JWST 2nd birthday: what we have learned so far

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TRIESTE

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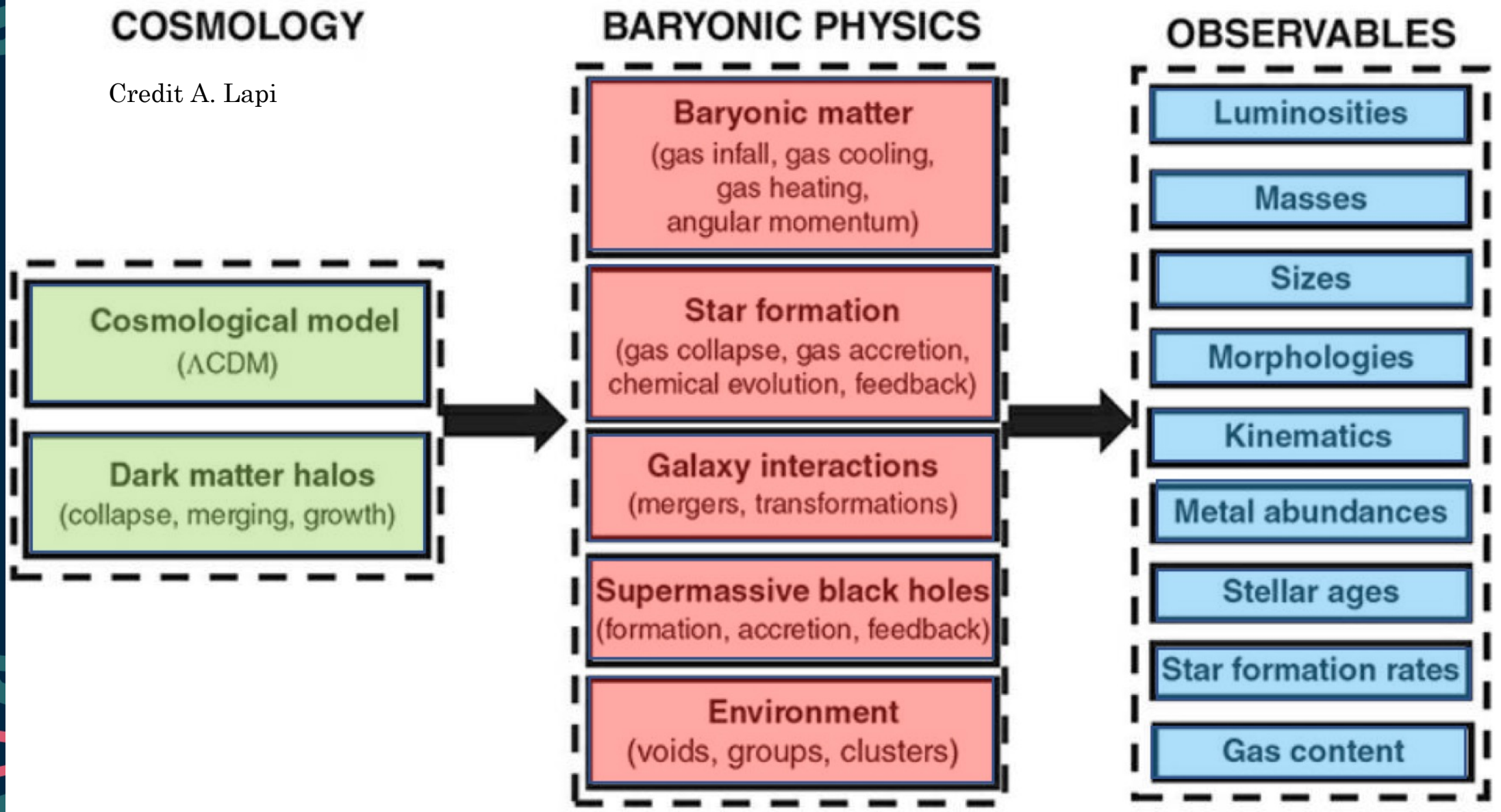
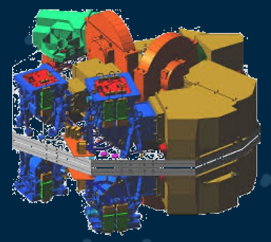

COSMOLOGY
BARYONIC PHYSICS
OBSERVABLES
Credit A. Lapi
Cosmological model
(ΛCDM)
Dark matter halos
(collapse, merging, growth)
Baryonic matter
(gas infall, gas cooling,
gas heating,
angular momentum)
Star formation
(gas collapse, gas accretion,
chemical evolution, feedback)
Galaxy interactions
(mergers, transformations)
Supermassive black holes
(formation, accretion, feedback)
Environment
(voids, groups, clusters)
Luminosities
Masses
Sizes
Morphologies
Kinematics
Metal abundances
Stellar ages
Star formation rates
Gas content

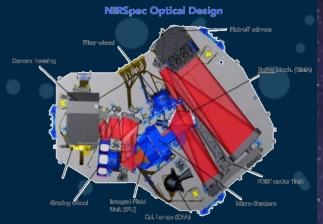
James Webb Space Telescope (JWST)

Launched: 25 December 2021

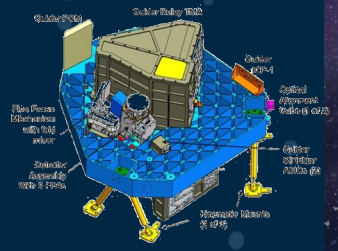
6.5m segmented hexagonal primary mirror, 18 segments.



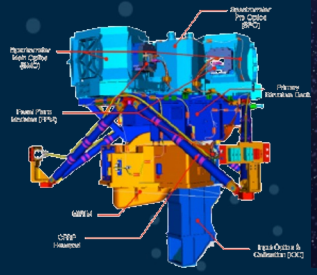
NIRCam = Near-InfraRed Camera
University of Arizona. PI: M. Rieke, **FoV: 2 modules of 2.2'x2.2'**.



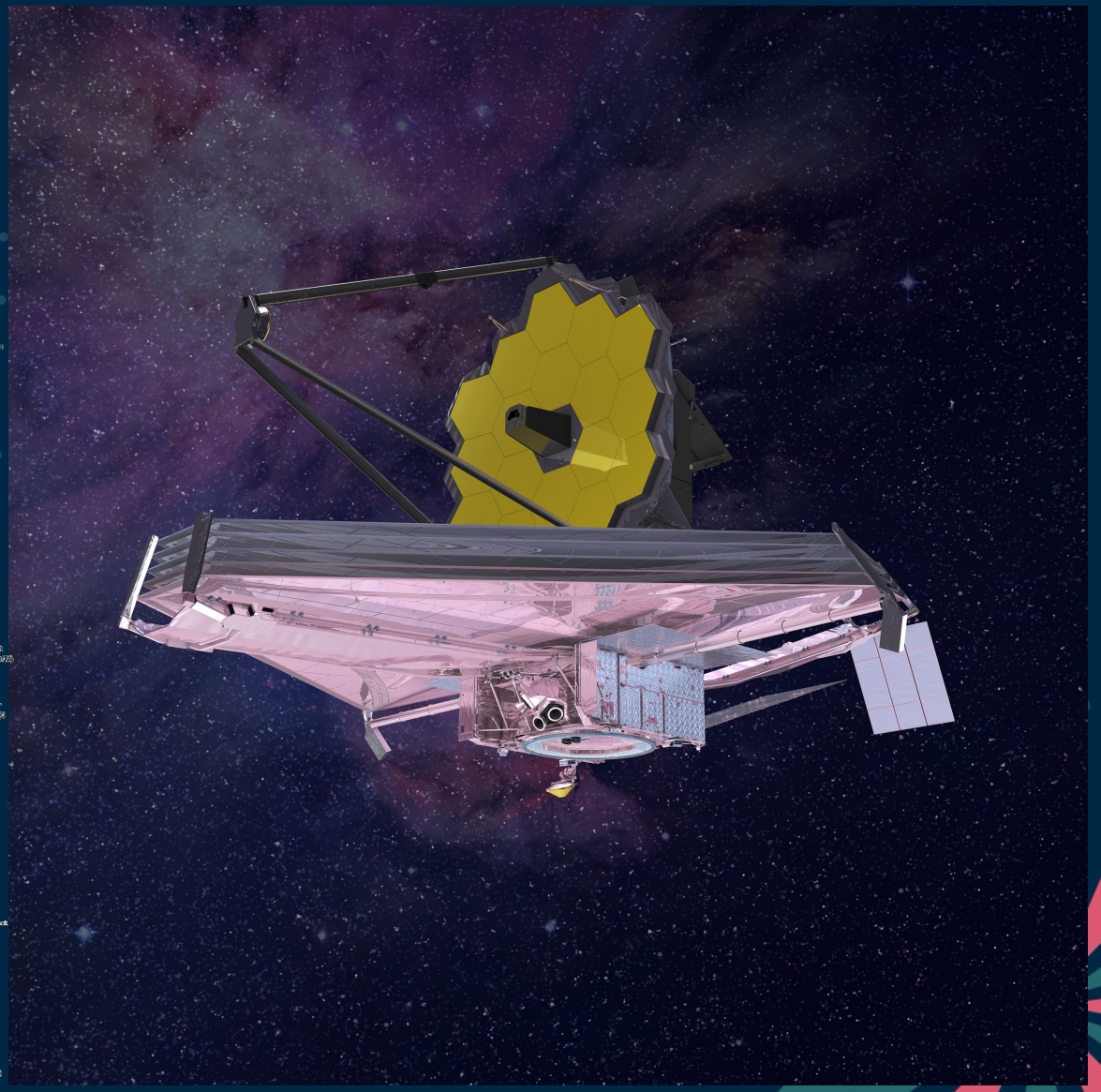
NIRSpec = Near-infrared Spectrograph
European Space Agency (ESA) , **FoV: ~ 3'x3'**.



