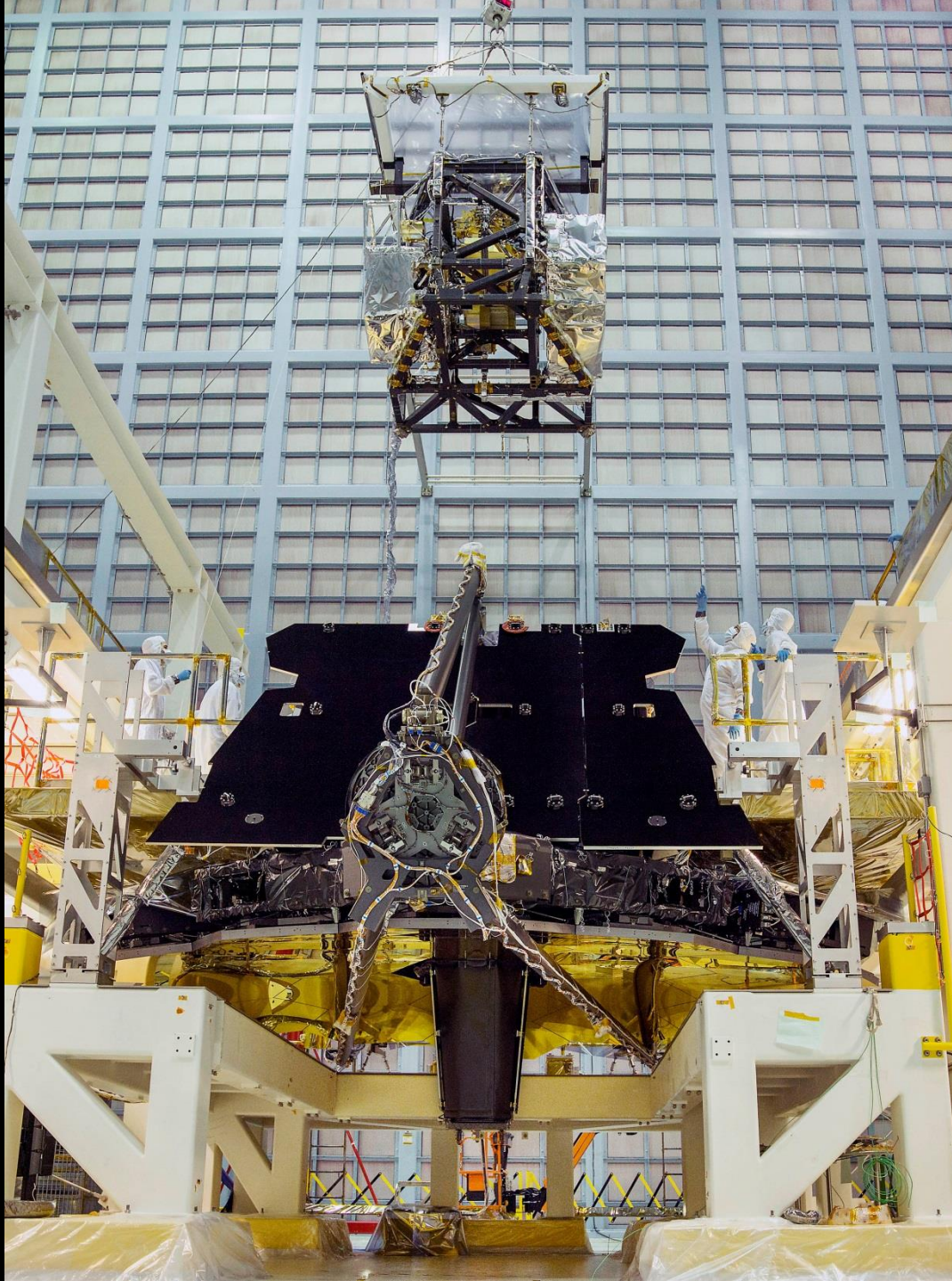
Approved for public release; NG 16-1286 dated 7/11/16.

