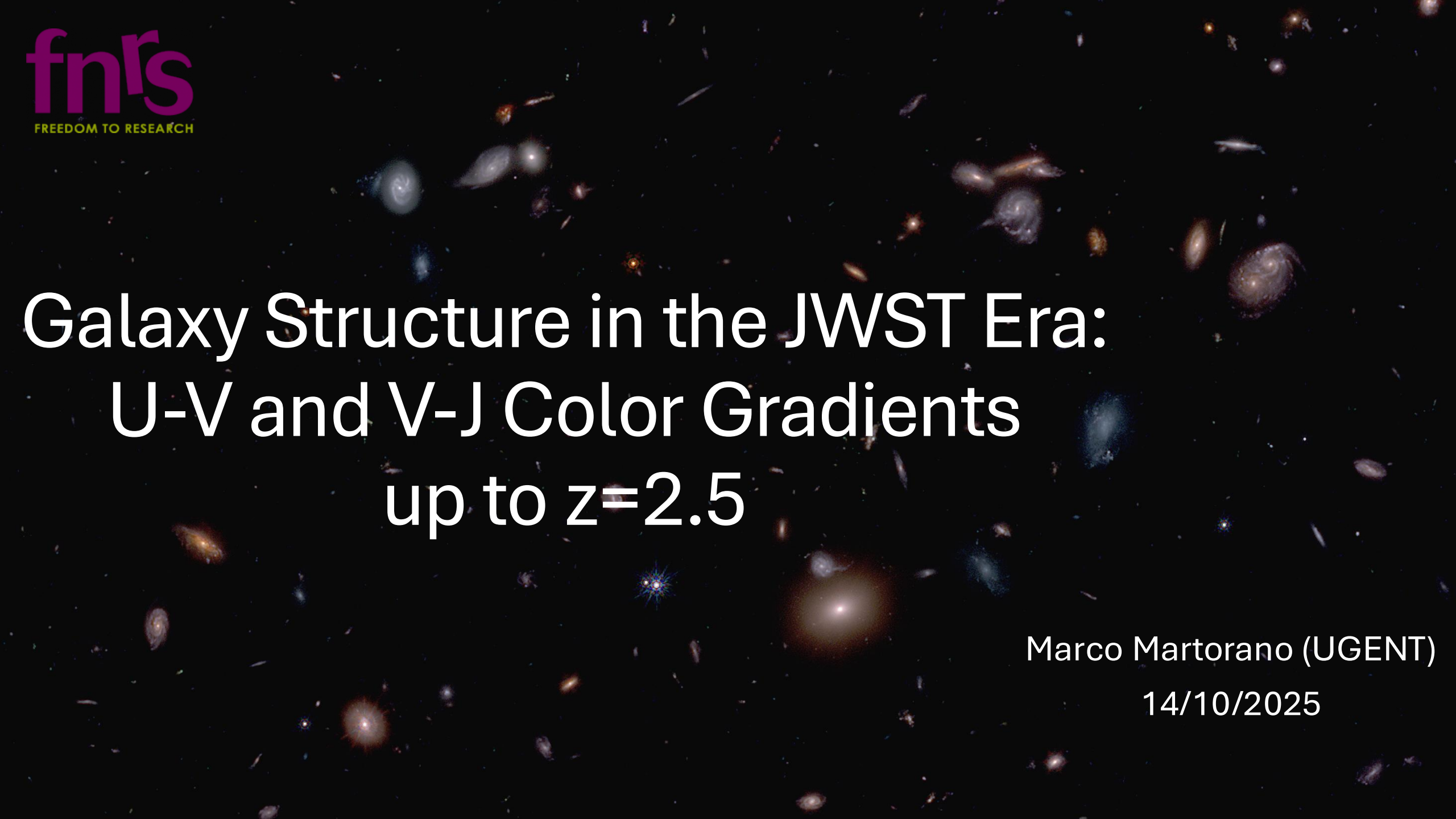