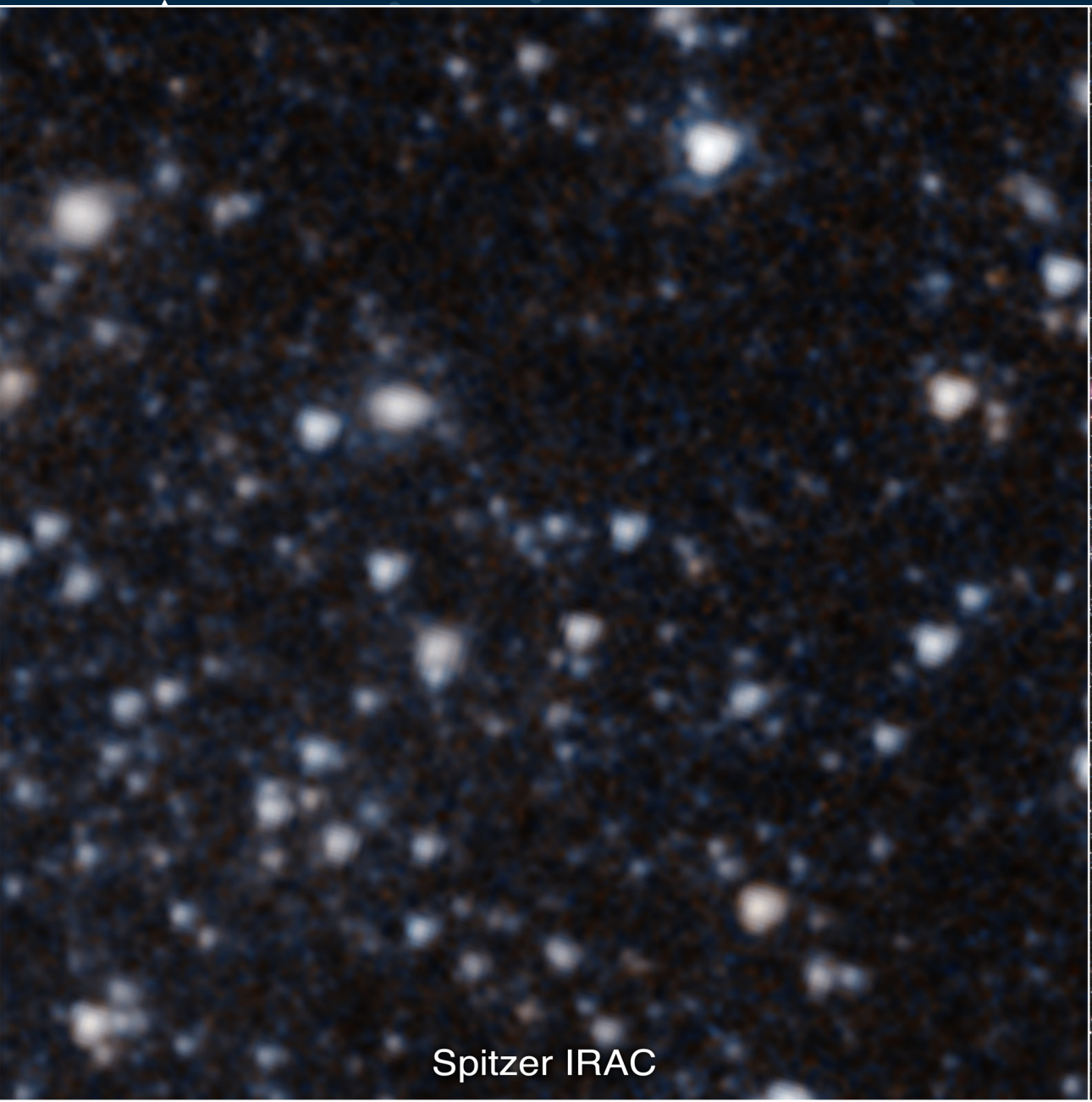
NIRISS = Near-infrared Imager and Slit-less Spectrograph
Canadian Space Agency. PIs: R. Doyon & C. Willott, **FoV: 2.2'x2.2'.**

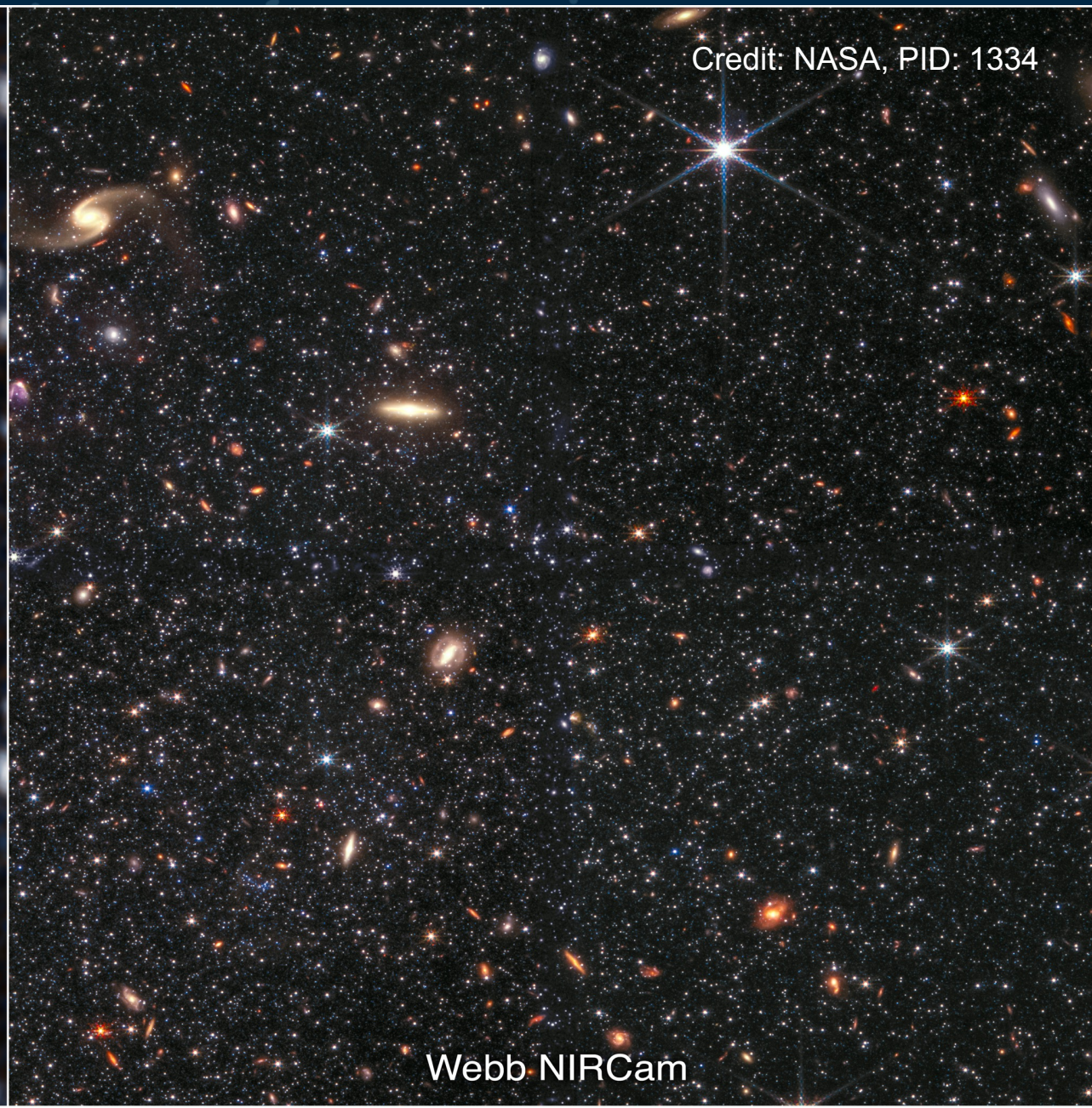


MIRI = Mid-InfraRed Instrument
50/50 between consortium of European institutes (MIRI EC) and NASA/JPL. PIs: G. Wright and G. Rieke, FoV: **1.3'x1.7'**.