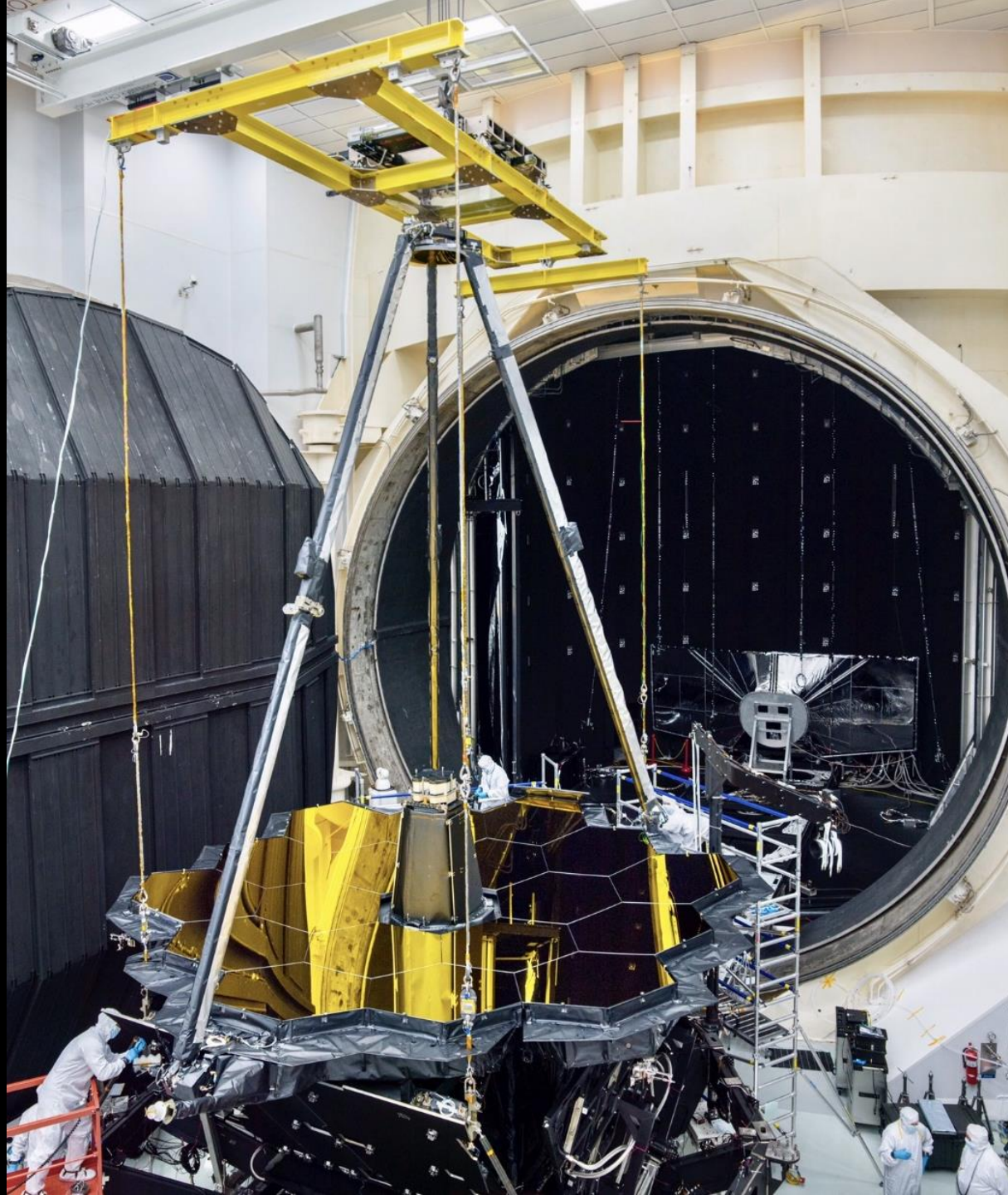


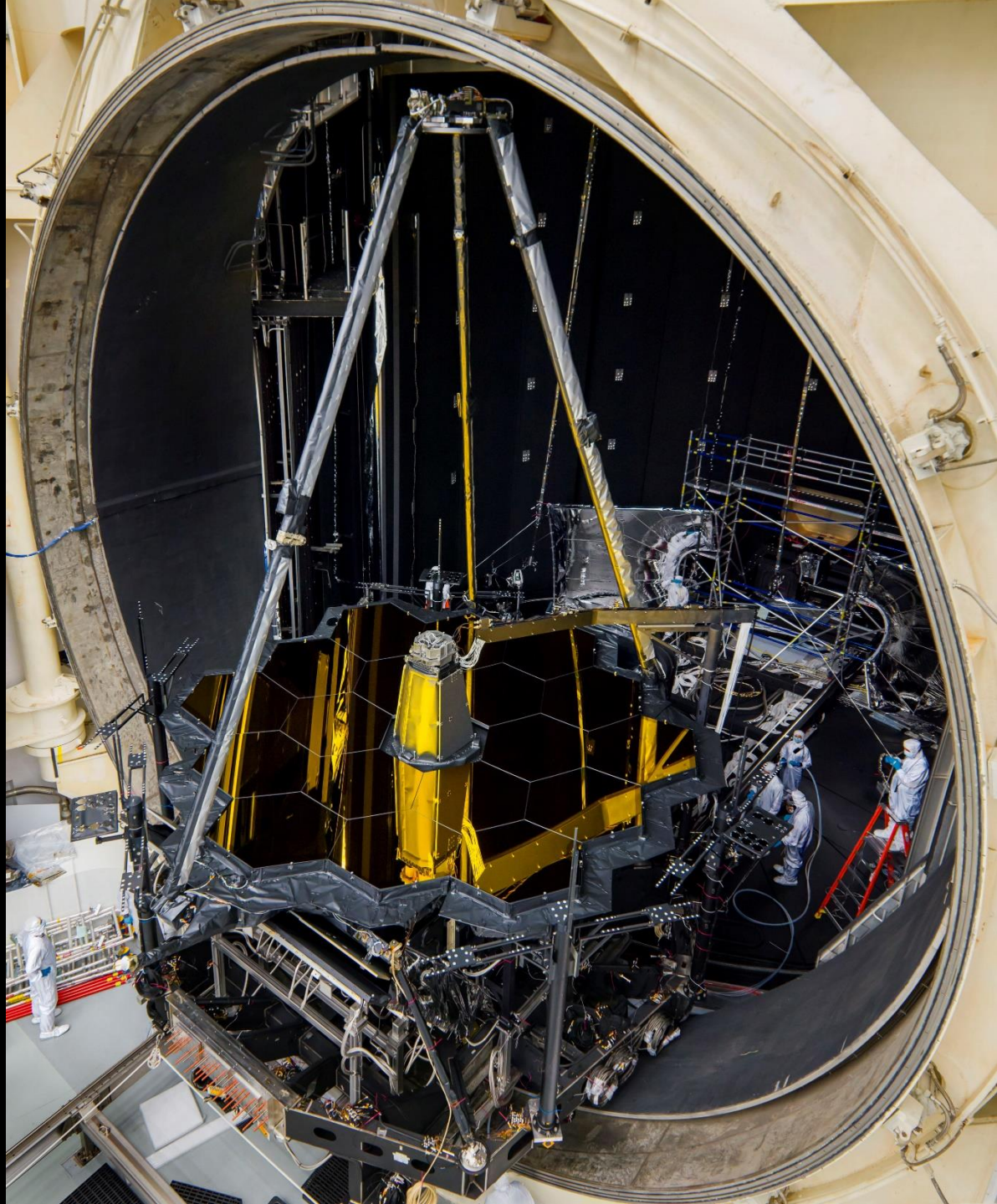
- Has a...
- Has a...
- Construction elements...
- Calculate their...
- Has two 25-ton cranes...
- Has a...
- Has a...

