James Webb Space Telescope
Exoplanet Science Update

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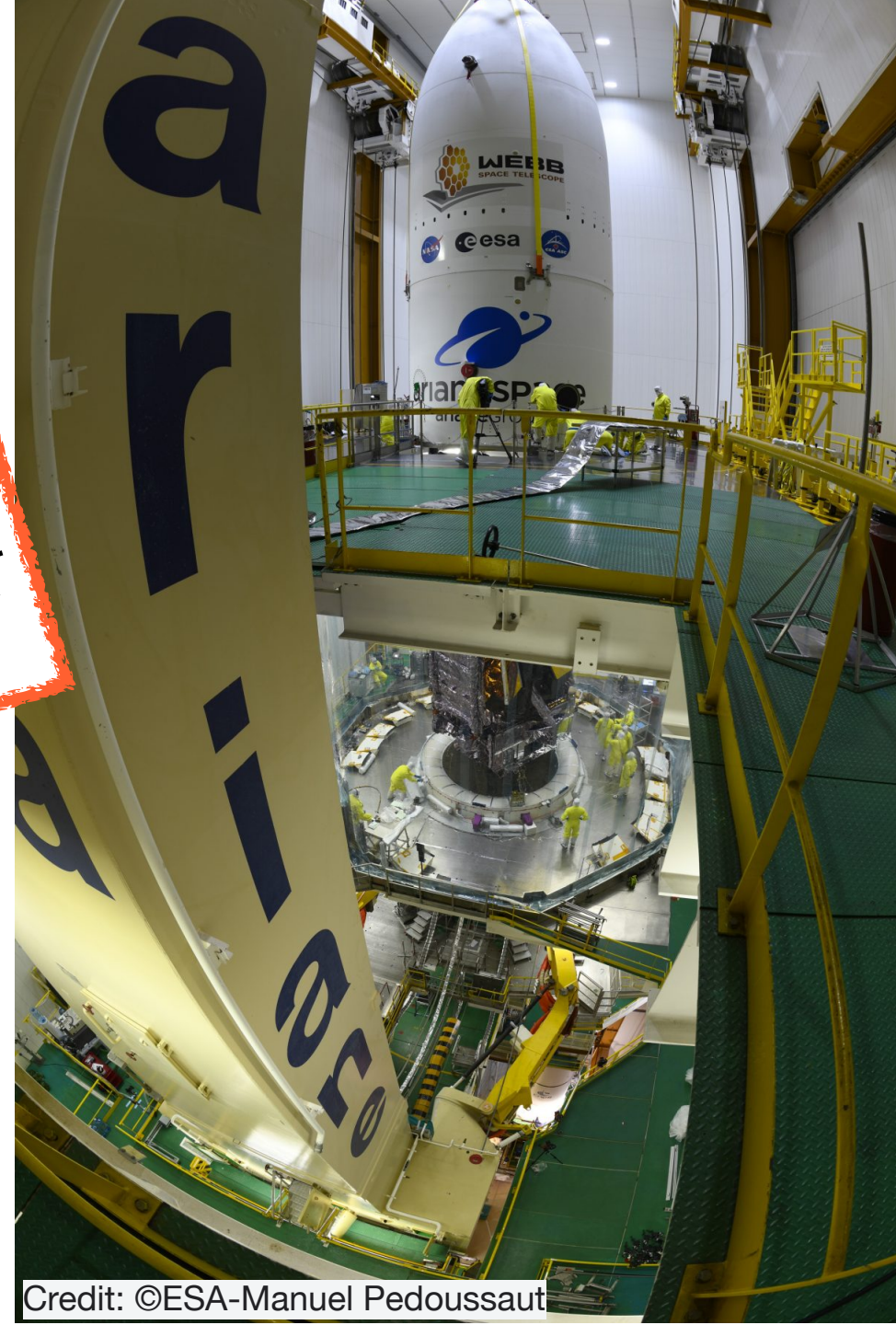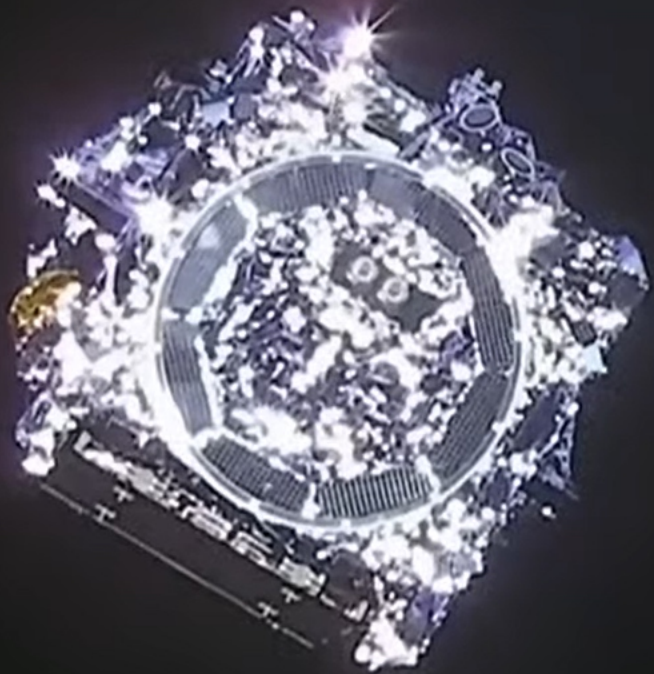
ExoPAG 25