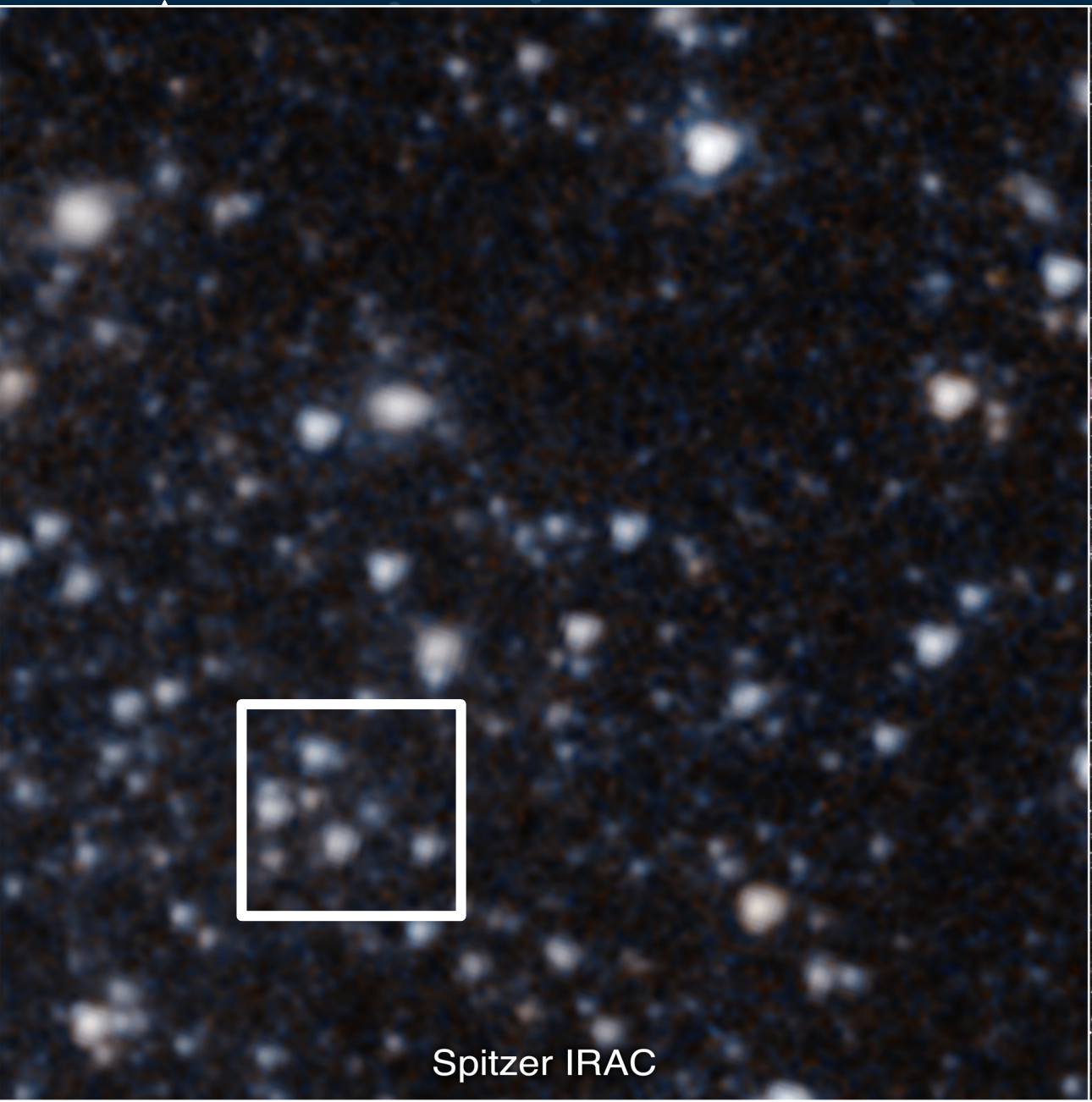


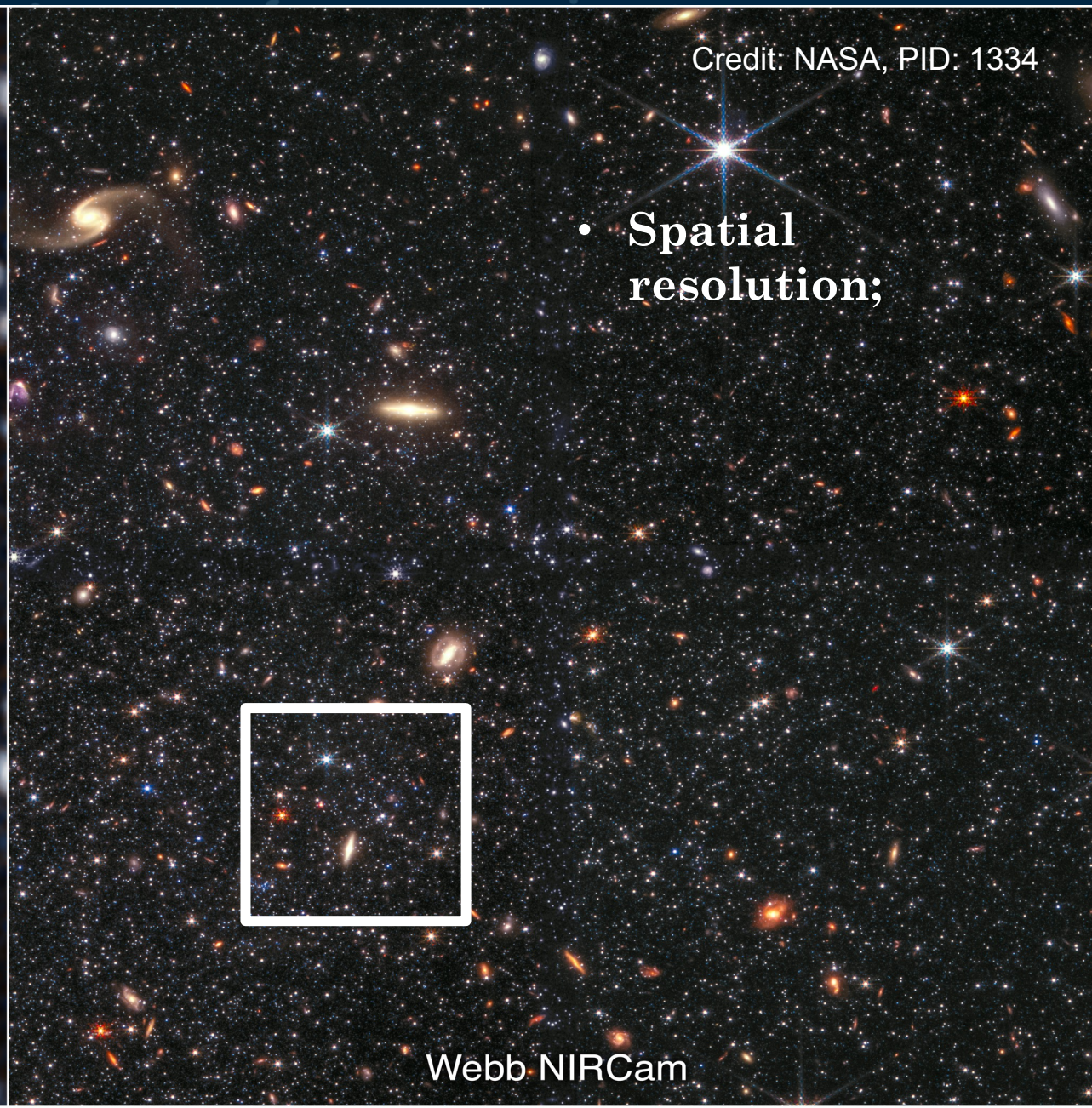
JWST – Key aspects (I)