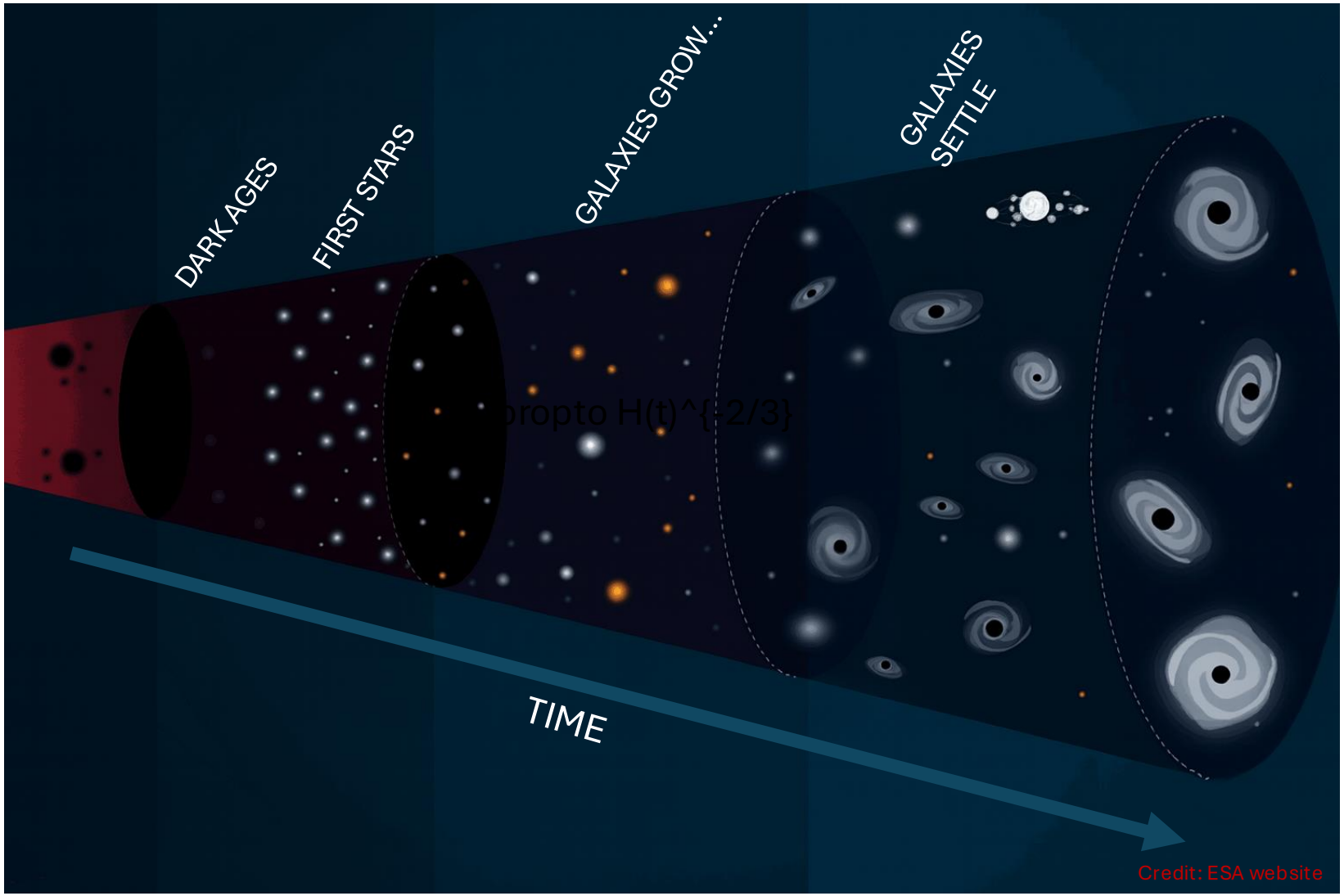