10 January 2022

Credit: Arianespace, ESA, NASA, CSA, CNES

Some of the final images of JWST on Earth!

JWST successfully launched from Kourou, French Guiana, on December 25, 2021!
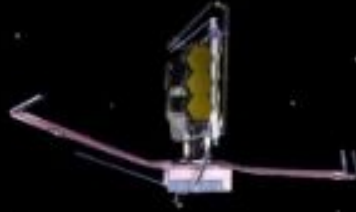
Credit: (NASA/Bill Ingalls)

3

The JWST mission is currently at L+16 days.
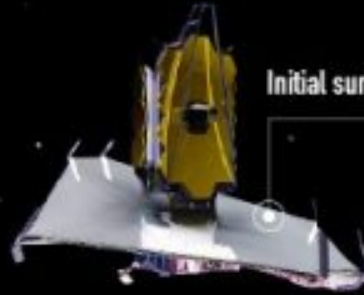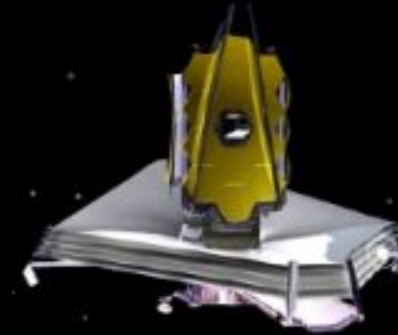
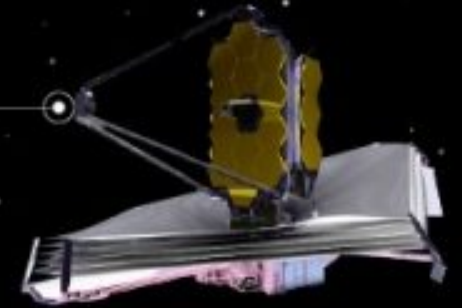All major deployments have successfully completed as of January 8!

EARTH

Initial sunshield deployment

Tensioning and separation of sunshield's layers

- Solar array deployed
- Gimbaled antenna assembly released
- Deployable tower assembly extended
- Aft momentum flap deployed
- Sunshield pallet structures deployed and mid-booms extended
- All five layers of the sunshield fully tensioned
- Secondary mirror support structure deployed and locked in place
- Aft deployable instrument radiator deployed
- Both primary mirror wings deployed and latched

Secondary mirror support unfolds

Fully unfolded

Two primary mirror lateral wings deploy

Where is Webb?
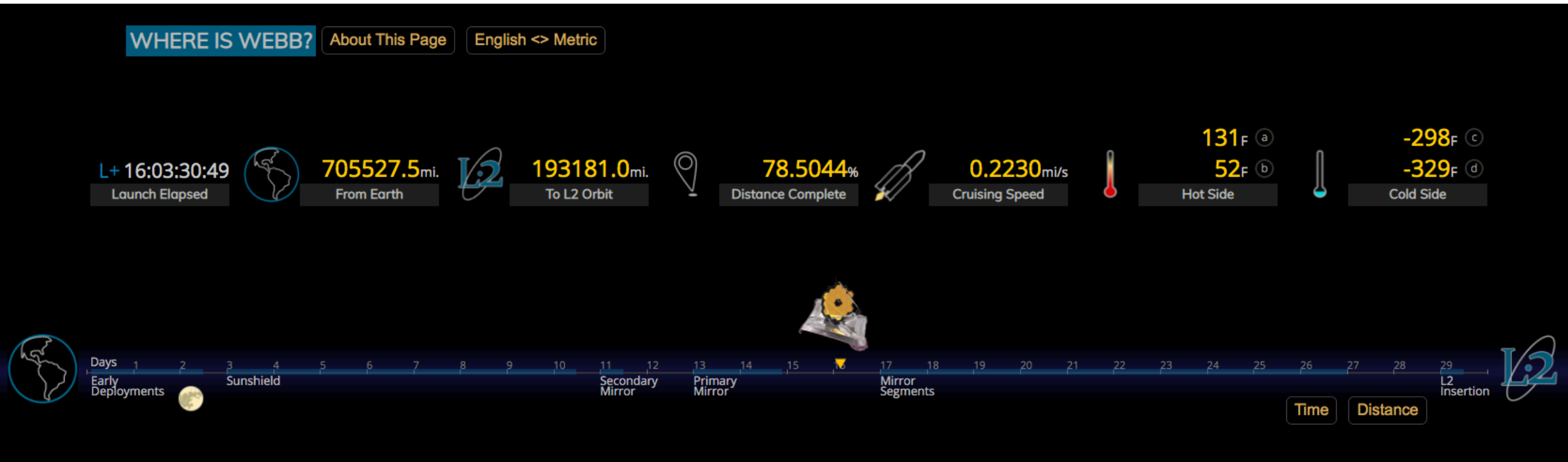
Where Webb is as of ~11:00am EST, January 10, 2022.