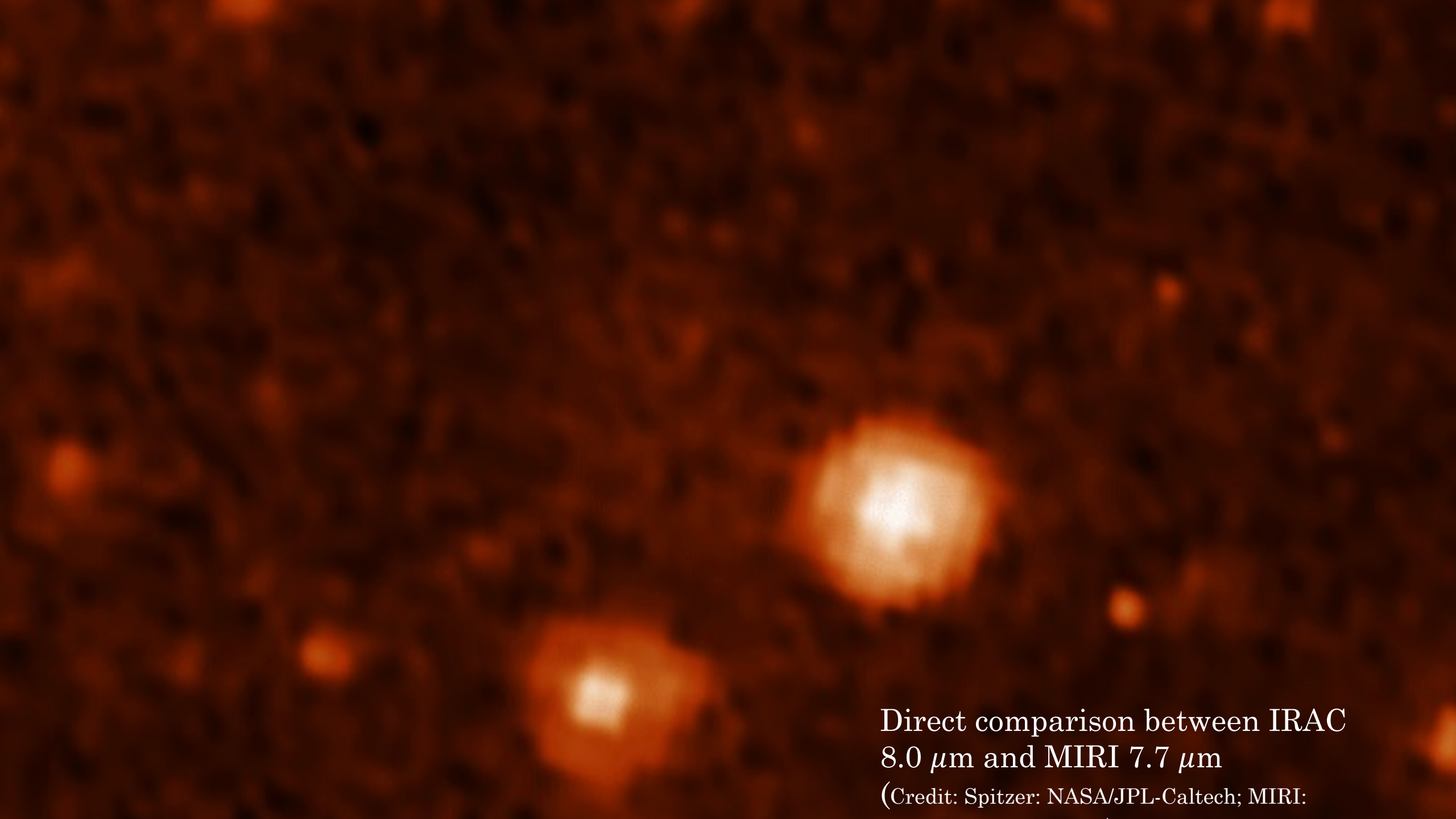


JWST – Key aspects (I)