# Galaxy Structure in the JWST Era: U-V and V-J Color Gradients up to z=2.5

Marco Martorano (UGENT)

14/10/2025

# THE EVOLUTION OF GALAXIES



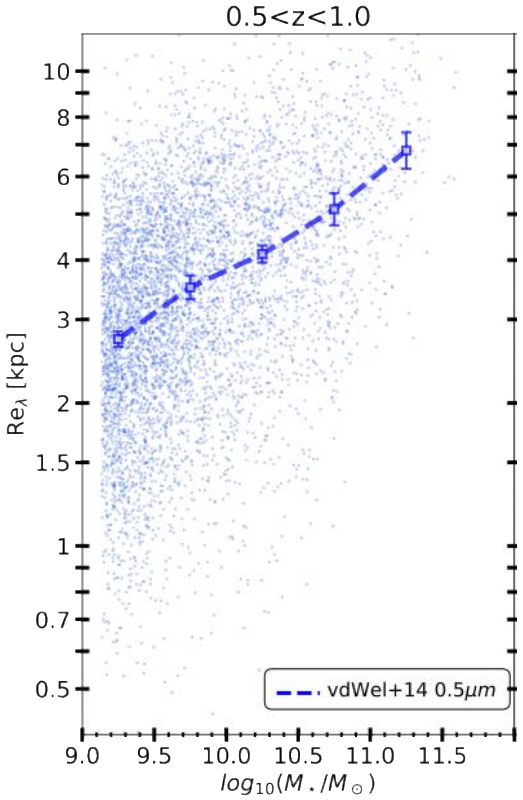

What does cosmology tell us?

