



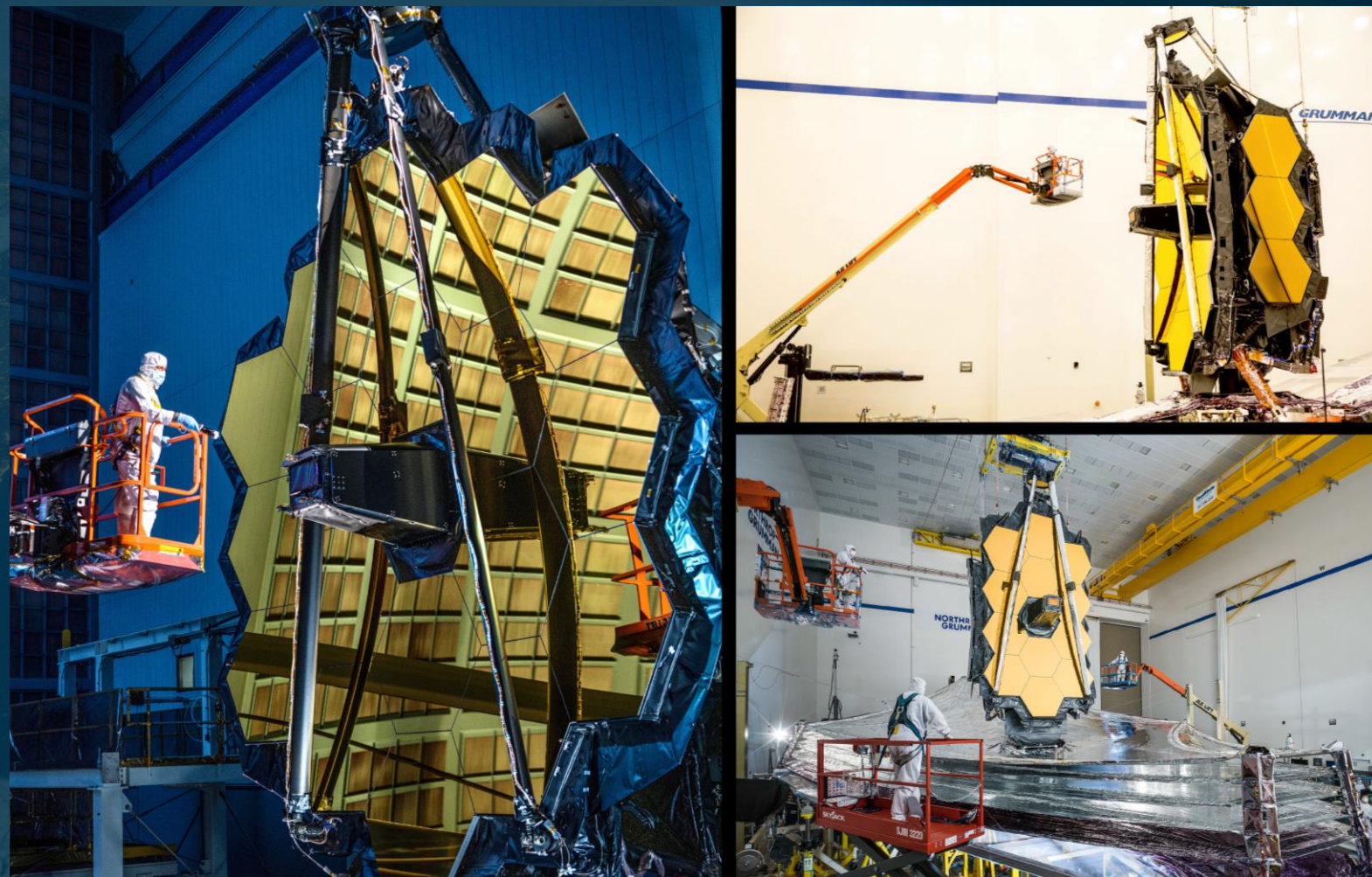
James Webb Space Telescope: Status & Perspective



Chris Evans – ESA JWST Project Scientist
3 October, 2022

NASA/ESA/CSA partnership:

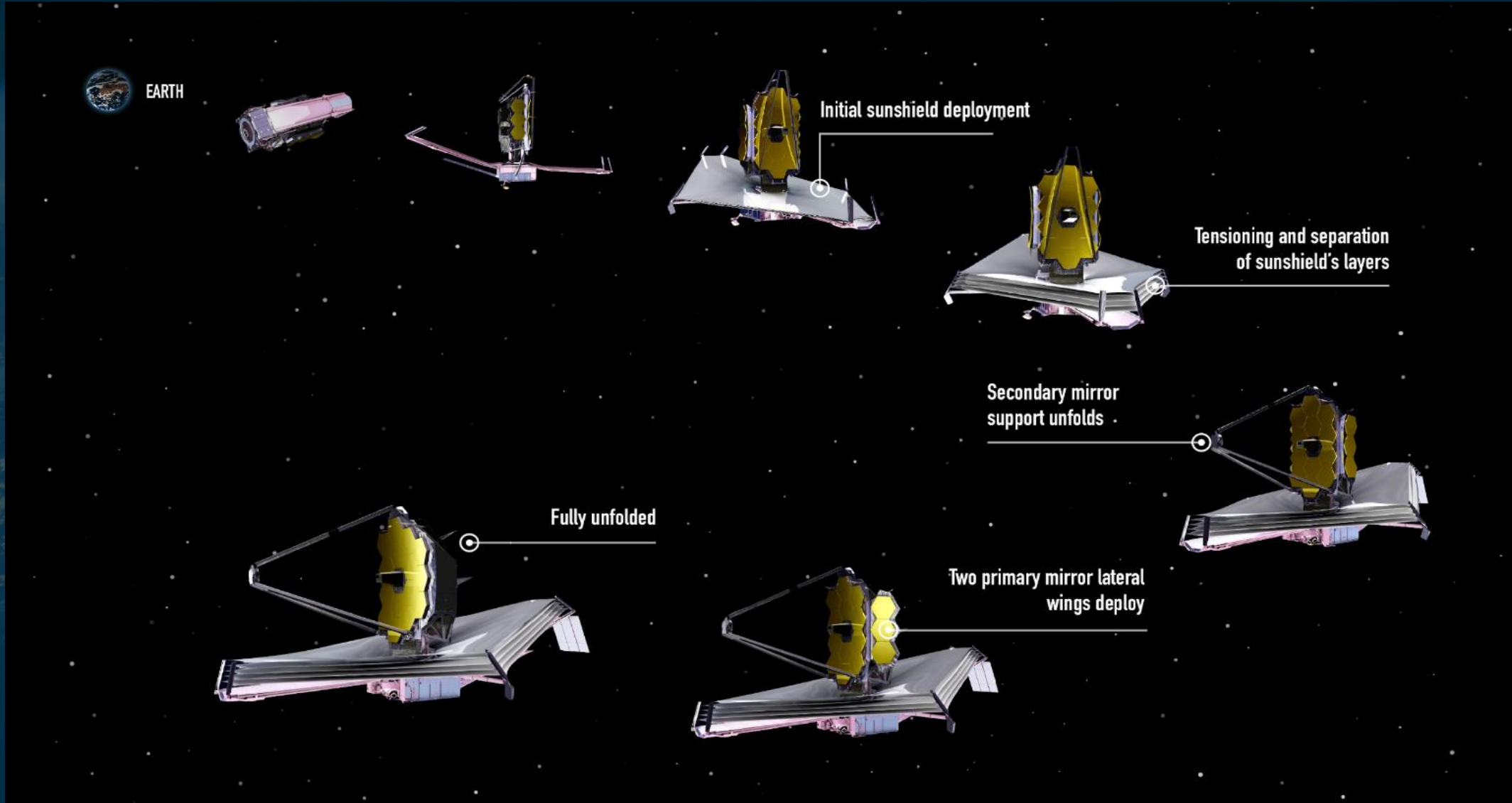
- 6.5m diameter mirror
- 18 x 1.3m segments
- 0.6-28.8 microns
- 4 science instruments
- At Sun-Earth L2 point
- Operates at ~40K