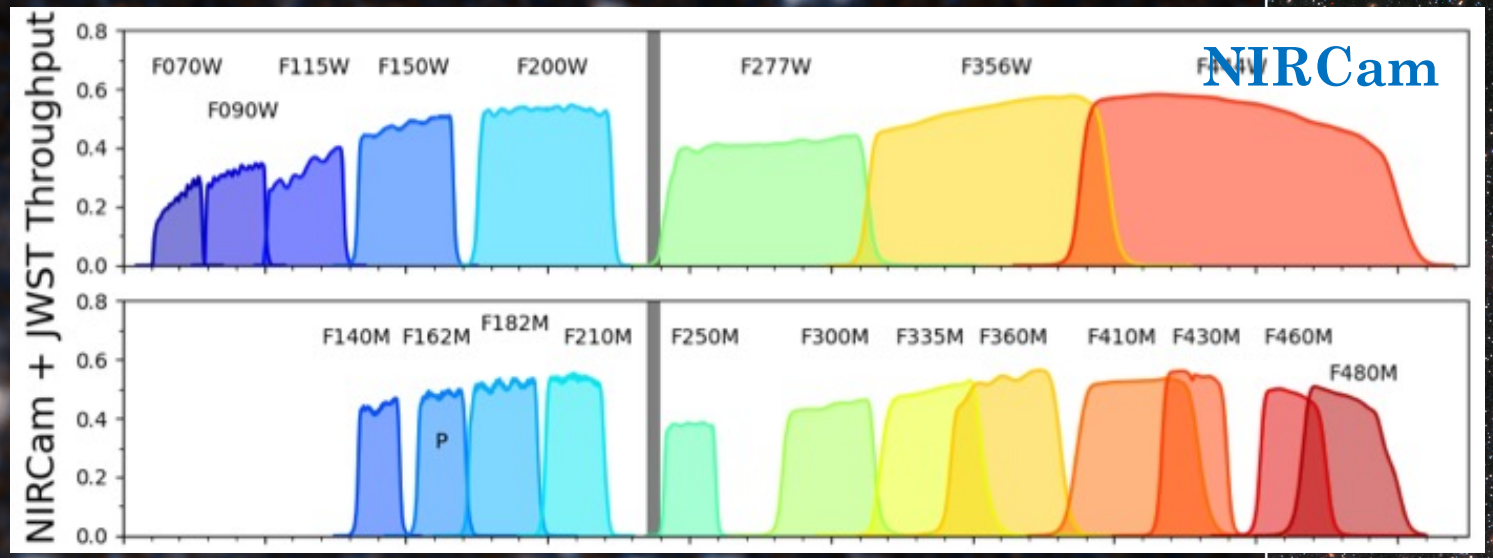
- **Spatial resolution;**

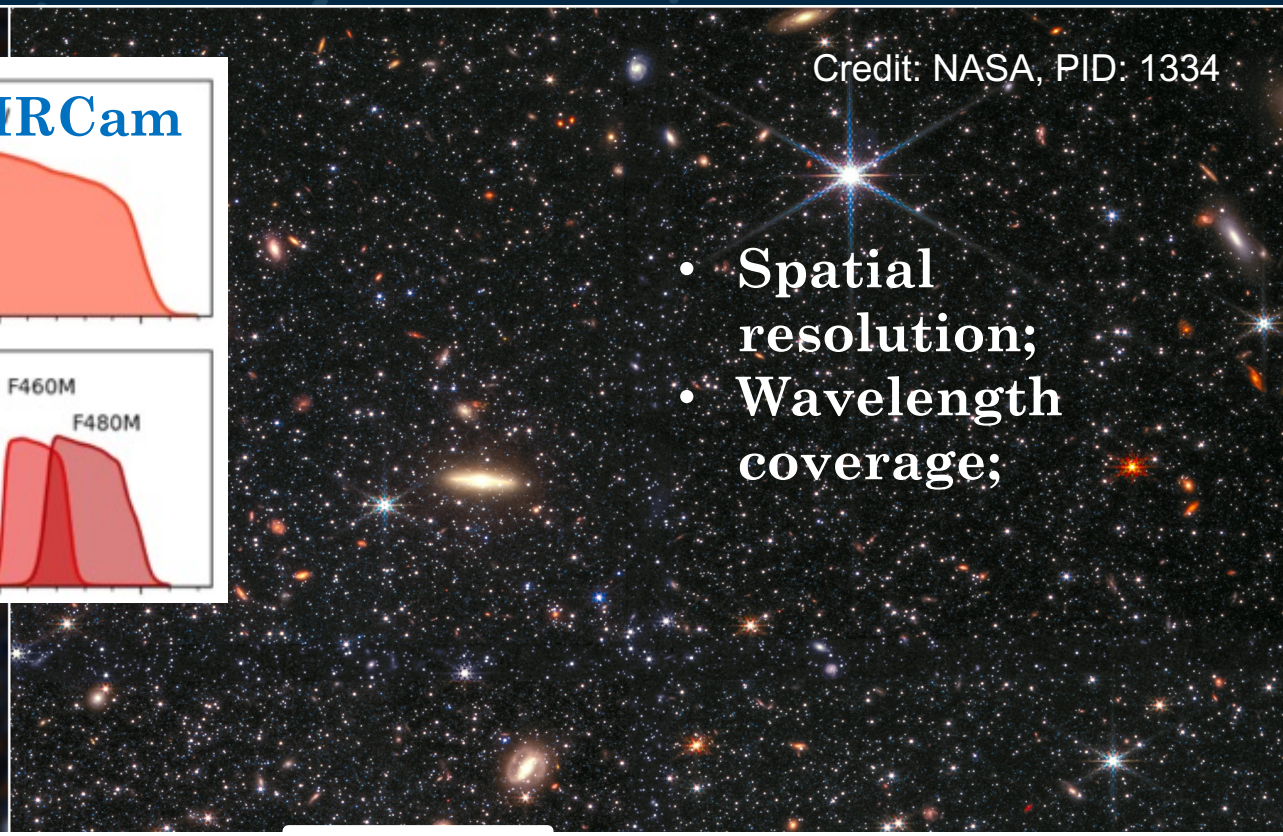


Direct comparison between IRAC 8.0 μm and MIRI 7.7 μm

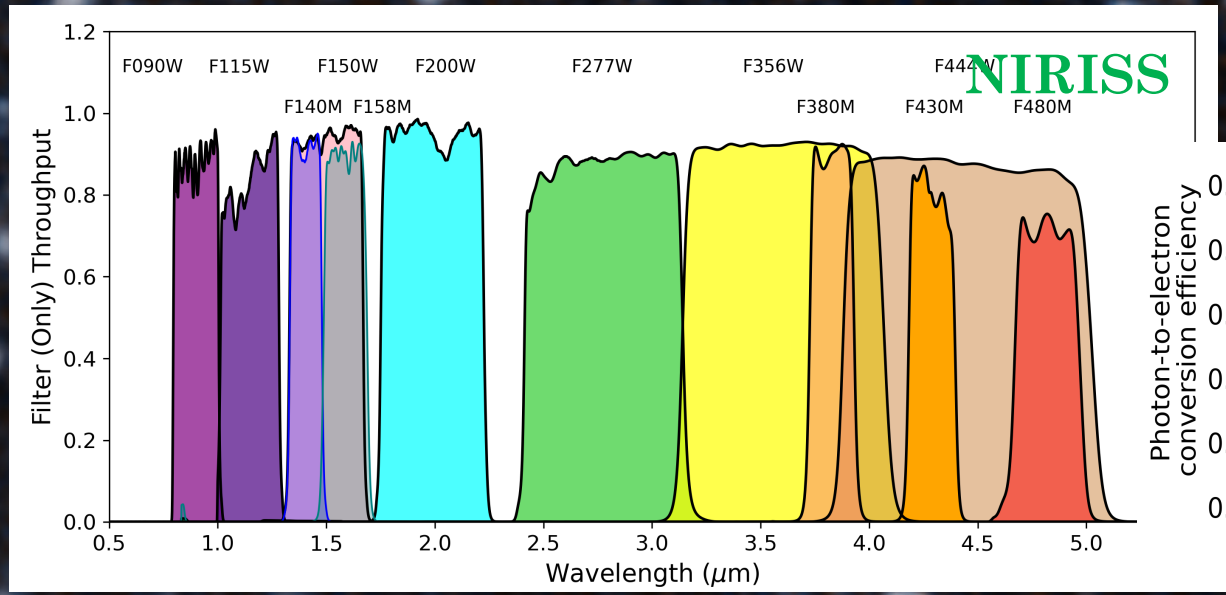
(Credit: Spitzer: NASA/JPL-Caltech; MIRI:

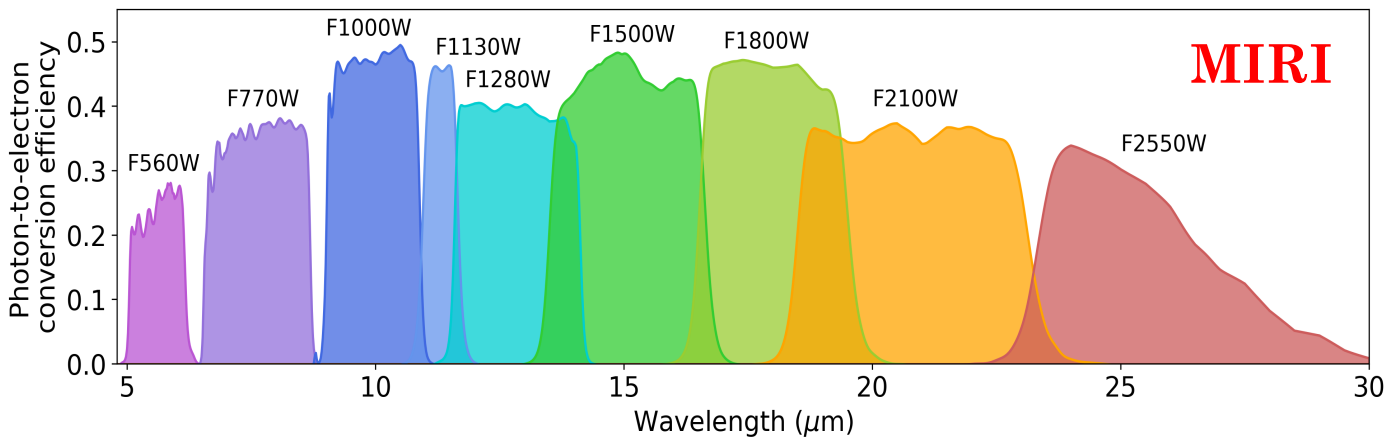
JWST – Key aspects (II)



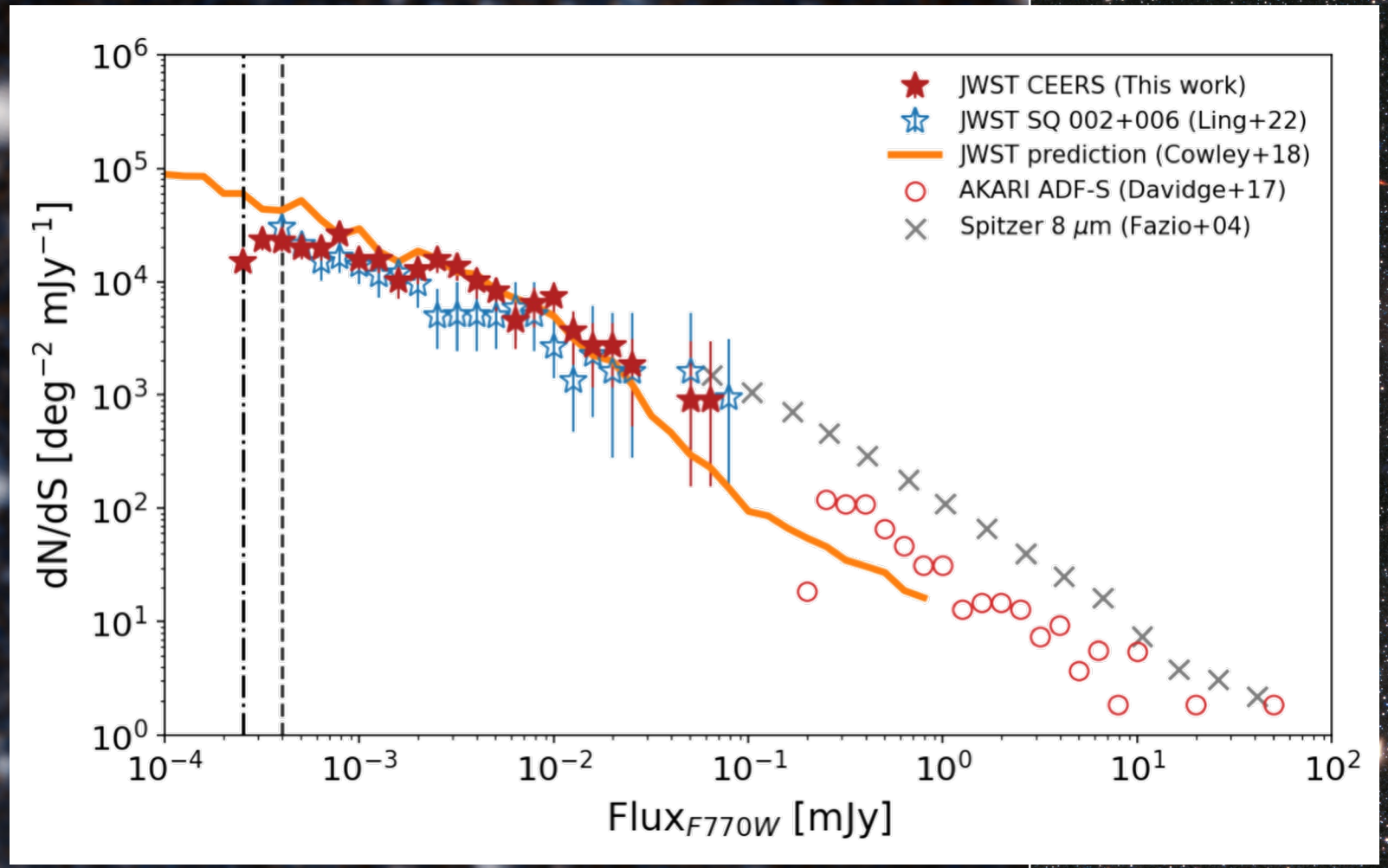


- **Spatial resolution;**
- **Wavelength coverage;**





JWST – Key aspects (II)