$$\mathrm{dlog}(R) \propto 0.2\mathrm{dlog}(\mathrm{M}_\star)$$

Galaxy's size

Galaxy's stellar mass

# DO OBSERVATIONS CONFIRM THIS MODEL?



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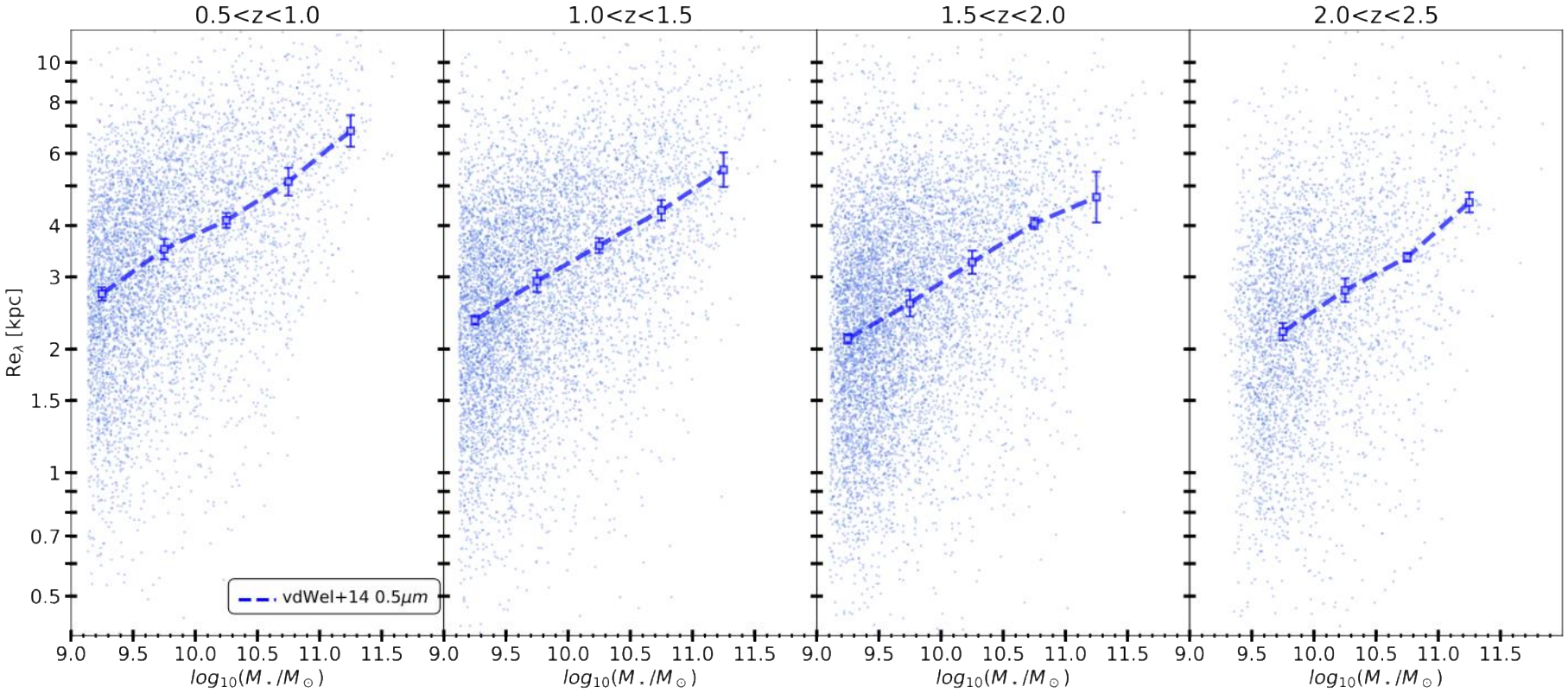
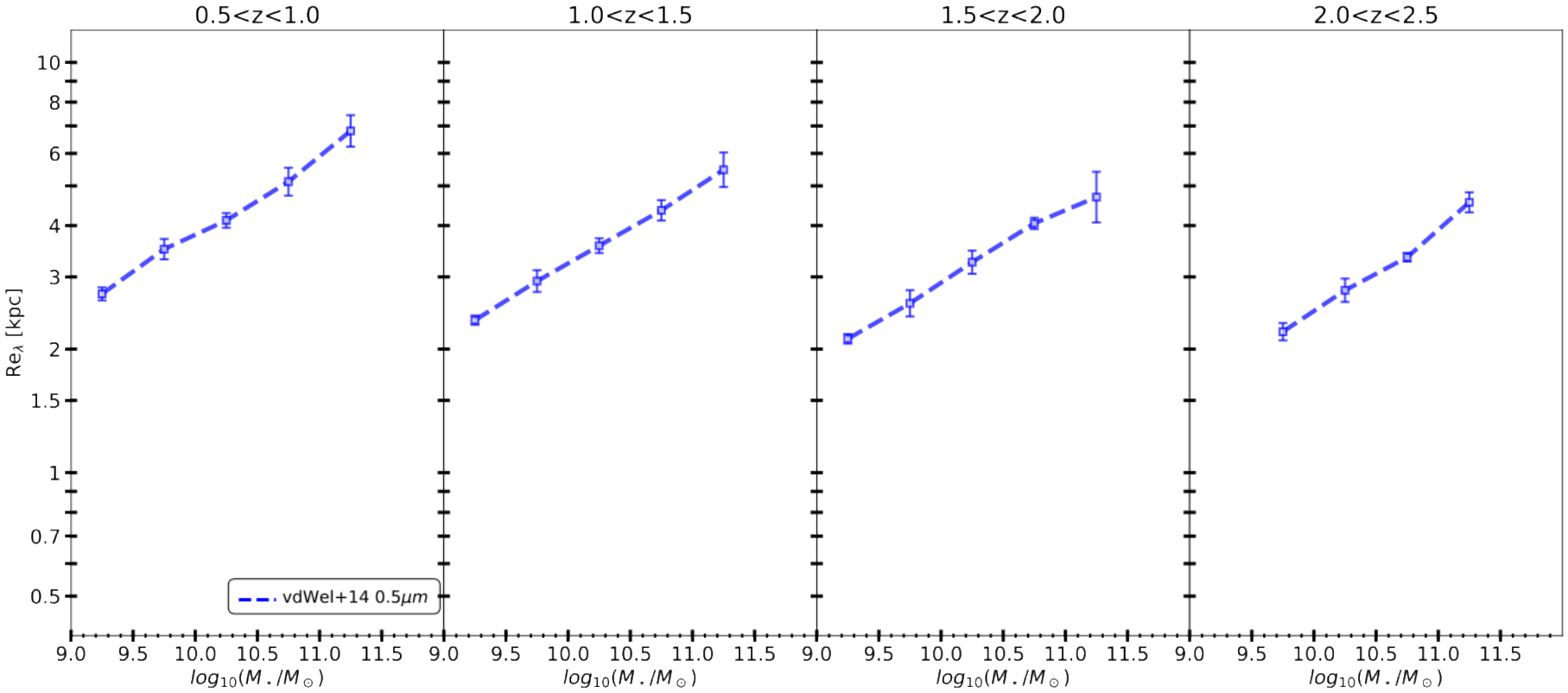



For a fixed redshift, sizes perfectly follow the model!

$$\mathrm{dlog}(\mathrm{R}_{0.5\mu\mathrm{m}}) \propto 0.2\mathrm{dlog}(\mathrm{M}_\star)$$