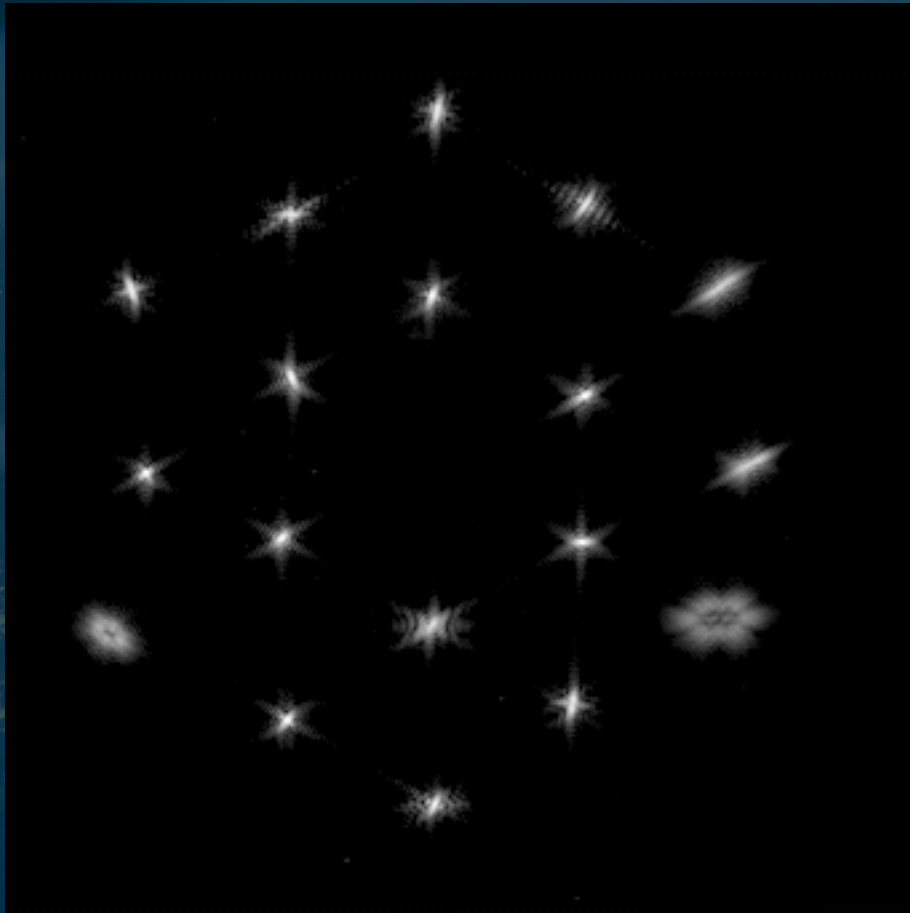
Launch: 25 December 2021



Month 1: Deployment



Months 2-4: Alignment & Cooldown

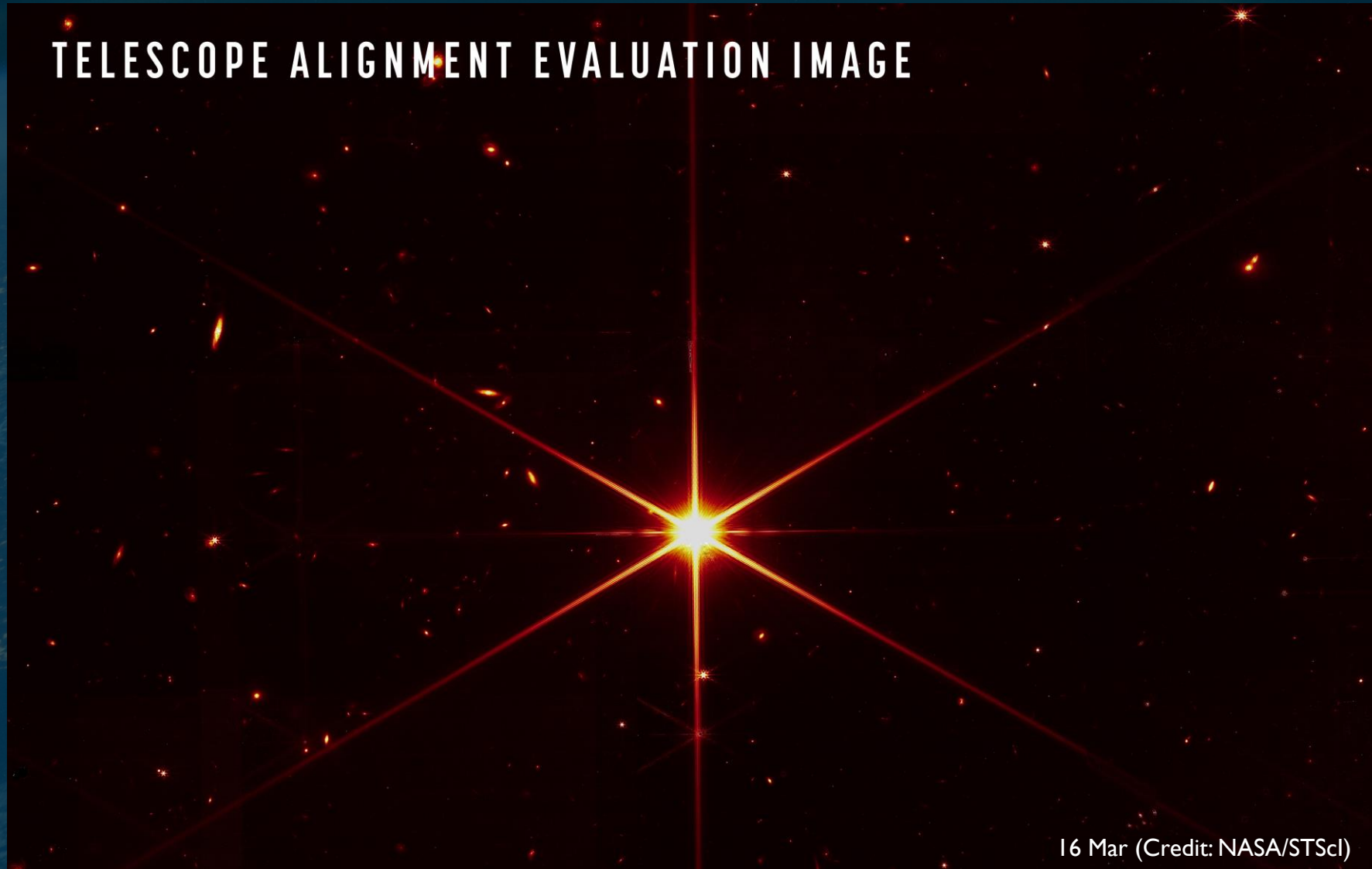


Segment alignment – 25 Feb (Credit: NASA/STScI)

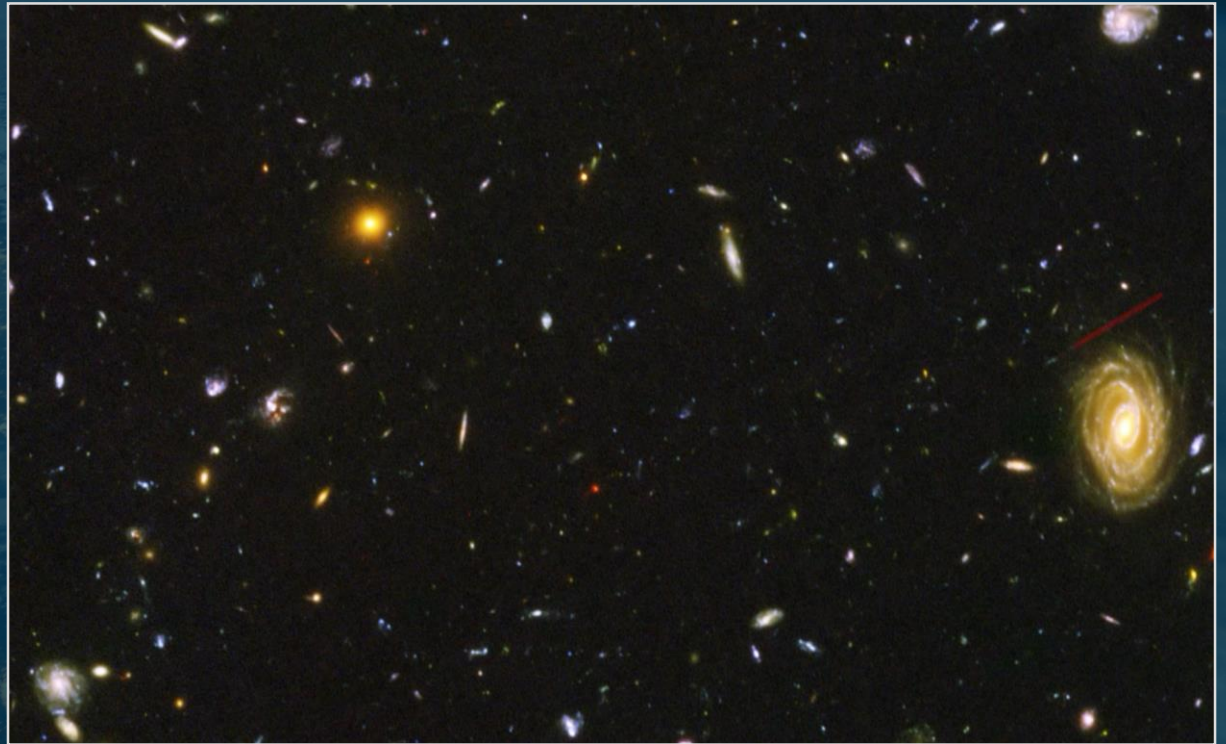
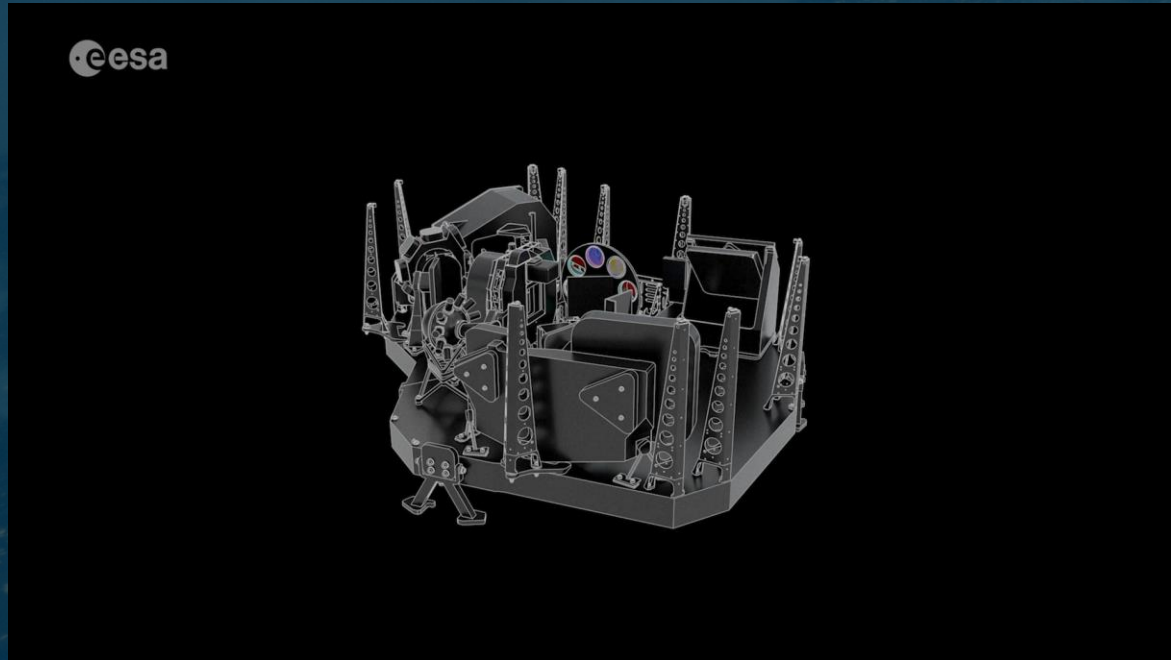