Credit: NASA, PID: 1334

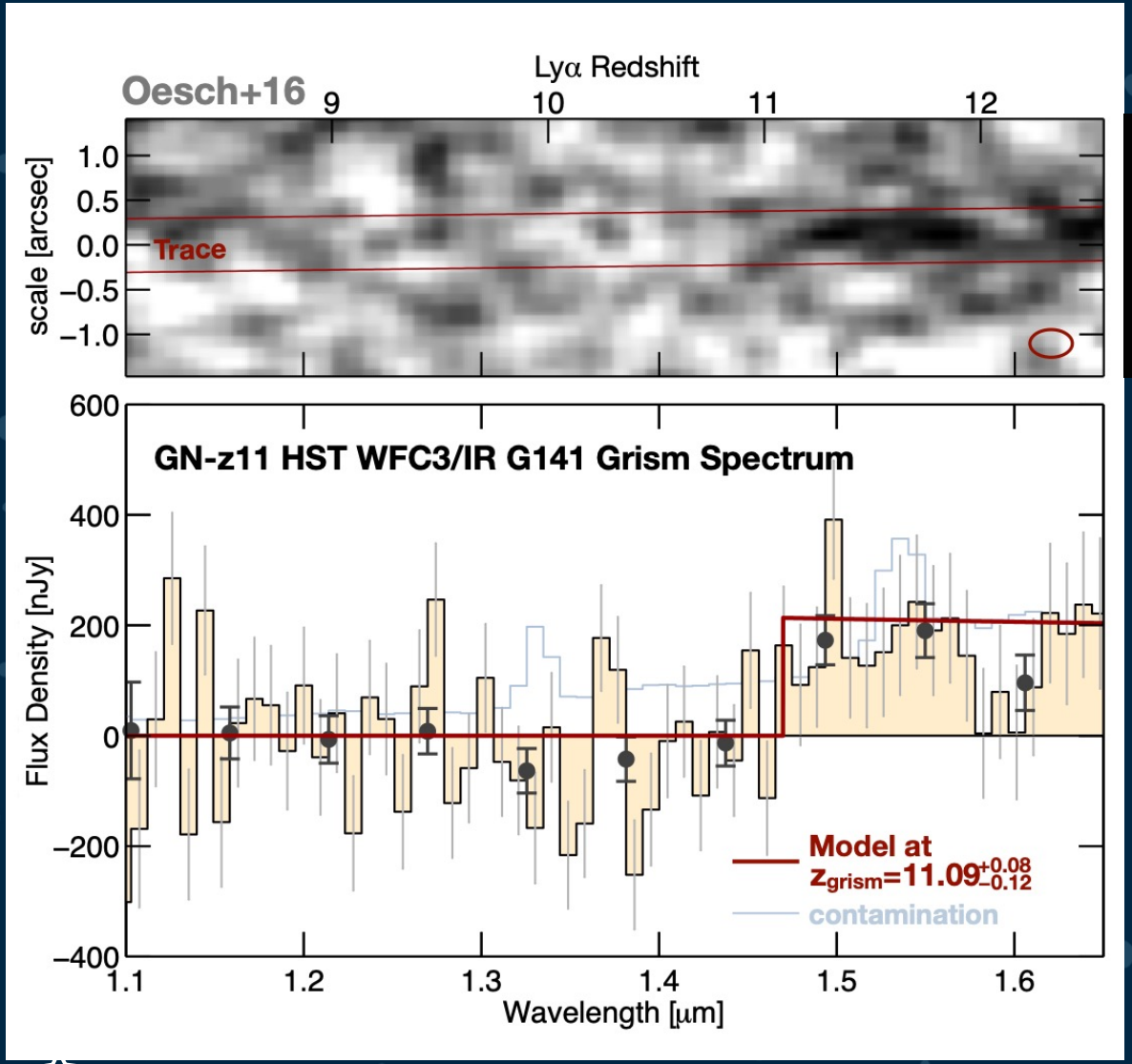
- **Spatial resolution;**
- **Wavelength coverage;**
- **Depth.**