# DO OBSERVATIONS CONFIRM THIS MODEL?




$$d\log(R_{0.5\mu m}) \propto 0.2 d\log(M_\star)$$

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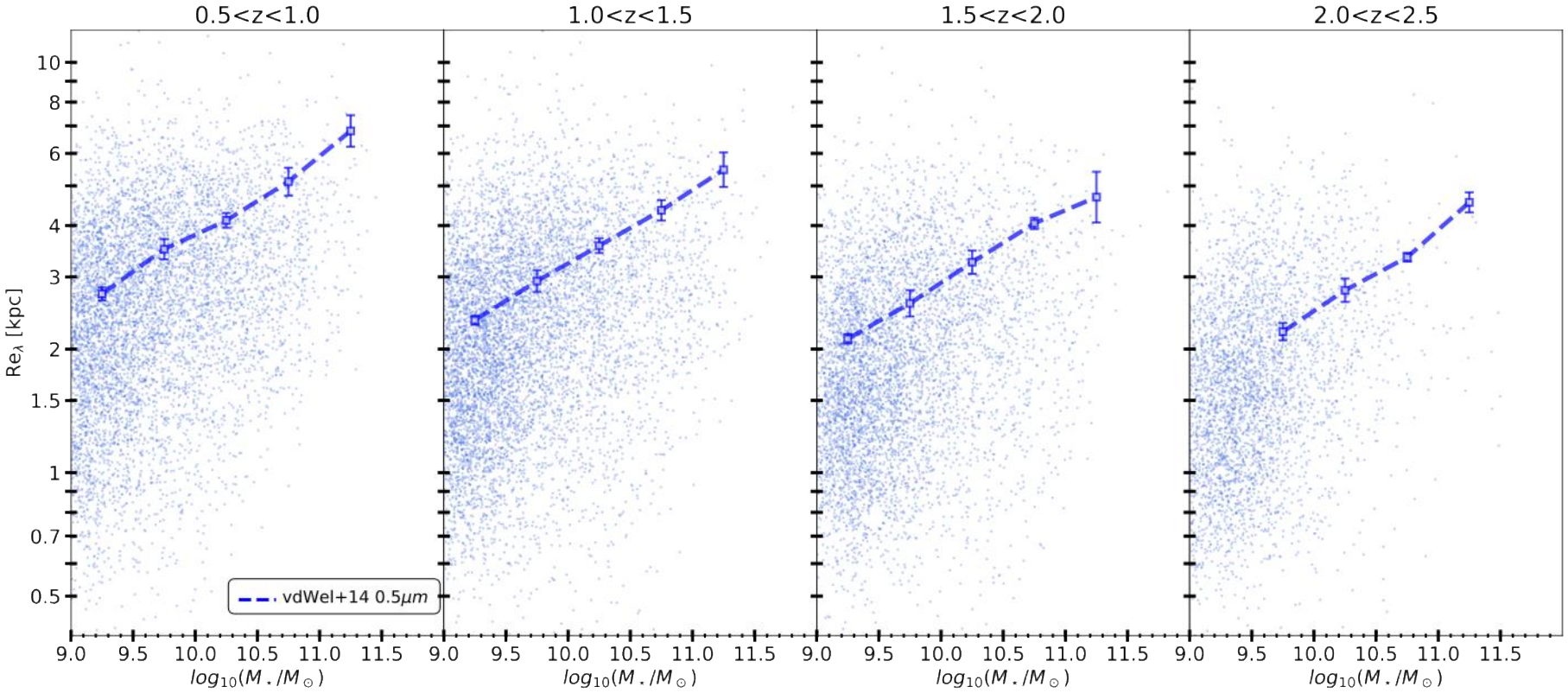


$$\mathrm{dlog}(\mathrm{R}_{0.5\mu\mathrm{m}}) \propto 0.2\mathrm{dlog}(\mathrm{M}_\star)$$