COMPLETED IMAGE STACKING

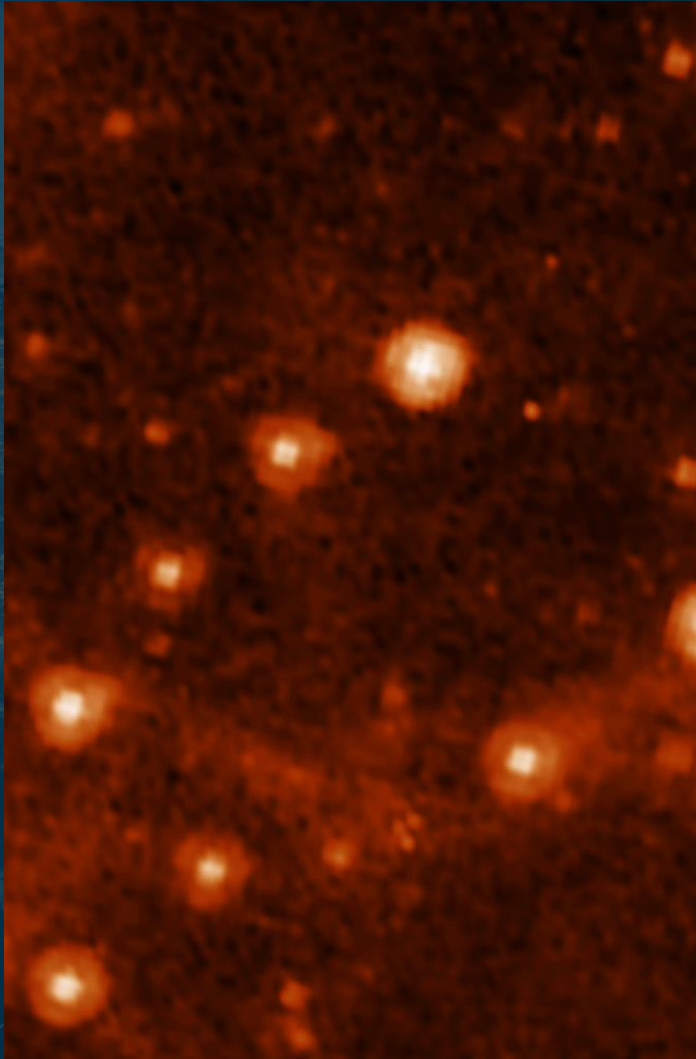
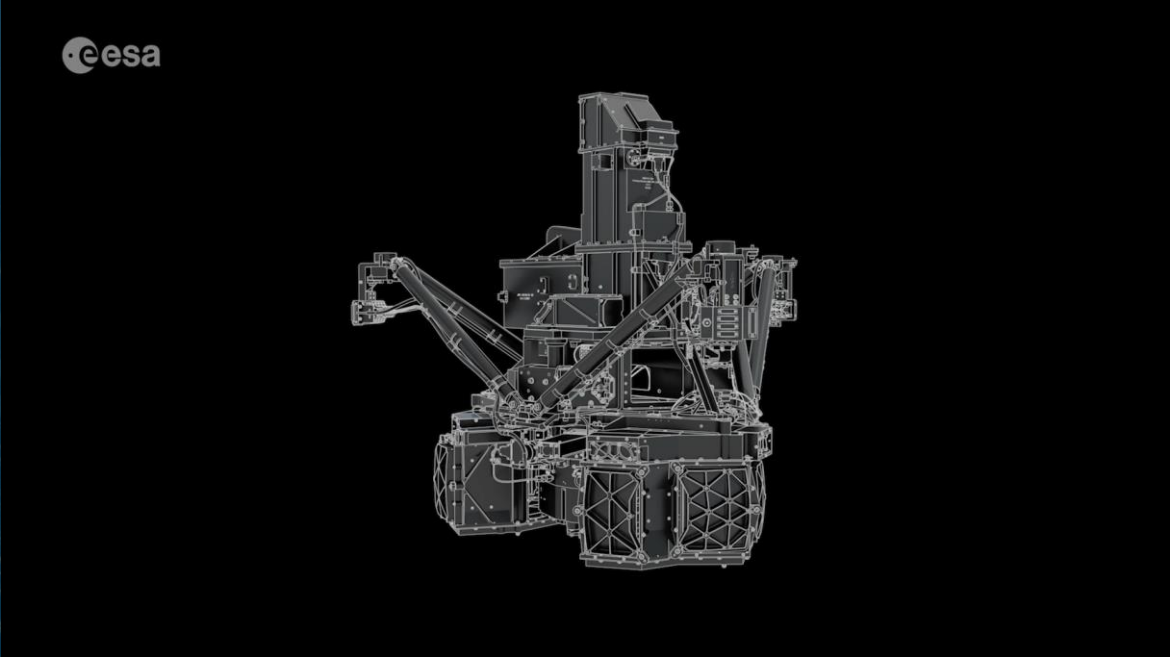
Months 2-4: Alignment & Cooldown



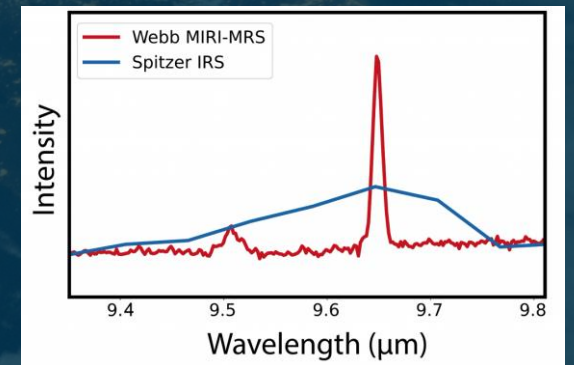
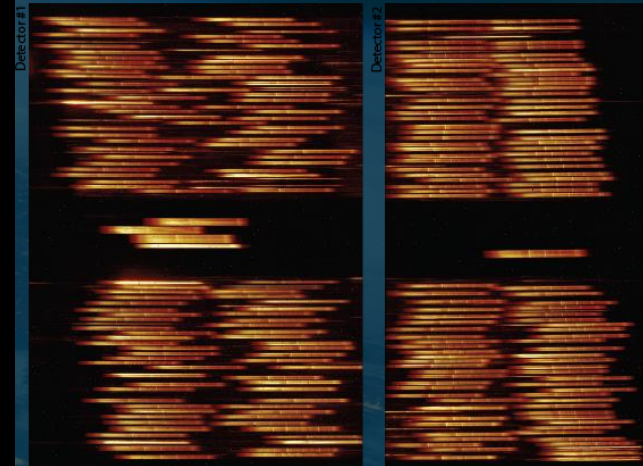
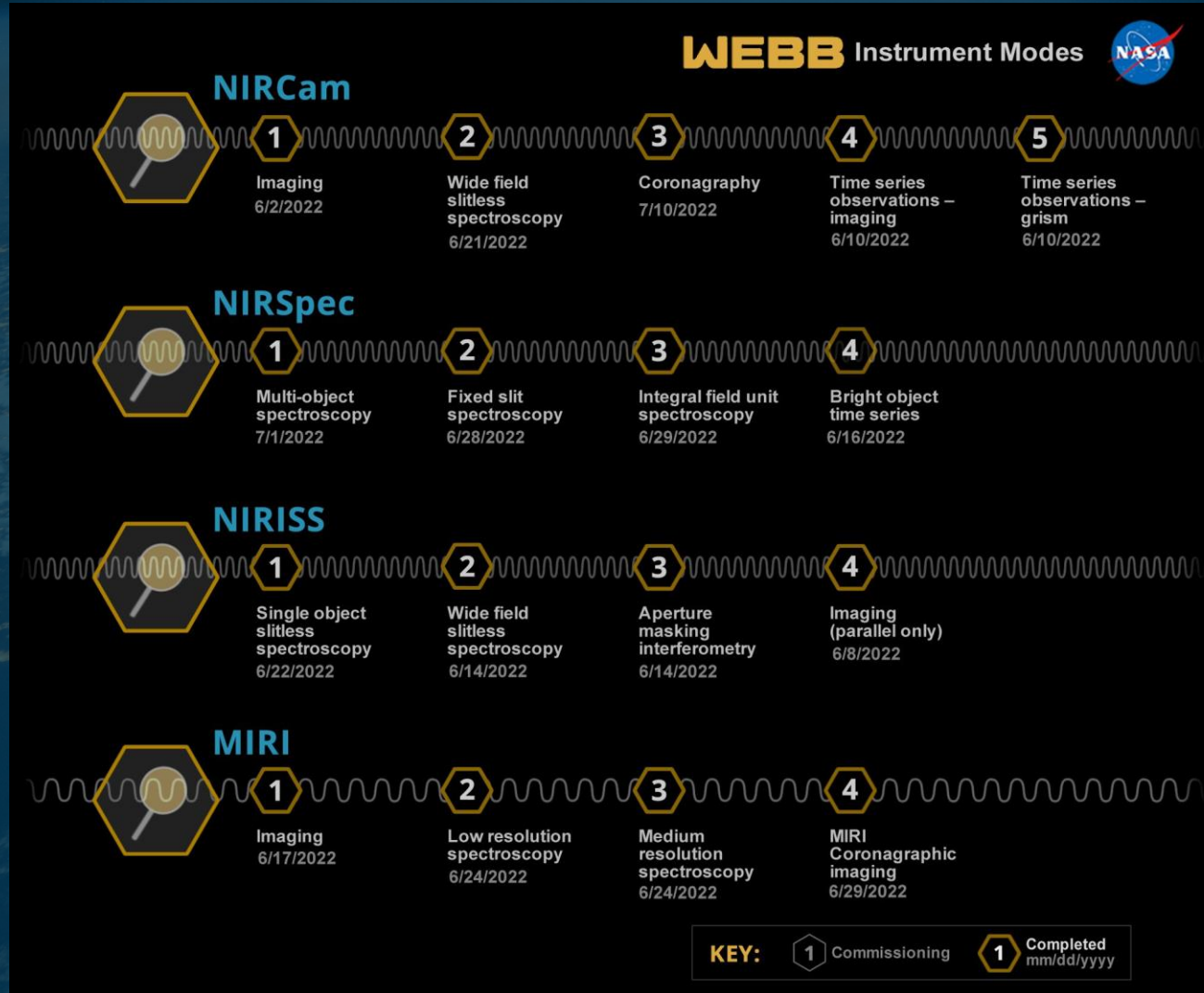
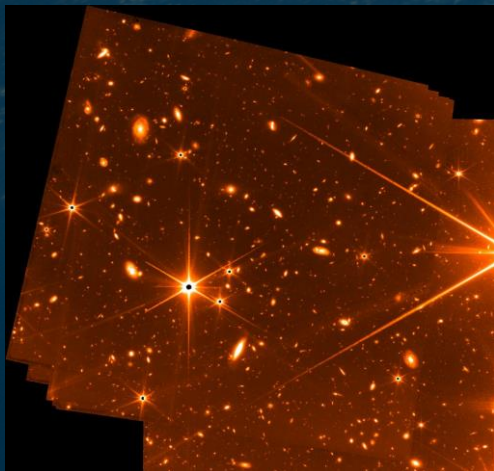
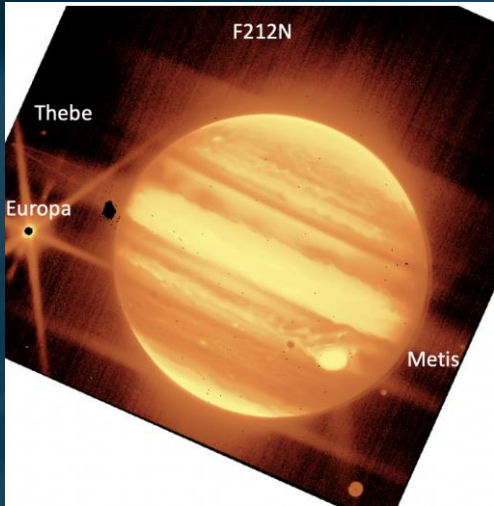
Europe's Contribution: NIRSpec