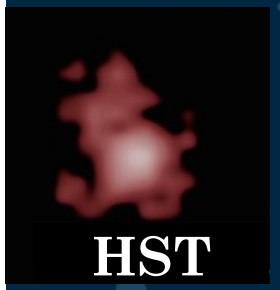
Spitzer IRAC

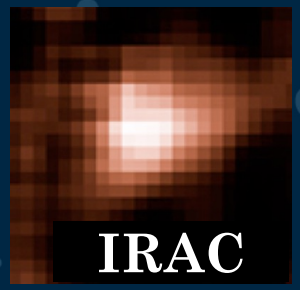
Webb NIRCam

JWST – Galaxy evolution

GN-z11: z ~ 11

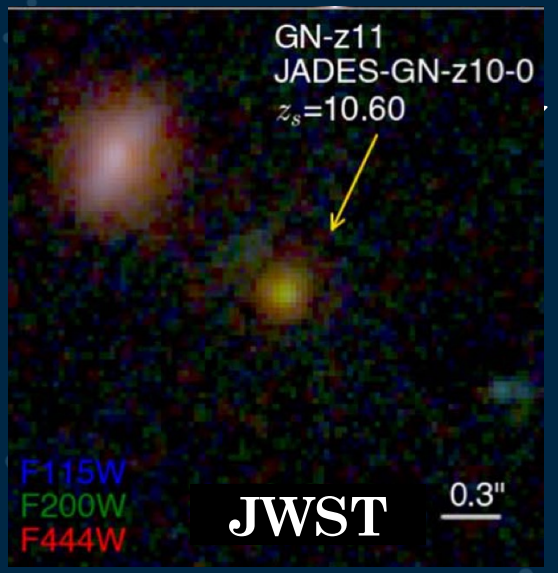




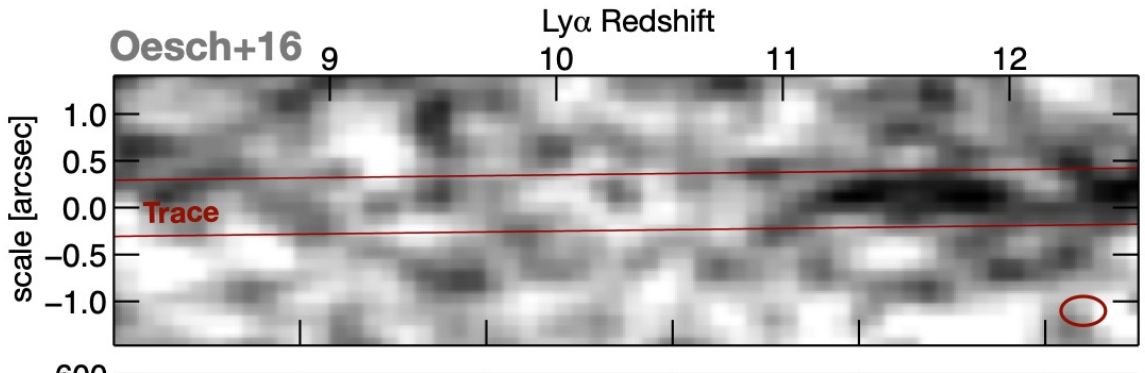


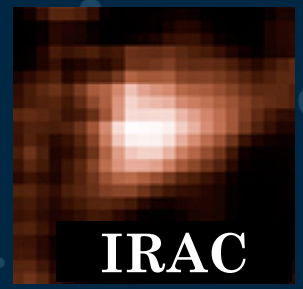
JWST – Galaxy evolution

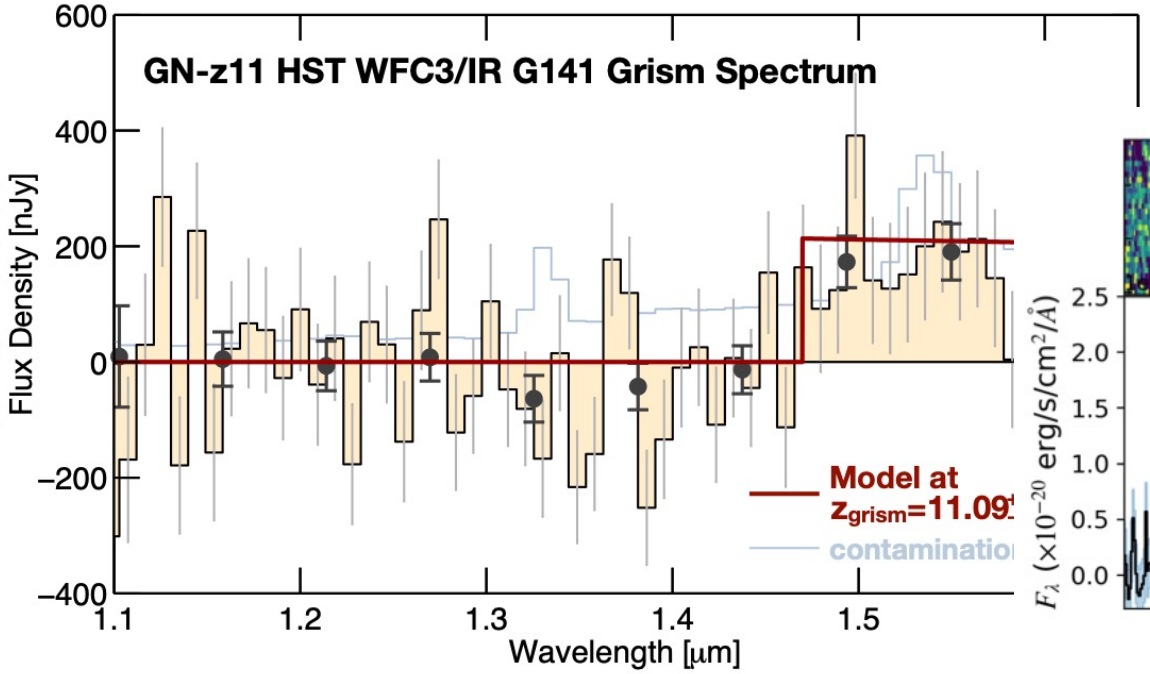
GN-z11: z ~ 11

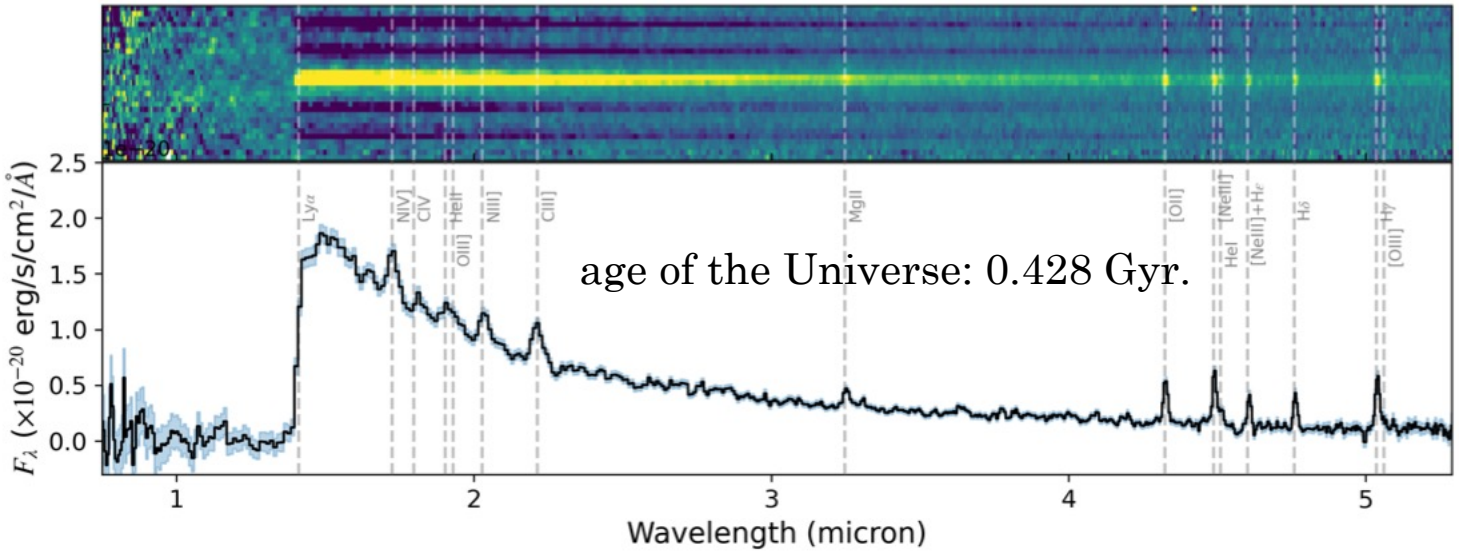


Tacchella et al. 2023



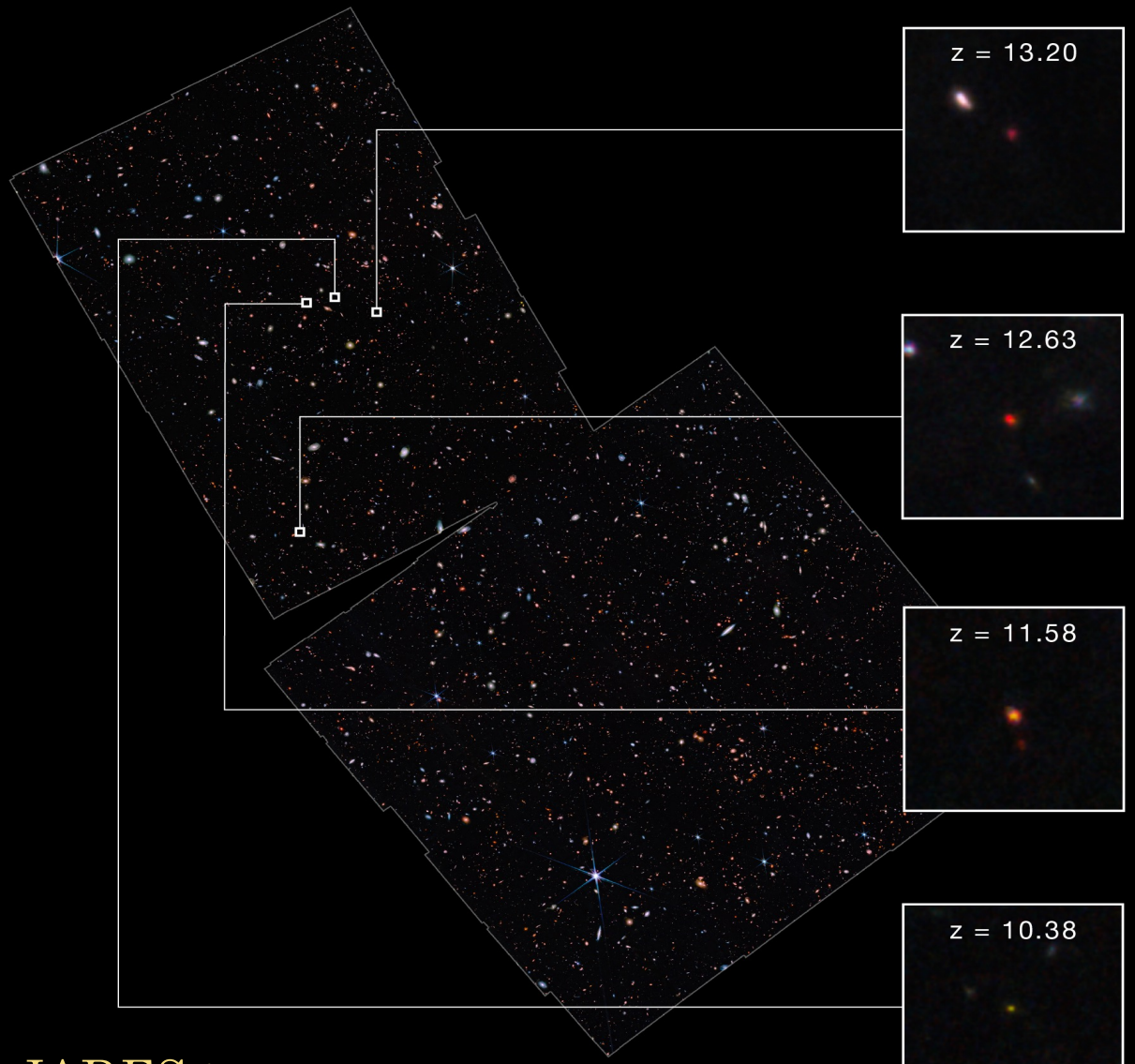






Bunker et al. 2023

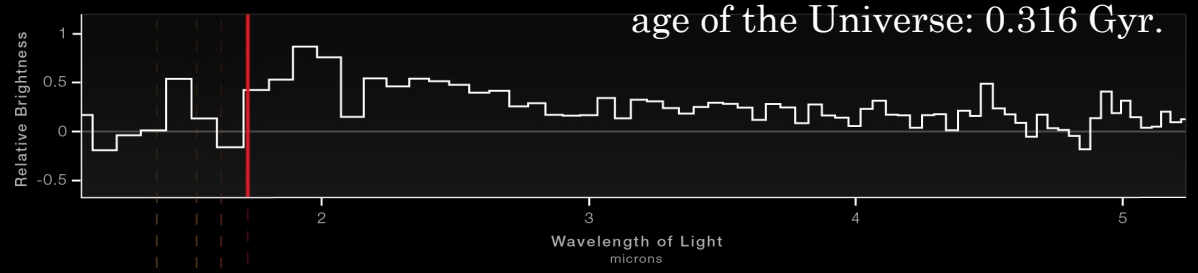
JWST – Galaxy evolution

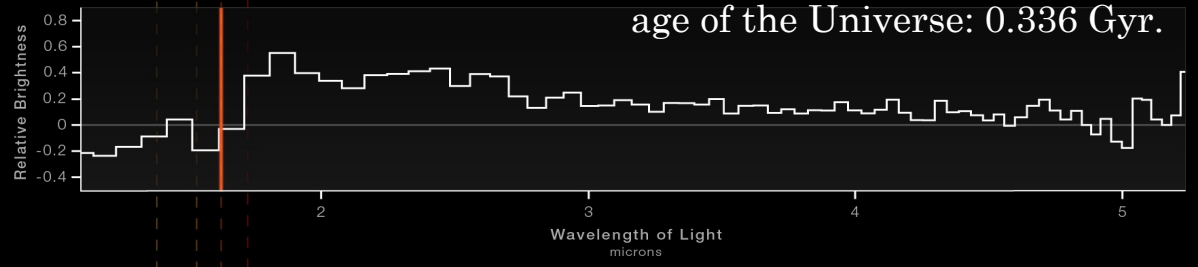


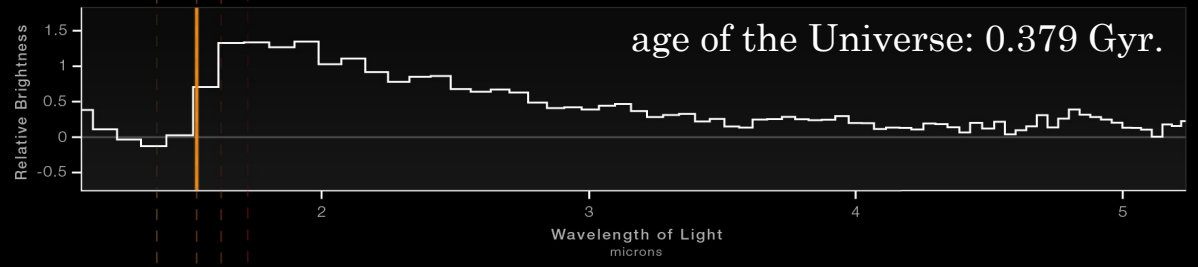
JADES team

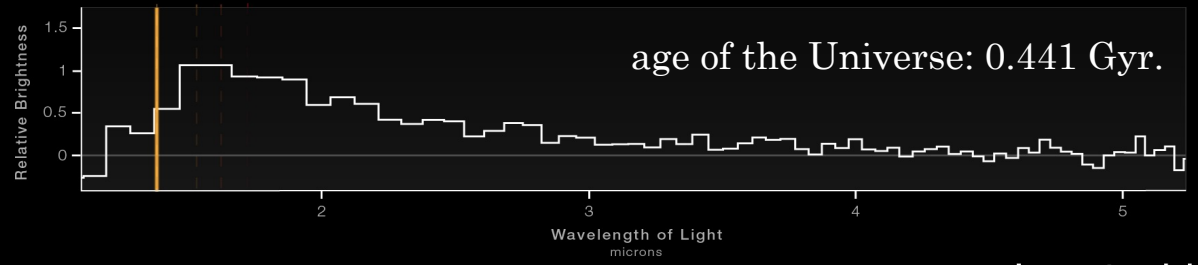
Highest redshift

Lyman break









Lowest redshift

MIDIS: MIRI Deep Imaging Survey

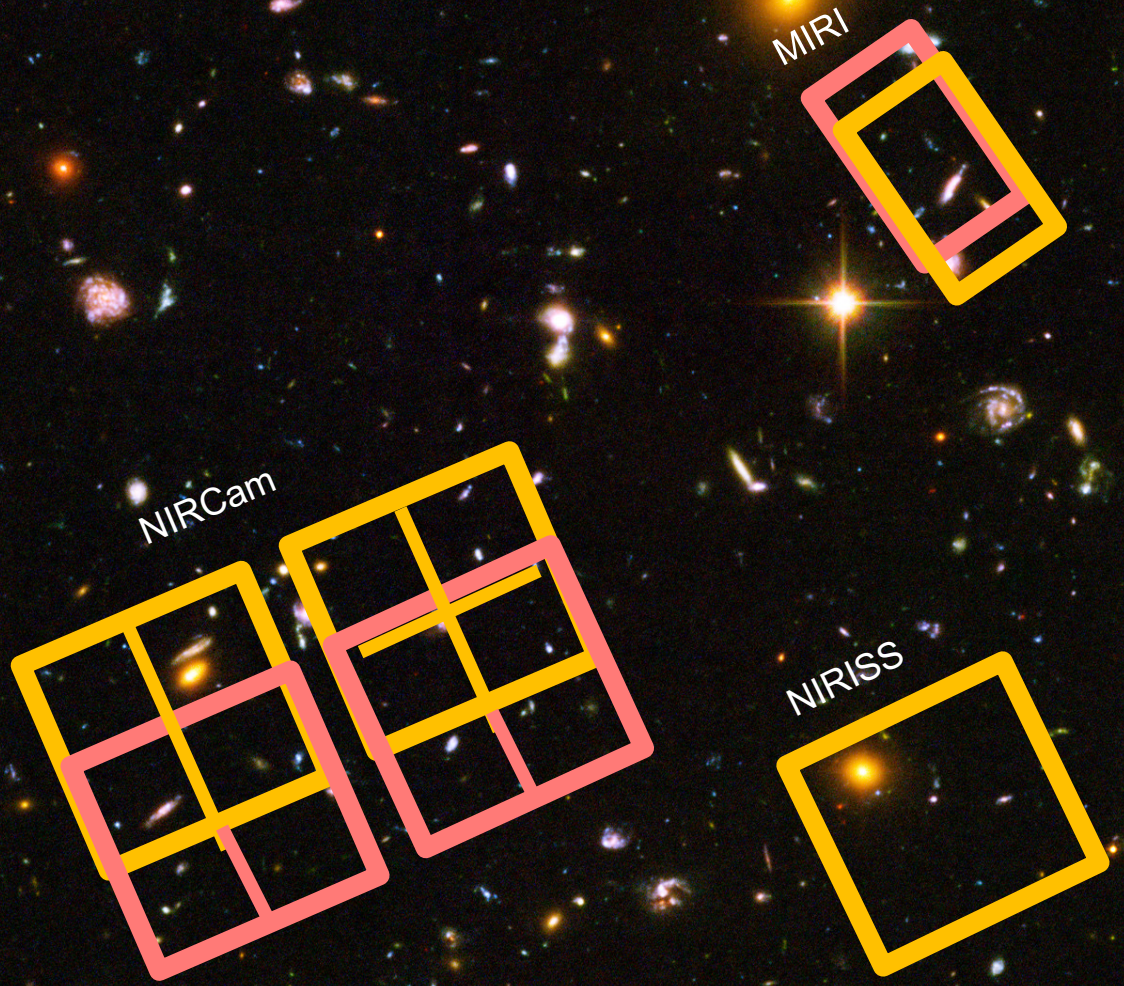
MIRI GTO program (PID: 1823;PI: G. Öestlin & L. Colina)