https://webb.nasa.gov/content/webbLaunch/whereIsWebb.html

APOD
JWST on the Road to L2
December 31, 2021

7

JWST Commissioning Timeline

https://blogs.nasa.gov/webb/

Launch   Deployed   Telescope aligned   END

MCC1a burn   Reach L2 orbit   NIRISS ready

Sunshield done   Images from 18 mirrors   Start aligning to 3 SIs   Thermal characteriz.   MIRI ready

Wings done   NIRCam on   Aligned to NIRCam   MIRI at operating temp.   NIRCam ready   NIRSpec ready

Deploy cooling   **Telescope commissioning**   **SI commissioning**   **Early Release Science / Cycle 1 observations start**

0   20   40   60   80   100   120   140   160   180

Days after launch

We are here

*Note: cooling continues until final stabilization of MIRI around L+100 days

Credit: NASA / Jane Rigby

8
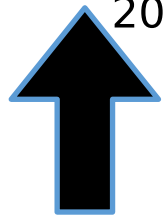
# Example Science Instrument Commissioning Activity

HAT-P-14 b: NIRISS/SOSS Commissioning Target

This massive transiting gas giant is planned as one of the commissioning targets for time-series observing modes. The transit light curve of HAT-P-14 b collected from two sectors of Transiting Exoplanet Survey Satellite data is shown below, demonstrating the high signal-to-noise of this target (from https://exo.mast.stsci.edu/).