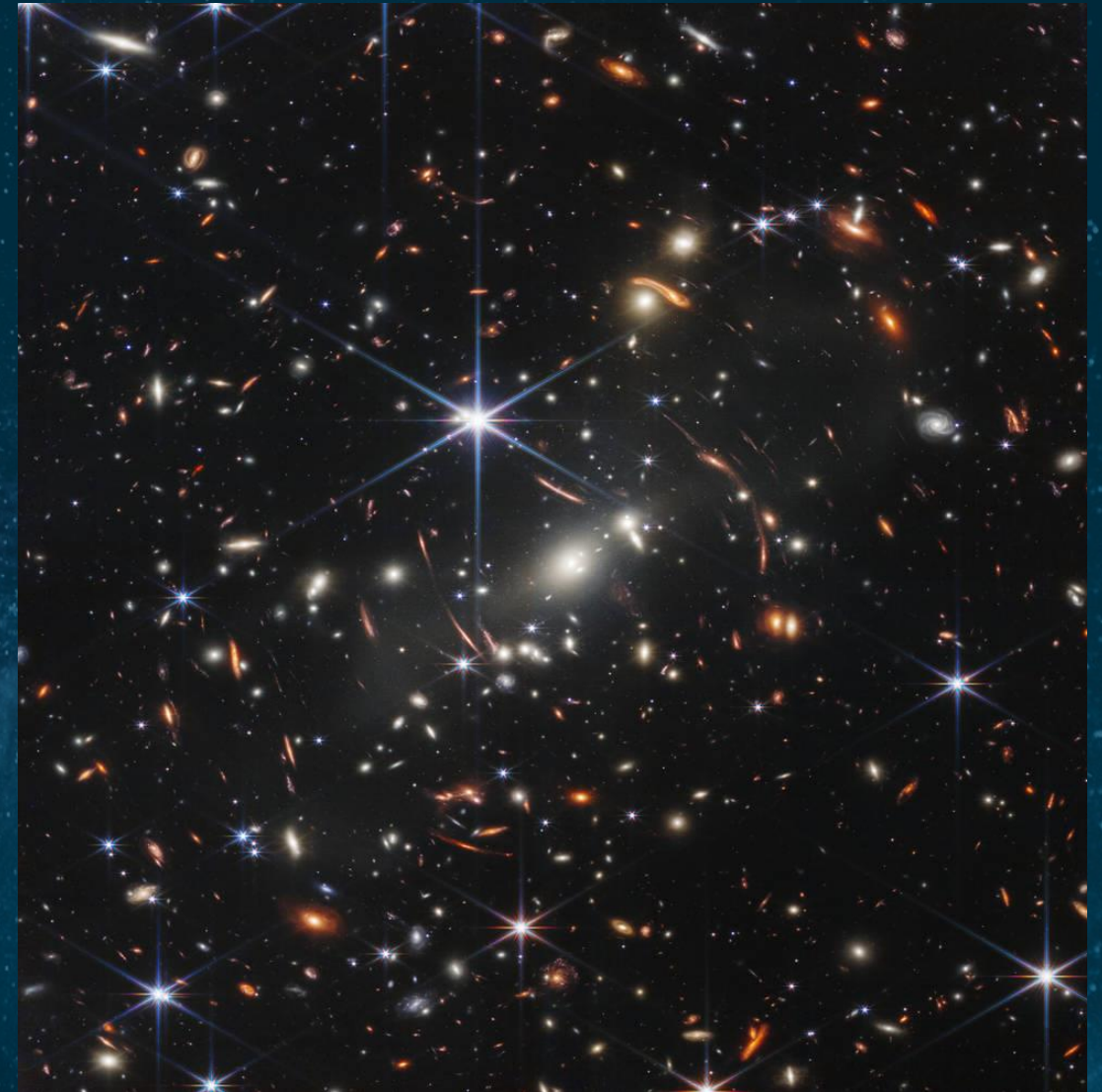
Europe's Contribution: MIRI



Months 5-6: Instrument Commissioning



First images preview



First images release



First images events

Over 40 events across 18 ESA Member States

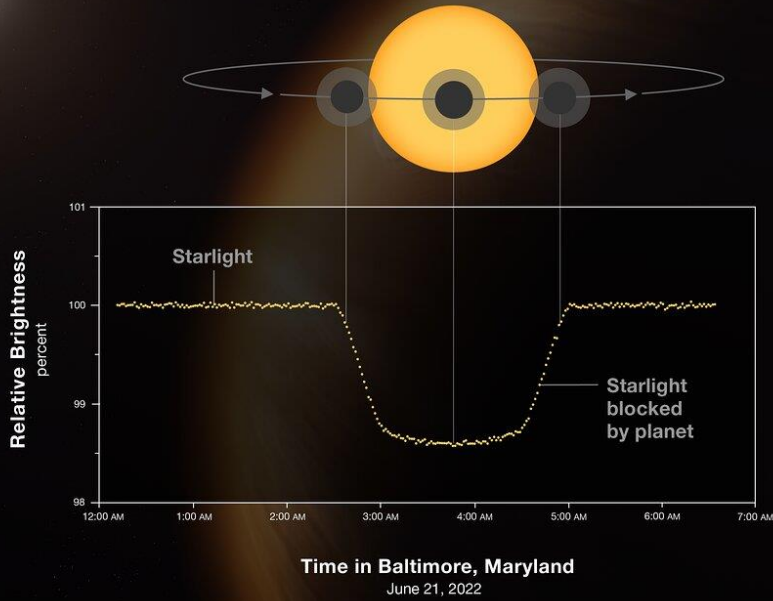


First images & spectra release



HOT GAS GIANT EXOPLANET WASP-96 b TRANSIT LIGHT CURVE

NIRISS | Single-Object Slitless Spectroscopy



WEBB
SPACE TELESCOPE

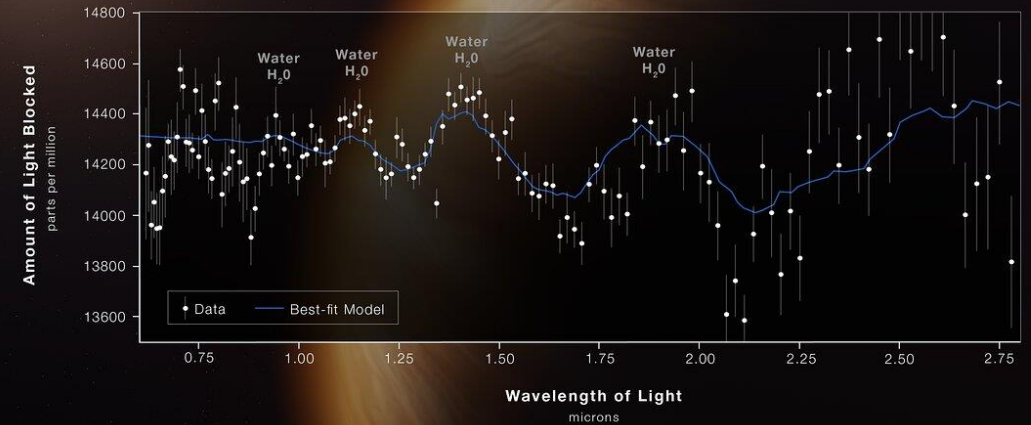
NIRISS observations of WASP-96 b

WASP-96: G8 V star, ~350 pc

WASP-96 b: $P = 3.4$ d, $R_{\text{orb}} = 0.045$ AU, $M = 0.48M_J$

HOT GAS GIANT EXOPLANET WASP-96 b ATMOSPHERE COMPOSITION

NIRISS | Single-Object Slitless Spectroscopy



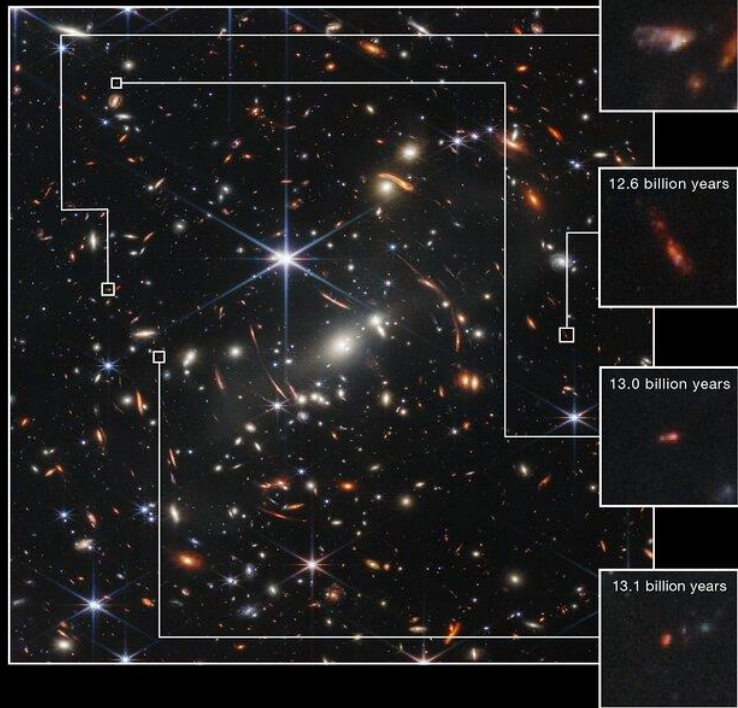
WEBB
SPACE TELESCOPE



GALAXY CLUSTER SMACS 0723

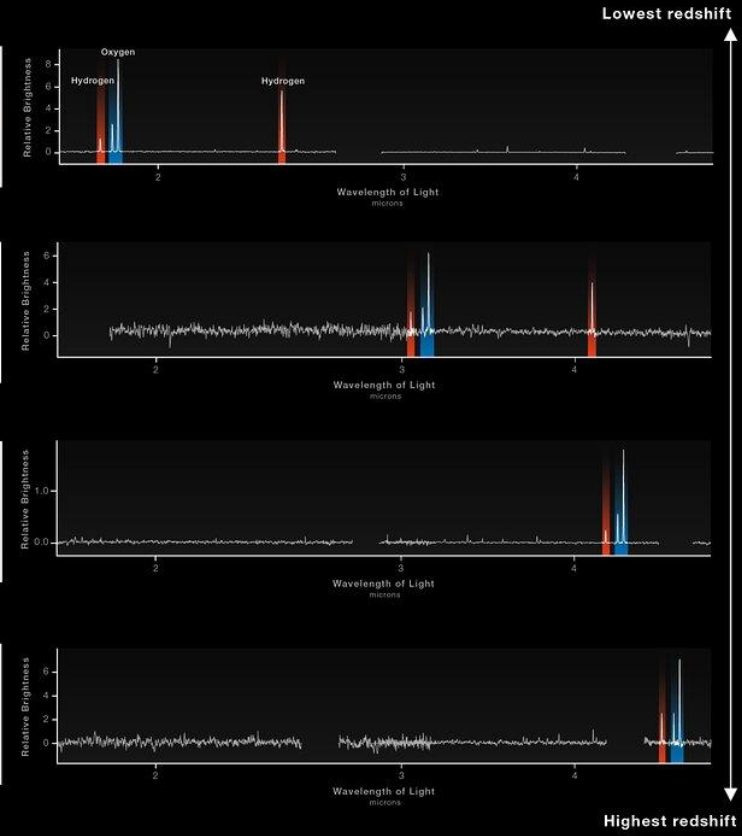
WEBB SPECTRA IDENTIFY GALAXIES IN THE VERY EARLY UNIVERSE

NIRCam Imaging



WEBB
SPACE TELESCOPE

NIRSpec Microshutter Array Spectroscopy



First images & spectra release

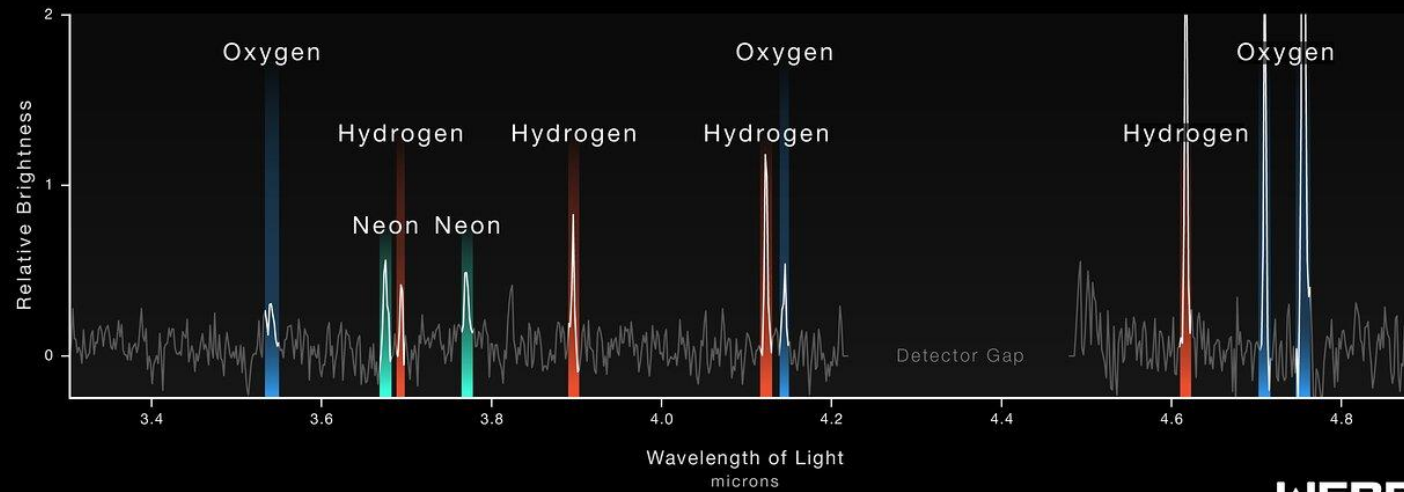
DISTANT GALAXY BEHIND SMACS 0723

WEBB SPECTRUM SHOWCASES GALAXY'S COMPOSITION

NIRCam Imaging