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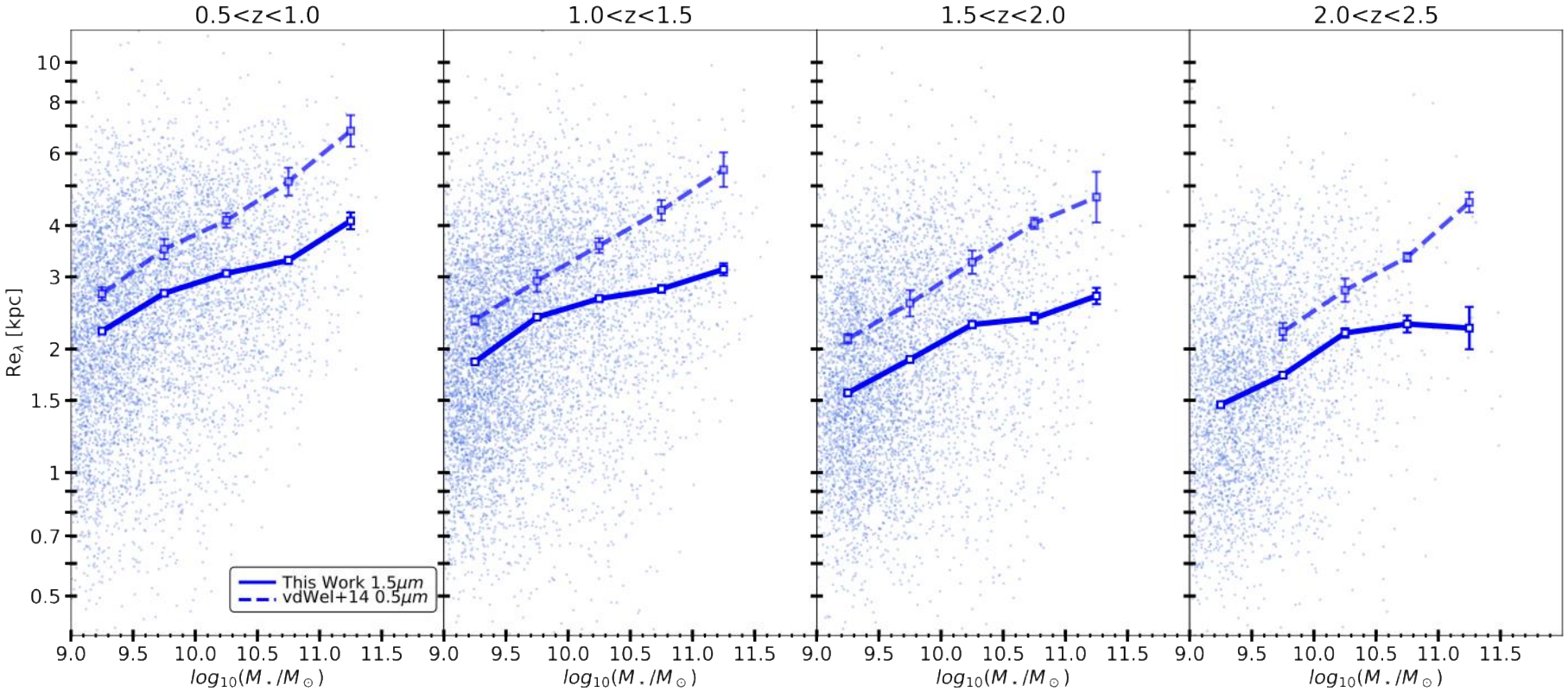


The relation is NOT preserved in the near-IR!

~~$\mathrm{dlog}(\mathrm{R}_{1.5\mu\mathrm{m}}) \propto 0.2\mathrm{dlog}(\mathrm{M}_\star)$~~

$\mathrm{dlog}(\mathrm{R}_{0.5\mu\mathrm{m}}) \propto 0.2\mathrm{dlog}(\mathrm{M}_\star)$

# WHY JWST IS SO IMPORTANT?

ULTRAVIOLET OPTICAL NEAR-IR

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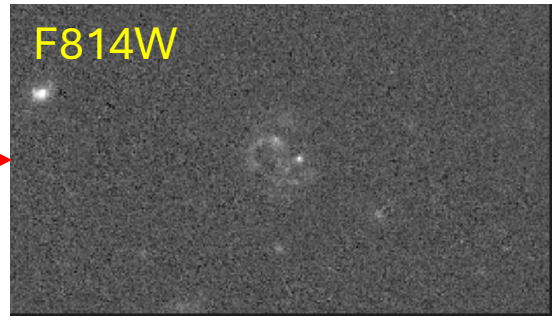
**HUBBLE** →

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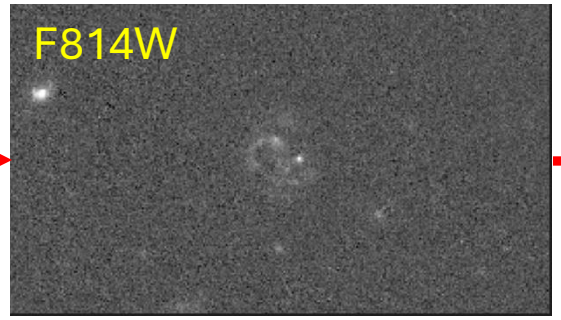
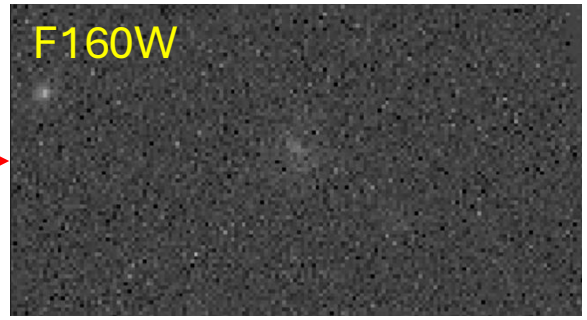