Folded Light Curve
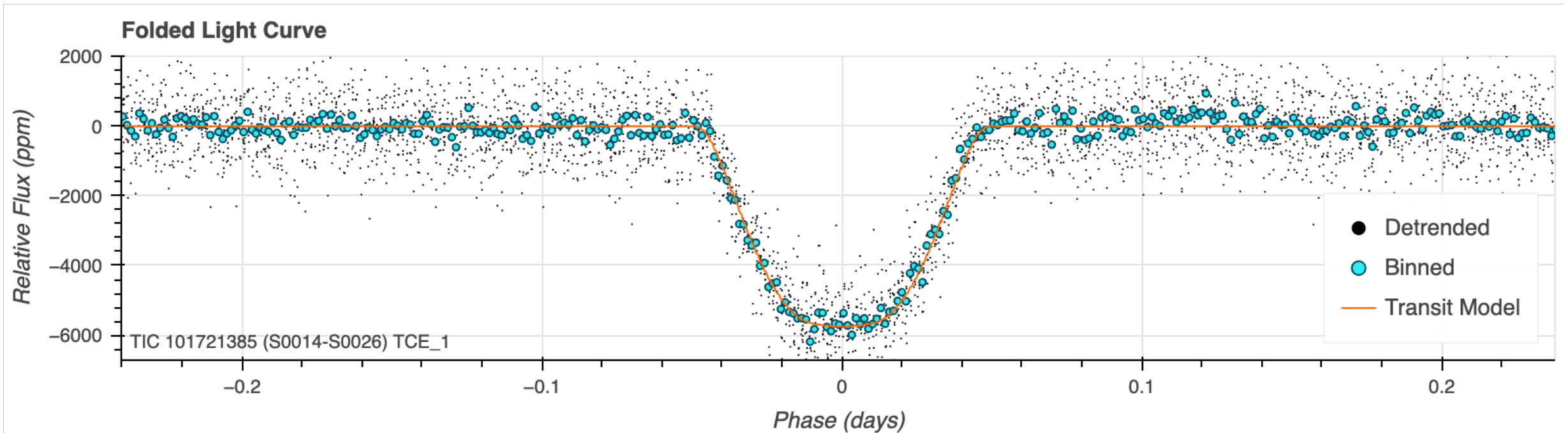
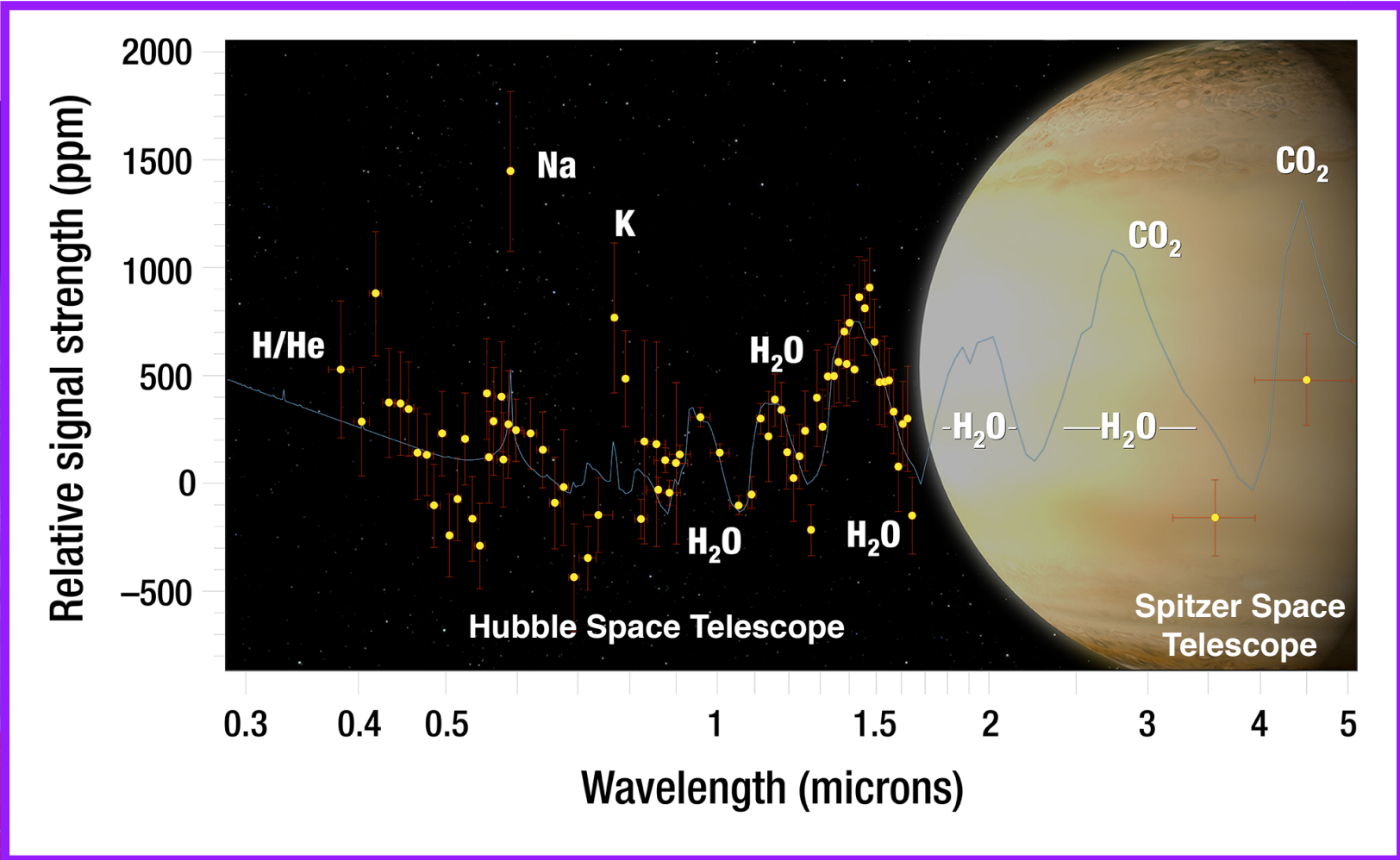