NIRSpec Microshutter Array Spectroscopy



WEBB
SPACE TELESCOPE

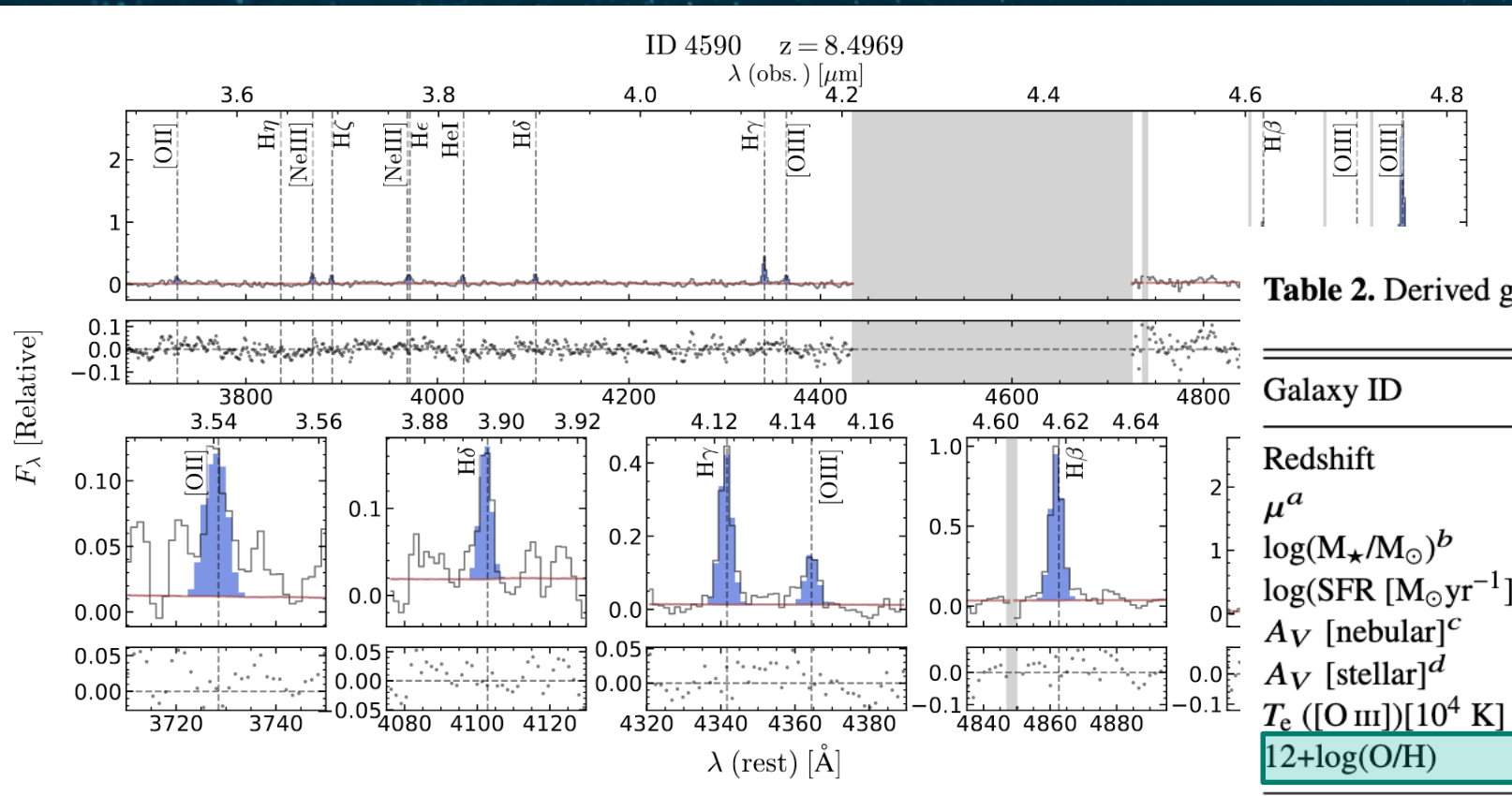


Table 2. Derived galaxy properties.

Galaxy ID	4590	6355	10612
Redshift	8.496	7.665	7.658
μ^a	3.74 ± 0.07	1.231 ± 0.002	1.339 ± 0.003
$\log(M_\star/M_\odot)^b$	7.75 ± 0.07	8.72 ± 0.04	8.08 ± 0.04
$\log(\text{SFR} [M_\odot \text{yr}^{-1}])^b$	0.35 ± 0.07	1.47 ± 0.04	0.90 ± 0.04
A_V [nebular] ^c	$0.68^{+0.34}_{-0.25}$	$0.0^{+0.1}_{0.0}$	$0.40^{+0.46}_{-0.27}$
A_V [stellar] ^d	0.37 ± 0.04	0.50 ± 0.03	0.21 ± 0.03
T_e ([O III])[10^4 K]	2.77 ± 0.42	1.20 ± 0.07	1.75 ± 0.16
$12+\log(\text{O}/\text{H})$	6.99 ± 0.11	8.24 ± 0.07	7.73 ± 0.12

^a derived from the lens models presented in [Mahler et al. 2022](#)

^b values are corrected for magnification (errors on μ are propagated)

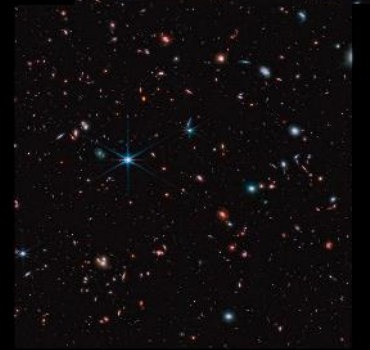
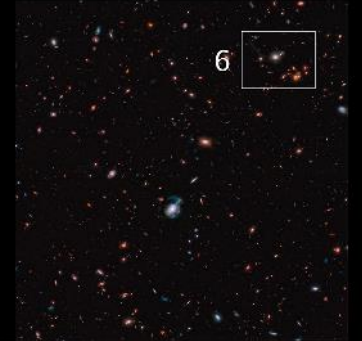
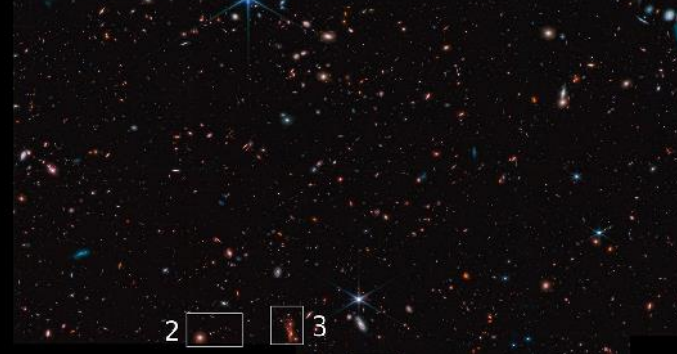
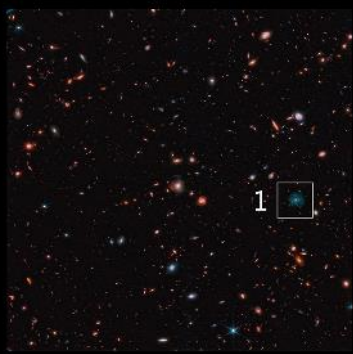
^c inferred from ratios of Balmer lines

^d inferred from SED fitting

Curti et al. (2022), MNRAS, in press

See also: Schaerer et al. (2022), Trump et al. (2022), Arellano-Cordova et al. (2022), Taylor et al. (2022) & more...