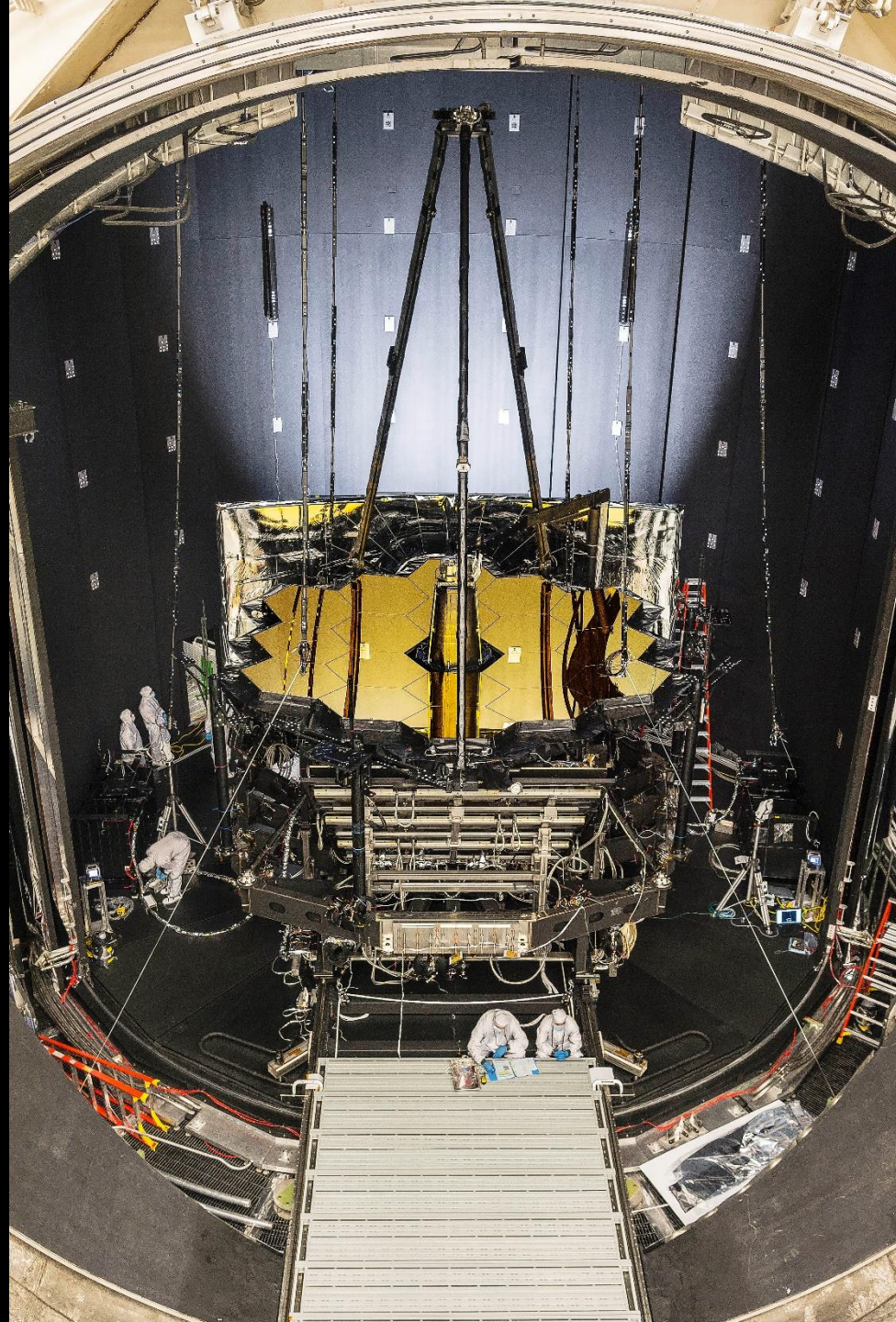










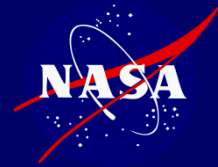




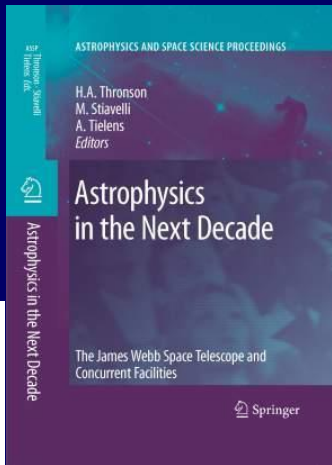
Spacecraft and Sunshield



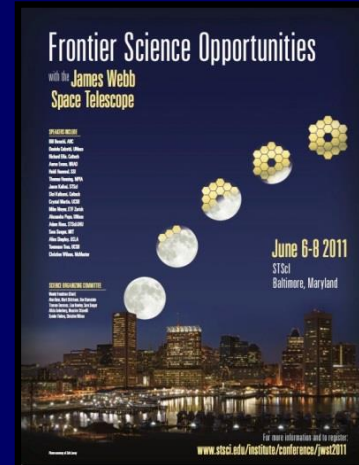
Want to Learn More about JWST?