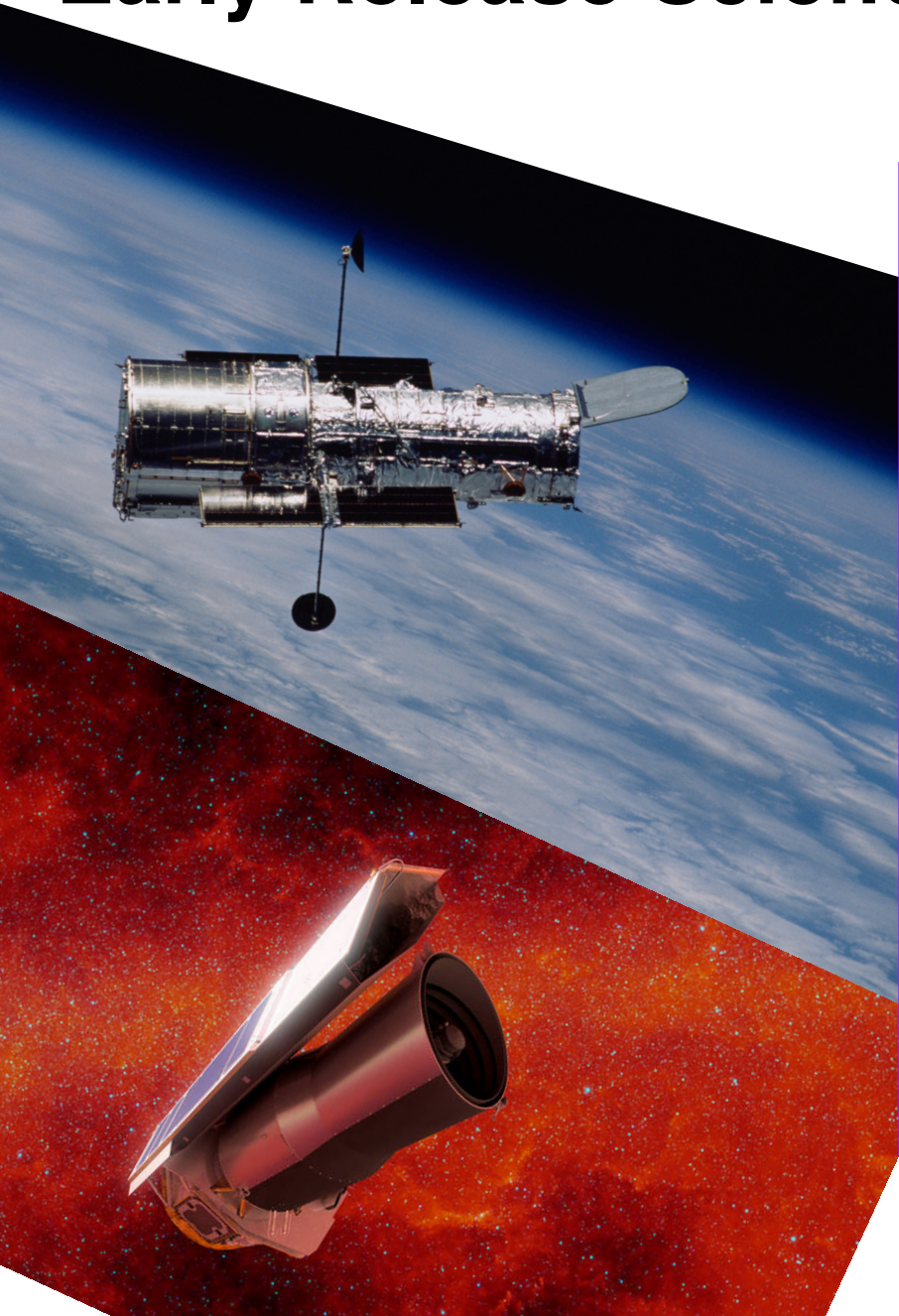# Early Release Science Programs: Time-Series