Cosmic Evolution Early Release Science (CEERS) Survey

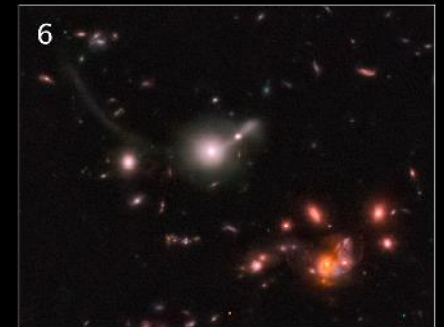
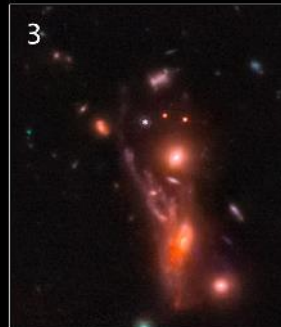
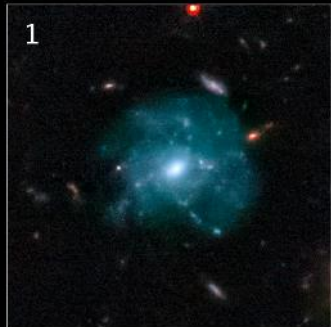


CEERS JWST/NIRCam F115W F150W F200W F277W F356W F410M F444W

NASA/STScI/CEERS/TACC/S. Finkelstein/M. Bagley/R. Larson/Z. Levay

100 sq. arcmin imaging, 6+ papers in press from CEERS team, & many more...

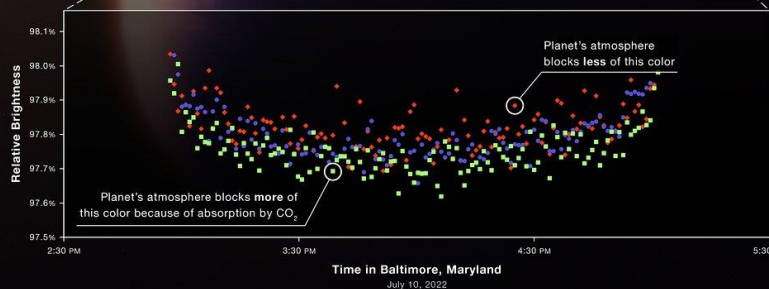
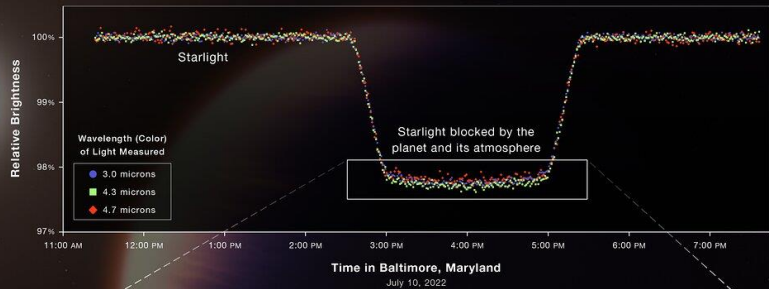
Early Release Science (ERS) programme, ID: I345, PI: Finkelstein



Detection of CO₂ in an exoplanet atmosphere

HOT GAS GIANT EXOPLANET WASP-39 b TRANSIT LIGHT CURVE

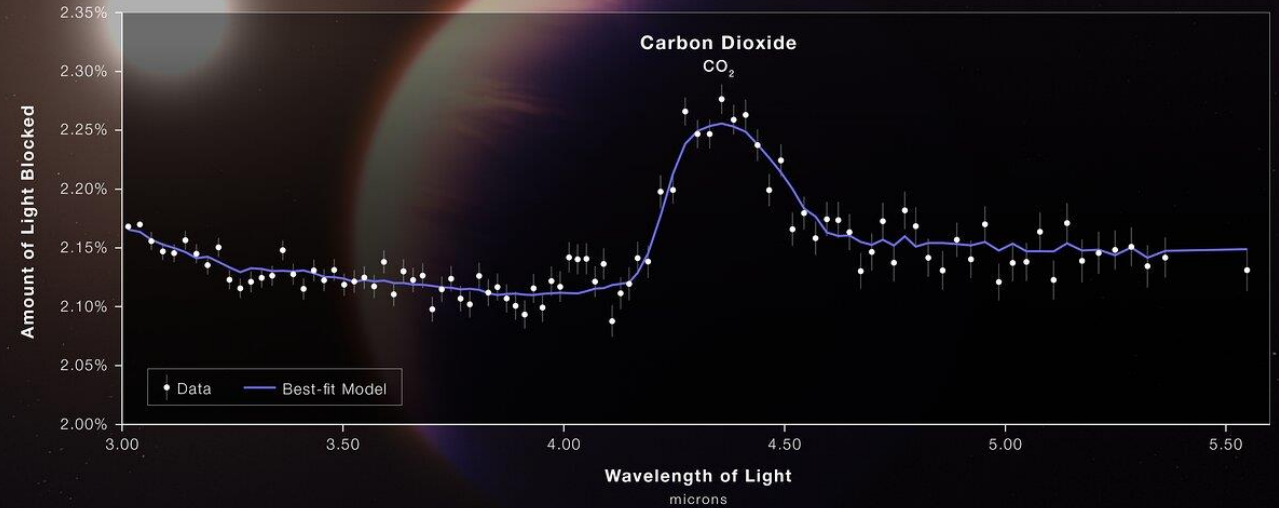
NIRSpec | Bright Object Time-Series Spectroscopy