Target of the principal MIRI pointing: Hubble Ultra Deep field (**HUDF,** Illingworth+13**)**;

Deepest image of the Universe at 5.6 μm, ~60 hours of total time carried out in December 2022.

NIRCam parallel pointing: 40 hrs;

NIRISS parallel pointing: 20hrs;



HUDF seen by Hubble, Credit:NASA, ESA, and S. Beckwith (STScI) and the HUDF Team

MIDIS: MIRI Deep Imaging Survey

MIRI GTO program (PID: 1823;PI: G. Öestlin & L. Colina)

Madrid - CAB

Groninghen

Stockholm

Heidelberg

Copenhagen

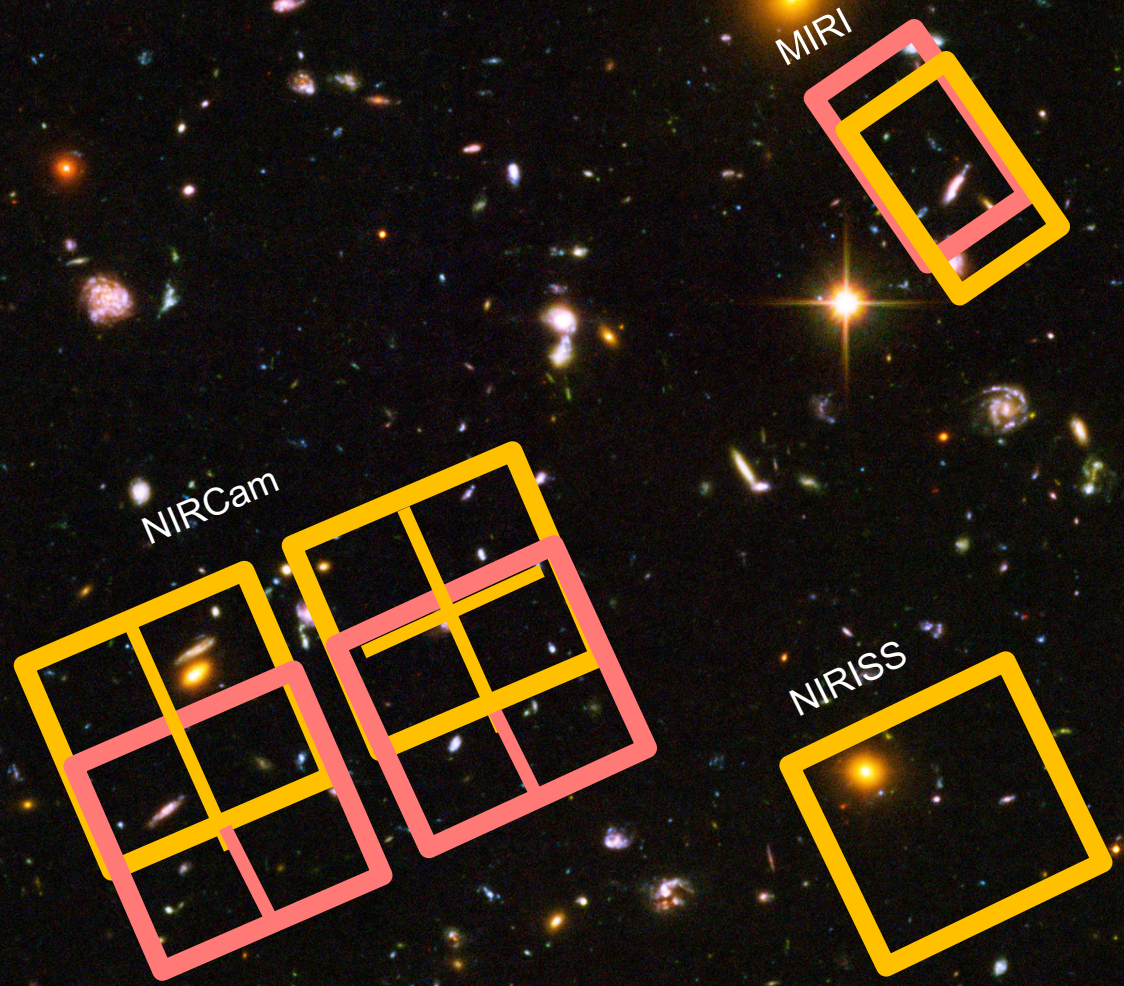
Marseille

MIDIS: MIRI Deep Imaging Survey

MIRI GTO program (PID: 1823;PI: G. Öestlin & L. Colina)

Main objectives:

- Discover and characterization of high-z galaxies;
- Characterization of galaxies at the epoch of reionization;
- Detailed analysis of ‘lower’ redsfhit galaxies (2<z<4).



HUDF seen by Hubble, Credit:NASA, ESA, and S. Beckwith (STScI) and the HUDF Team