- https://ers-transit.github.io/

- ERS program will use five instruments/time-series modes to provide a representative set of transiting exoplanet data for giant planets with bright host stars (WASP-39b, NGTS-10b, WASP-18b)

- ERS team held an ERS Pre-Launch Data Hackathon (21-25 June 2021) and ERS Pre-Launch Theory Webbinar (July-August 2021)
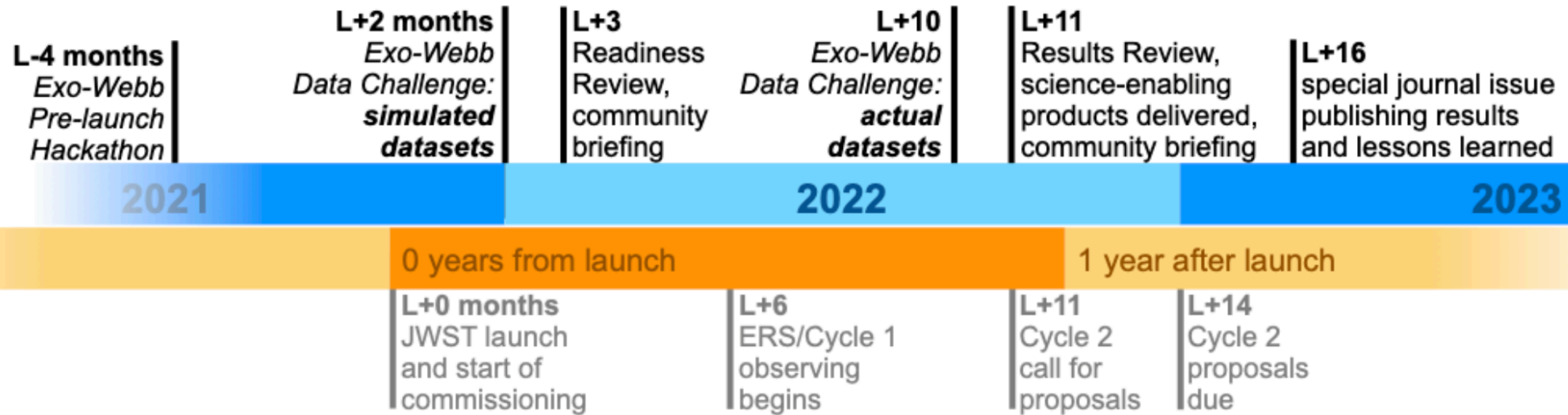
[PI: Natalie Batalha; Co-PI: Kevin Stevenson, Jacob Bean; Proposal 1366]