WEBB
SPACE TELESCOPE

HOT GAS GIANT EXOPLANET WASP-39 b ATMOSPHERE COMPOSITION

NIRSpec | Bright Object Time-Series Spectroscopy



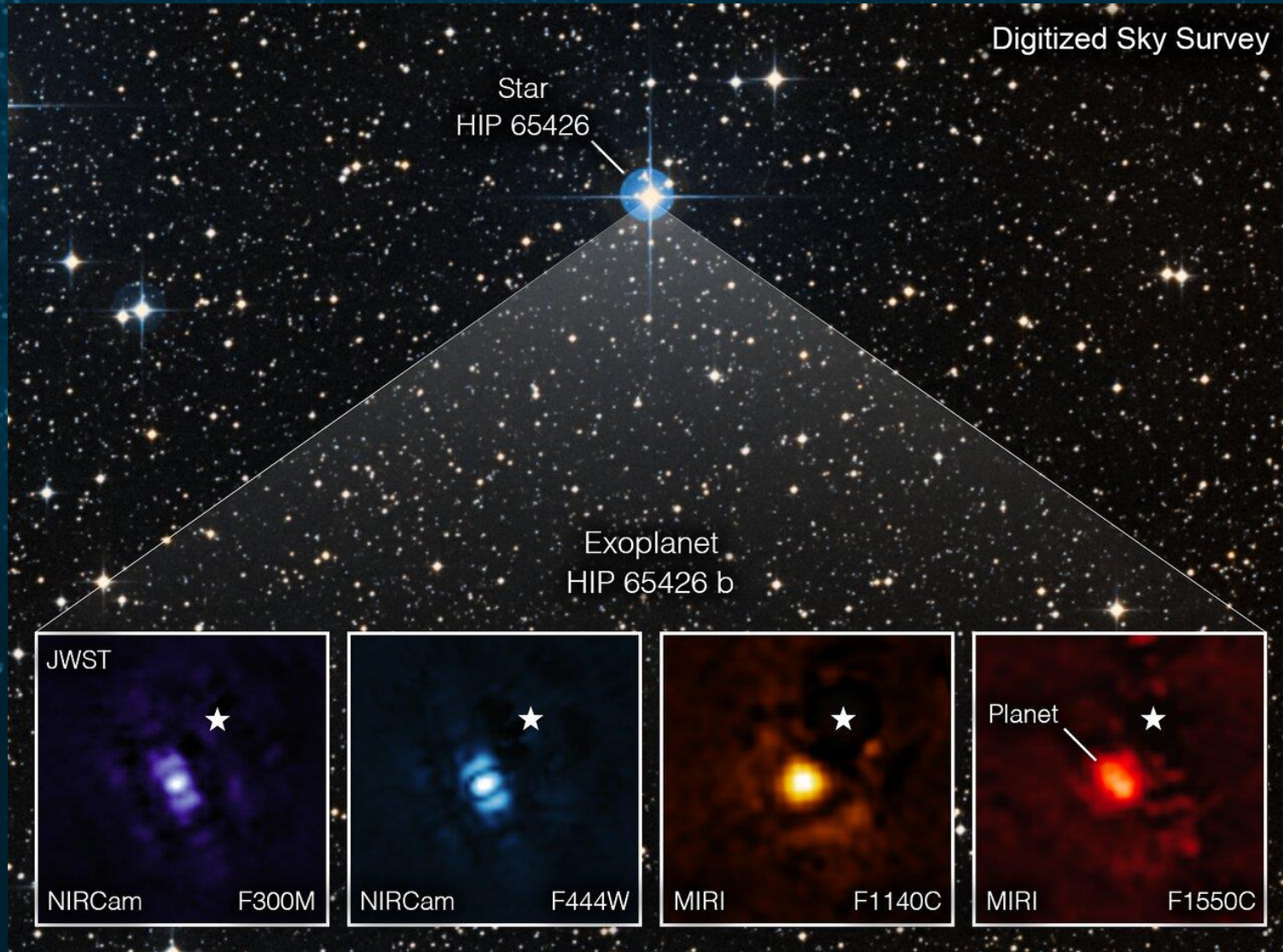
WEBB
SPACE TELESCOPE

WASP-39 b, $P \sim 4$ d, $R_{orb} \sim 0.05$ AU, $M = 0.28 M_J$

JWST Transiting Exoplanet Community ERS Team, arXiv:2208.11692

NIRSpec spectroscopy from ERS programme, ID: I 366, PI: Batalha

First exoplanet image with JWST



HIP 65426 b

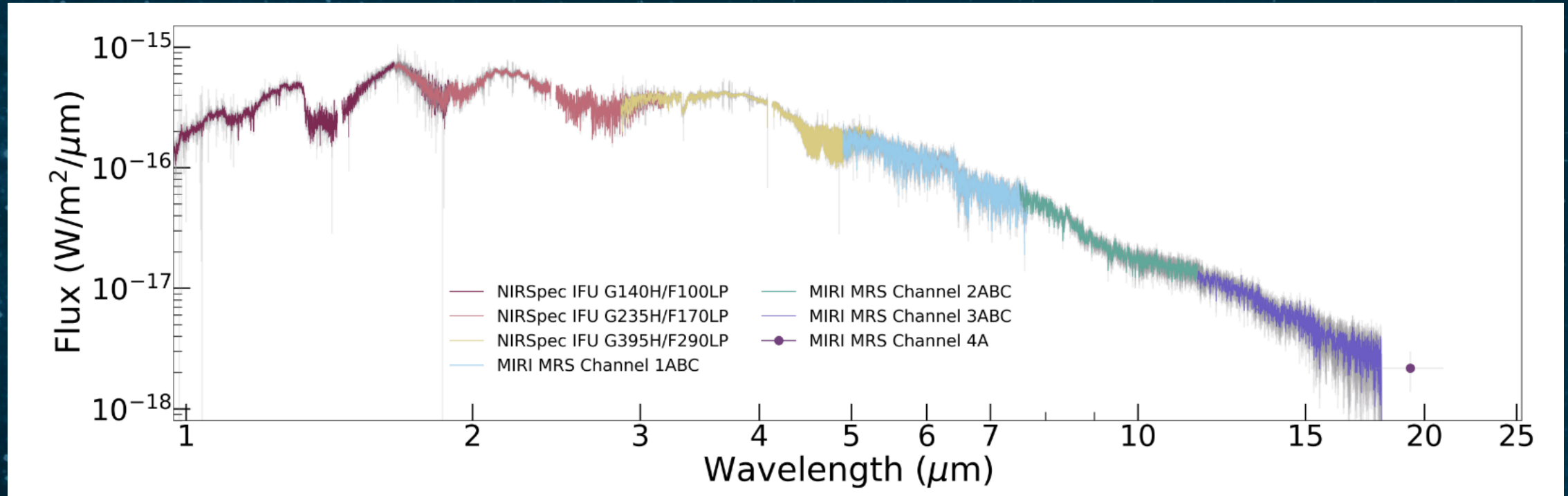
Discovered in 2017 (VLT-SPHERE)

$M = 7 M_J$, $R_{orb} \sim 100 \text{ AU}$

Carter et al. arXiv:2208.14990

From Early Release Science (ERS) programme, ID: I 386, PI: Hinkley

Spectroscopy of planetary-mass companion: VHS I 256 b

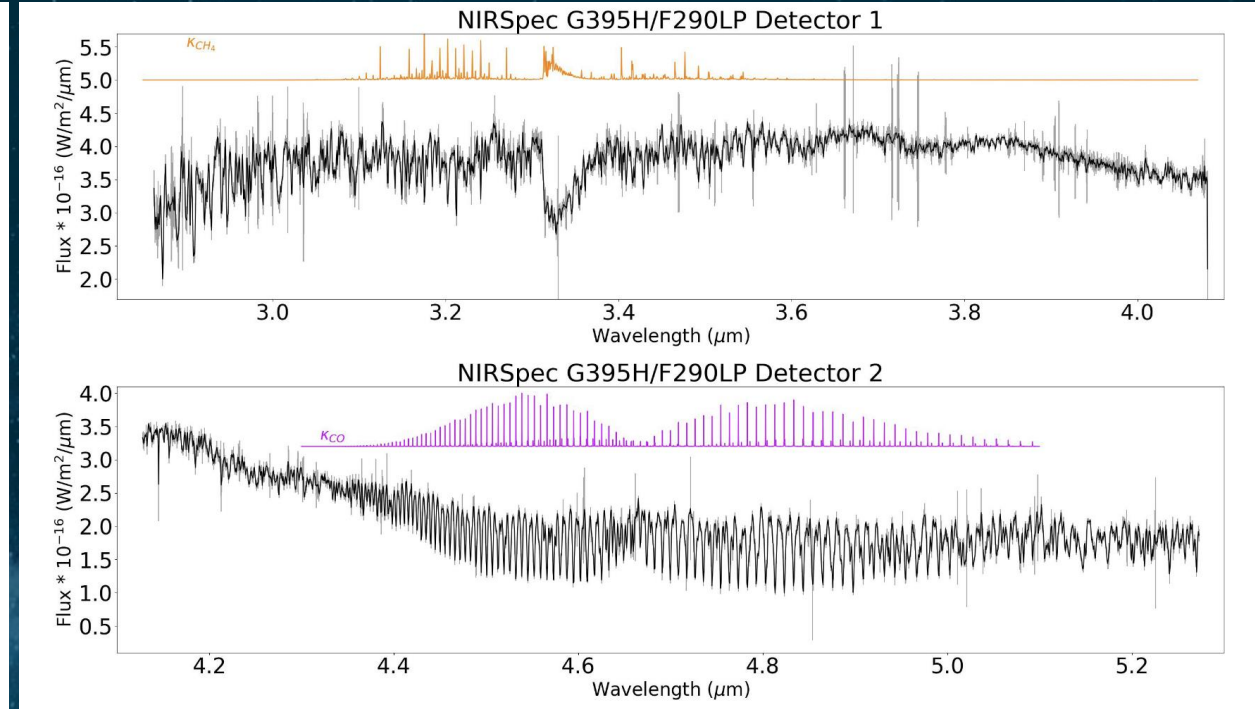
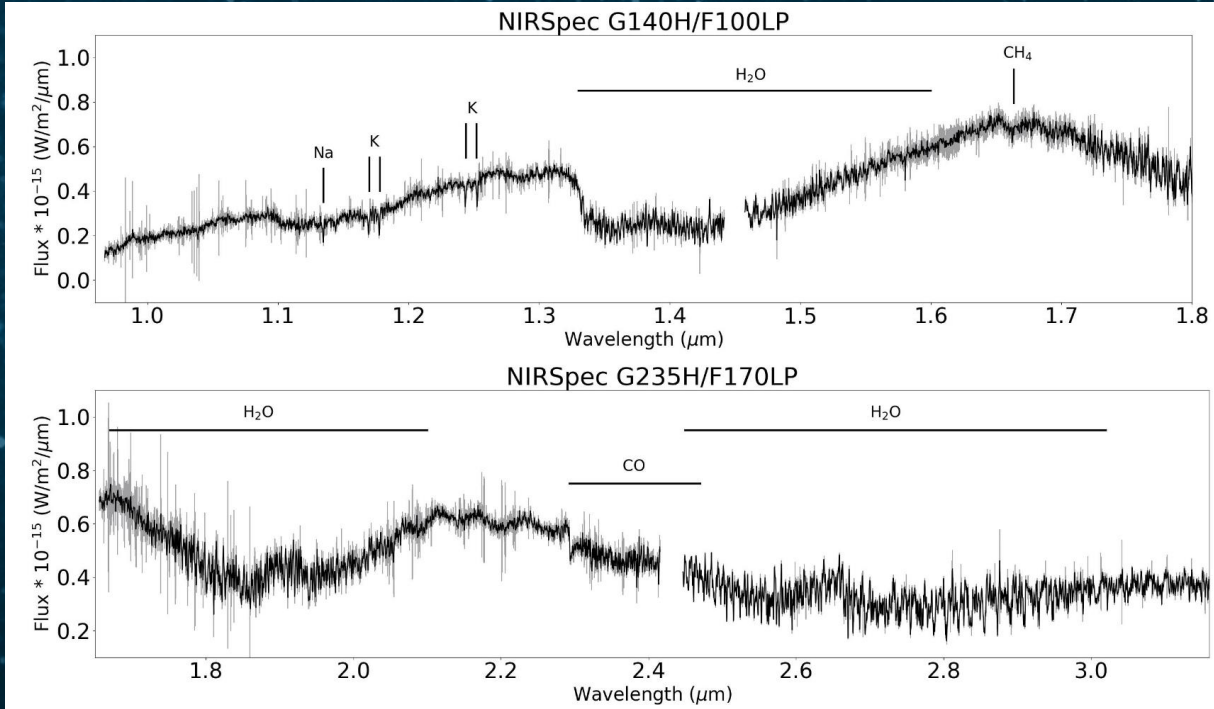