Gardner et al. 2006,
Space Science Reviews, 123/4, 485
<http://jwst.nasa.gov/scientists.html>



2007 Tucson



2011 Baltimore



2015
Noordwijk

- White Papers:**
- JWST in Decadal Survey
 - Solar System Objects
 - Dark Energy
 - Transiting Planets
 - Coronagraphy
 - Planetary Systems
 - Stellar Pops
 - Star Formation
 - Galaxy Assembly
 - First Light
 - Astrobiology
 - Scientific Capabilities
 - Observation Planning

JWST Conferences On-line

Science White Papers
<http://www.stsci.edu/jwst/science/whitepapers/>

Annual Sessions at AAS and SPIE meetings

JWST Workshops and Conferences

- **Enabling Transiting Exoplanet Observations with JWST**
 - July 10 - 12, 2017 • Baltimore, MD
- **Spectral Diagnostics to Explore the Cosmic Dawn with JWST**
 - July 31 - August 2, 2017 • Baltimore STScI
- **JWST ESAC Workshop - Mastering the Science Instruments and the Observing Modes of JWST: Get Set**
 - October 4 - 6, 2017 • Madrid, Spain ESAC
- **Planning Solar System Observations with JWST - STScI venue**
 - November 13 - 15, 2017 • Baltimore STScI
- **JWST Proposal and Planning Workshop**
 - December 11 - 15, 2017 • Pasadena, CA
- **Planning Solar System Observations with JWST - ESTEC venue**
 - December 13 - 15, 2017 • Noordwijk, Netherlands ESTEC
- **American Astronomical Society 231st Meeting**
 - January 7 - 11, 2018 • National Harbor, MD

<https://jwst.stsci.edu/science-planning/workshops-and-lectures/jwst-workshops>

Most workshops will allow electronic participation.