Early Release Science Programs: WASP-39b

HST and Spitzer transmission spectrum of WASP-39b (Wakeford et al. 2018). Artist's Concept: NASA, ESA, G. Bacon and A. Feild (STScI), and H. Wakeford (STScI/Univ. of Exeter).

Early Release Science Programs: High Contrast Imaging

- https://www.stsci.edu/jwst/science-execution/approved-programs/dd-ers/program-1386

- ERS program will generate representative datasets in modes to be commonly used by the exoplanet and disk imaging communities

- Recorded webinar available on the JWST Observer YouTube channel

ERS target HIP 65426b (Chauvin et al. 2017 / Sasha Hinkley)
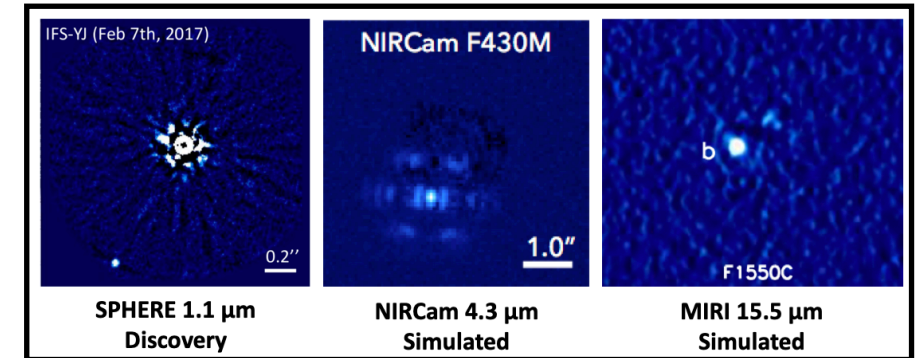
[PI: Sasha Hinkley; Co-PI: Andrew Skemer, Beth Biller; Proposal 1386]

[image from webinar given by Sasha Hinkley]
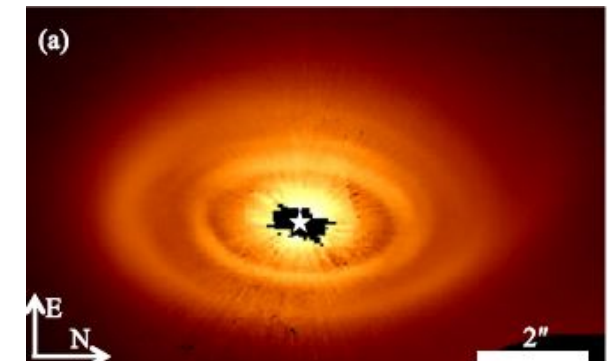
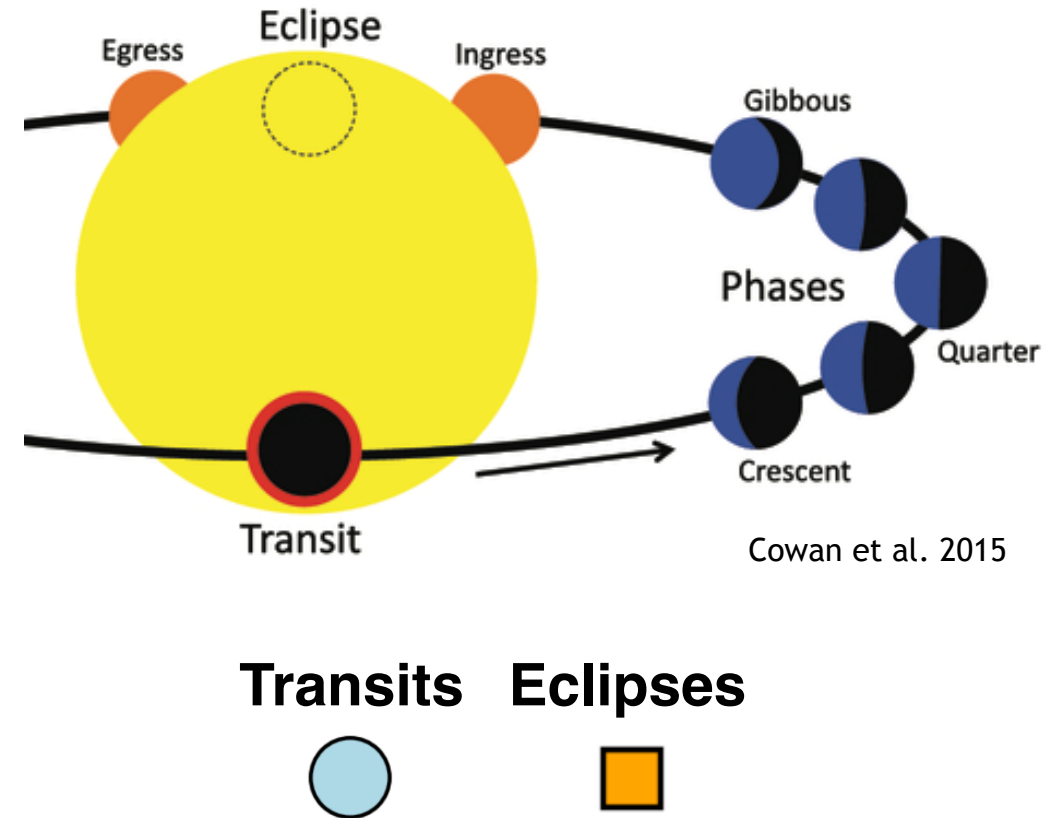ERS target HD 14159A (Konishi et al. 2016 / HST STIS)