Young, brown dwarf companion with $M < 20 M_J$

Miles et al. arXiv:2209.00620

NIRSpec & MIRI spectroscopy from ERS programme, ID: I 386, PI: Hinkley

Spectroscopy of planetary-mass companion: VHS I 256 b



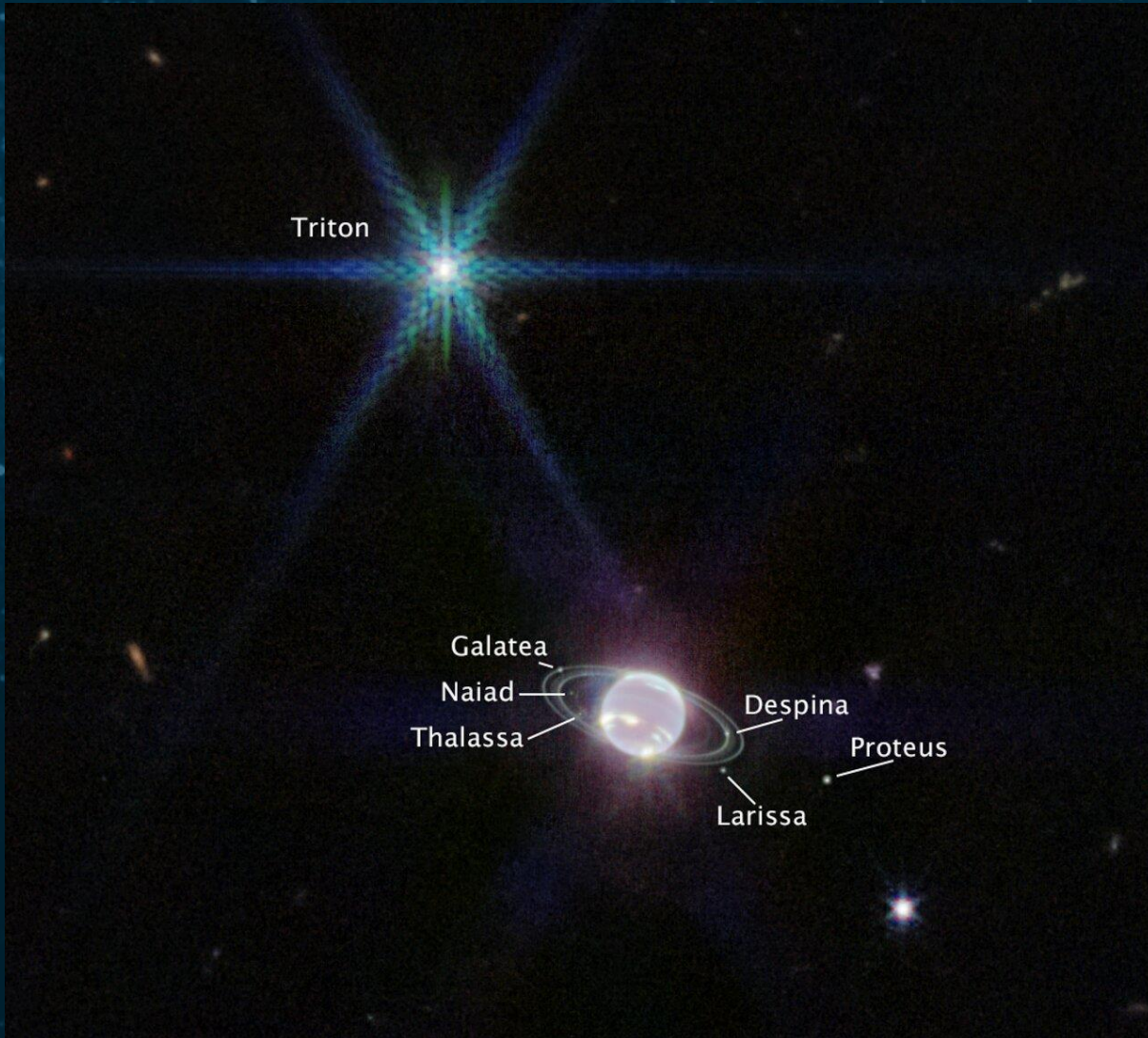
Young, brown dwarf companion with $M < 20 M_J$

Miles et al. arXiv:2209.00620

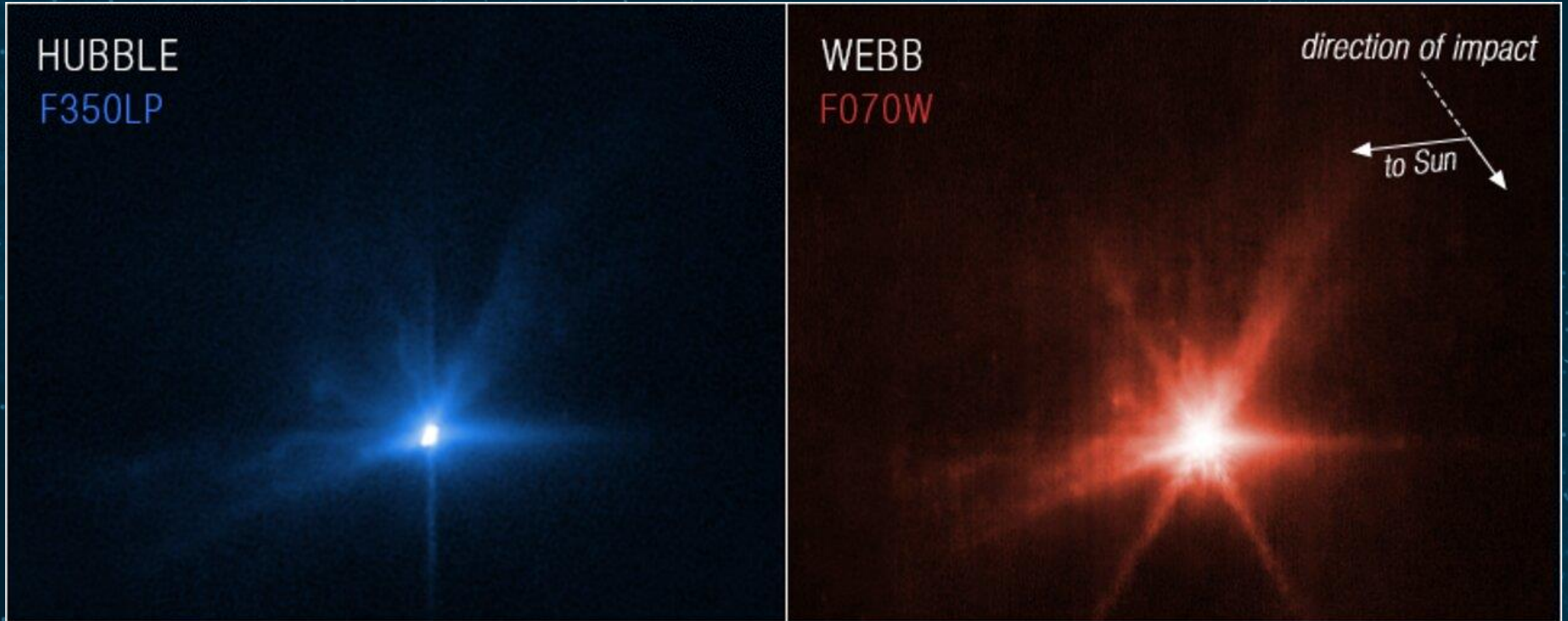
NIRSpect & MIRI spectroscopy from ERS programme, ID: I 386, PI: Hinkley



Neptune image release



Last week's DART impact



M74: Hubble & Webb together



Hubble / Optical



<https://esawebb.org>

Hubble & Webb



Webb / Infrared

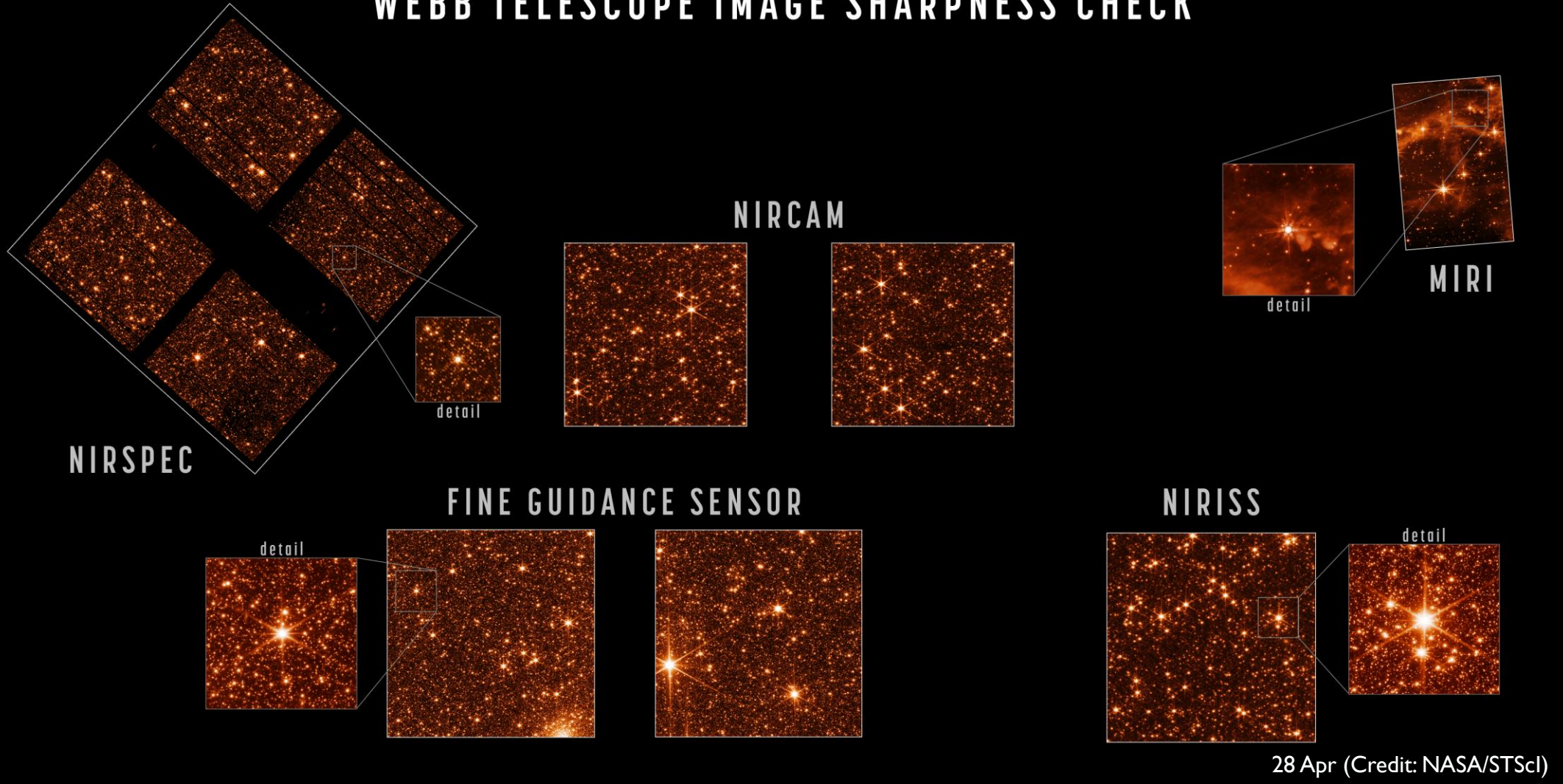


28 Apr (Credit: NASA/STScI)



Months 2-4: Alignment & Cooldown

WEBB TELESCOPE IMAGE SHARPNESS CHECK



28 Apr (Credit: NASA/STScI)

Months 5-6: Instrument Commissioning



MIRI
COMMISSIONING TEAM



Months 2-4: Alignment & Cooldown



11 Feb (Credit: NASA)



Segment alignment – 25 Feb (Credit: NASA/STScI)