jwst.nasa.gov

Latest News

Project Milestones updated monthly

Social Media

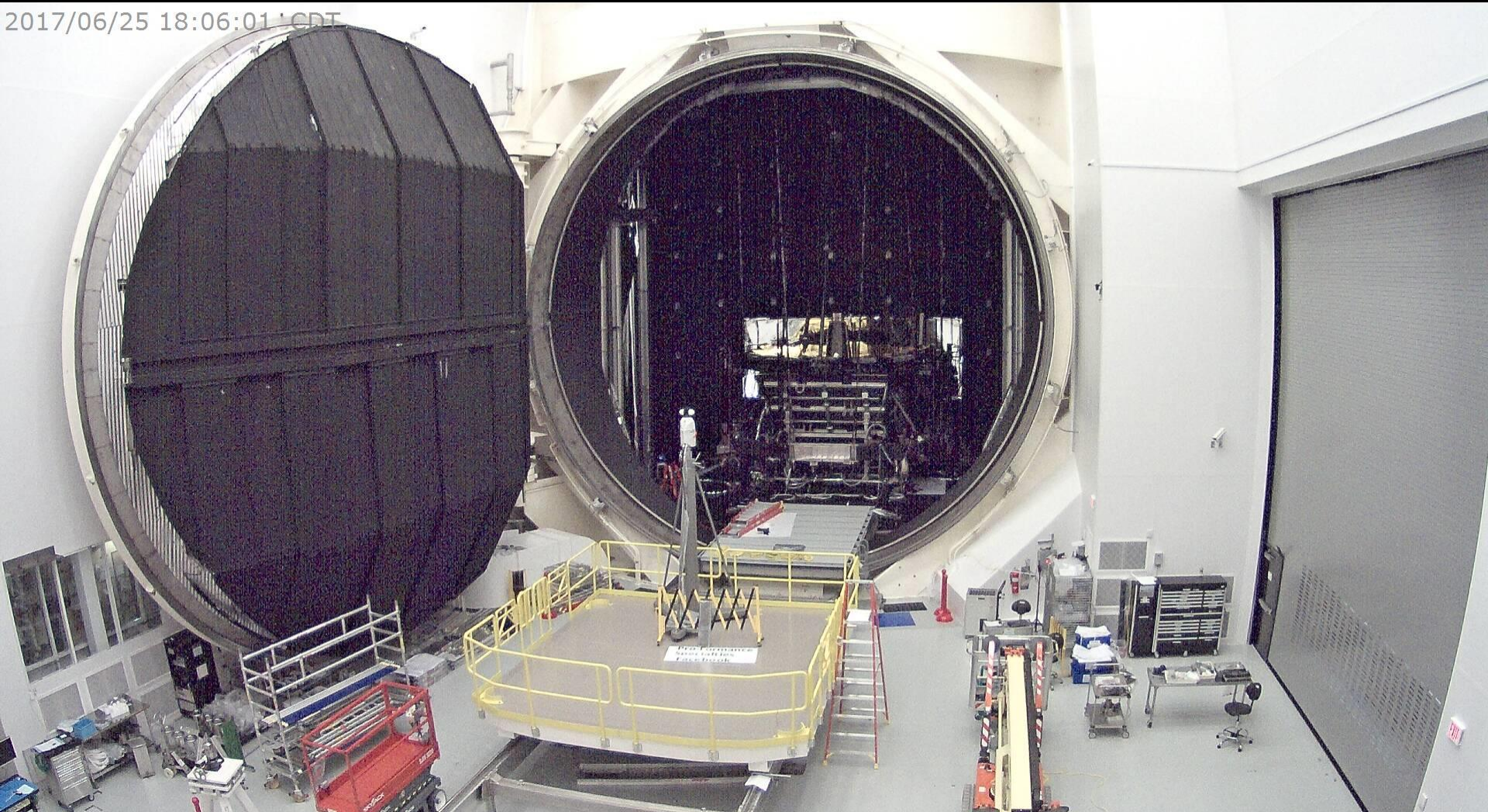
www.stsci.edu/jwst

Astronomy Software Tools ETC, PSF, APT

Webcam

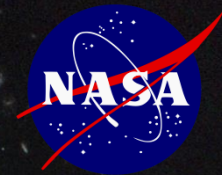
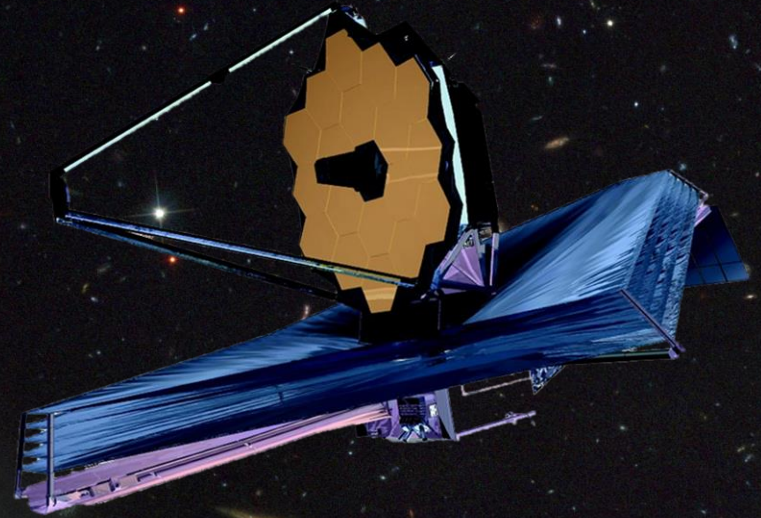
2017-06-25 18:06:01

2017/06/25 18:06:01 CDT



Live update every 60 seconds <http://jwst.nasa.gov/webcam.html>.

The James Webb Space Telescope



Jonathan P. Gardner

NASA's Goddard Space Flight Center

<http://jwst.nasa.gov>

Space Science Reviews, 2006, 123/4, 485