Sample Cycle 1 GTO/GO Transiting Exoplanet Targets

A subset of JWST Cycle 1 transiting exoplanet targets is shown below, illustrating particularly the population of small, cool planets to be observed in either transit, or eclipse, or at both phases.

K. Colón
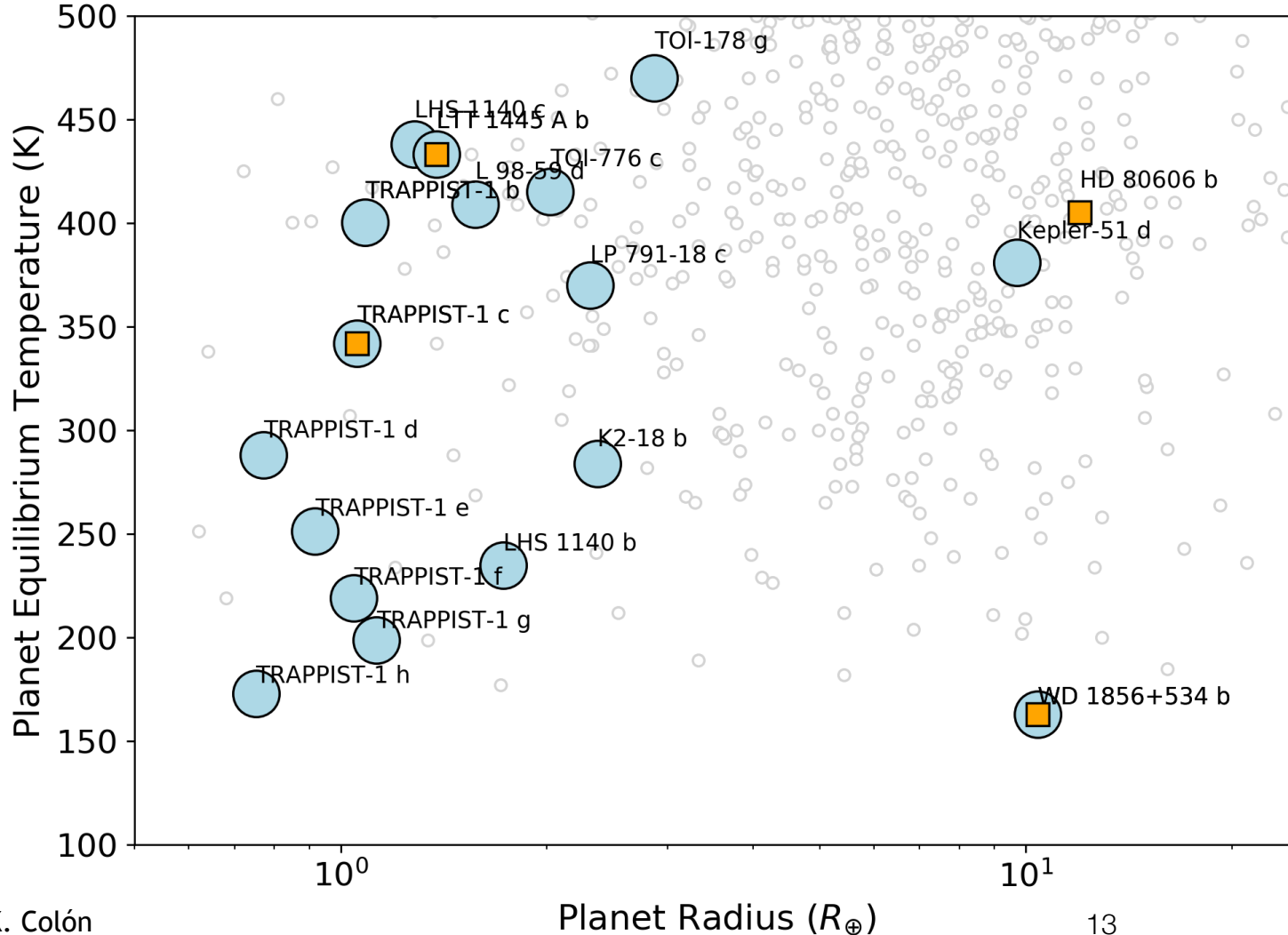
Paving the Way for a Large IR/O/UV Space Telescope…

- The successful launch and deployment of JWST is a great feat of engineering.

- JWST will revolutionize our understanding of what exoplanets (and disks) are made of thanks to its infrared sensitivity.

- HST programs that support JWST science demonstrate the need for precision UV and optical observations to continue for years to come. For example, HST Cycle 29 programs will observe a set of JWST Cycle 1 transiting exoplanet host stars in the UV to assess atmospheric formation and retention, stability, and chemistry (e.g., PI: Allison Youngblood/16701 and PI: Hannah Diamond-Lowe/16722).
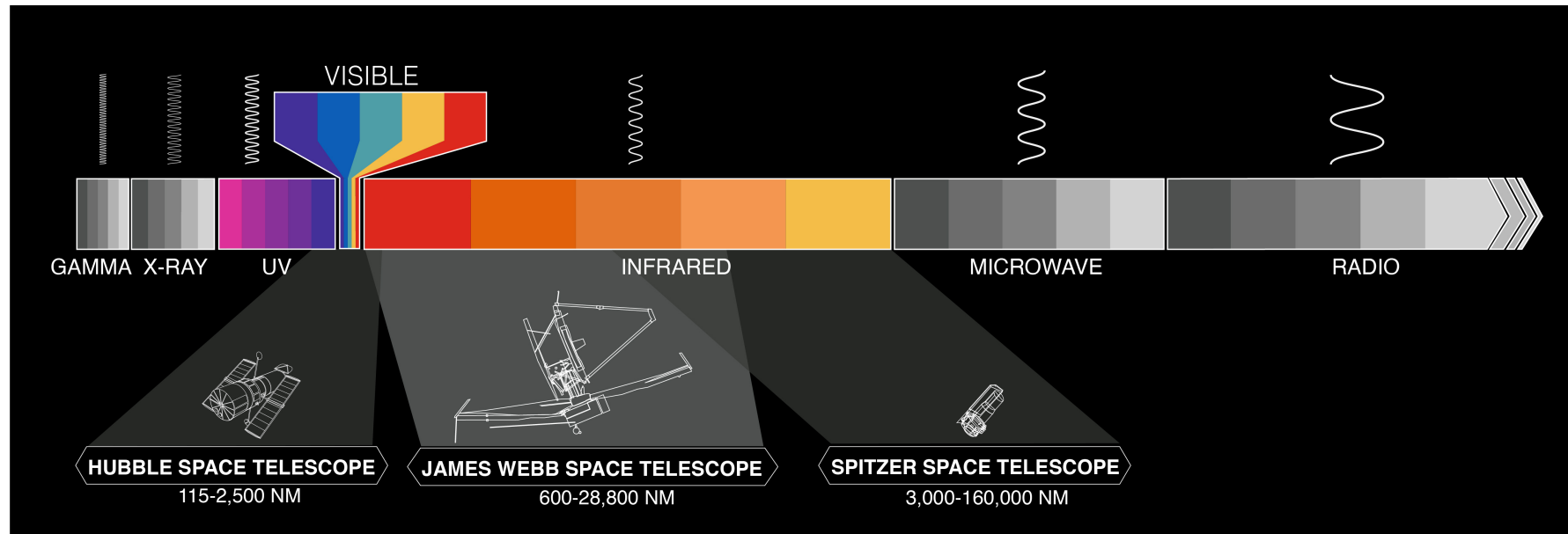
Recent and Upcoming Events

STScI JWebbinars
https://www.stsci.edu/jwst/science-execution/jwebbinars
Many, including one on time-series observations

Transiting Exoplanet Community ERS Events
ers-transit.github.io

Pre-Launch Data Hackathon
June 2021

Theory Webbinar
July-August 2021

Data Challenge
March 2022
Details TBA

AAS JWST Town Hall
Postponed to January 28, 2022
Details TBA

exoplanets.nasa.gov

Go Webb!

Credit: (NASA/Chris Gunn)

https://blogs.nasa.gov/webb/