→

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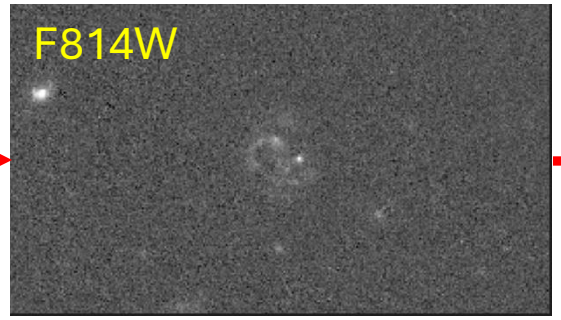
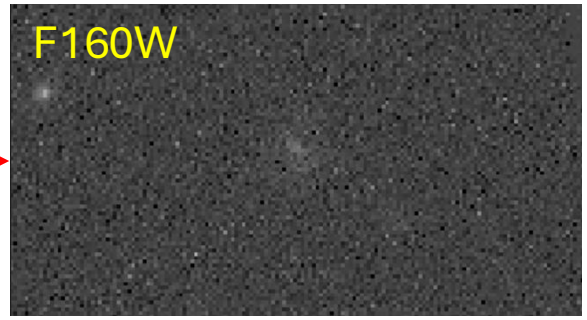
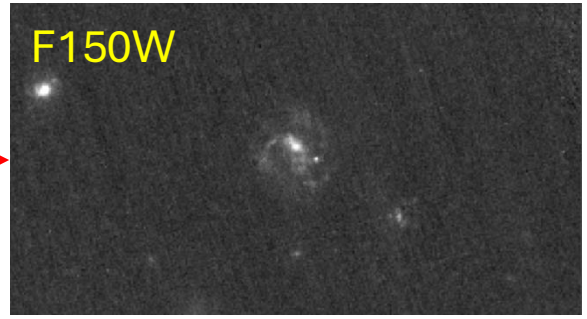



**JAMES WEBB**

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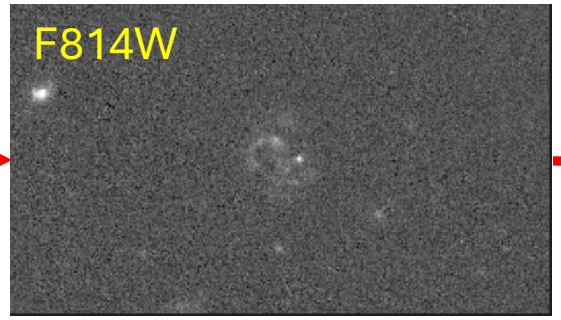


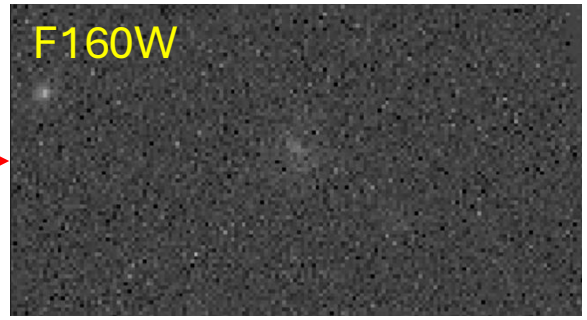


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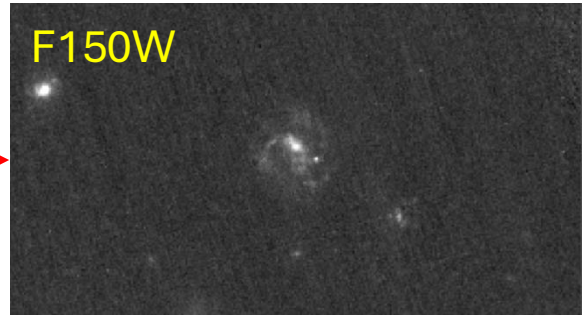
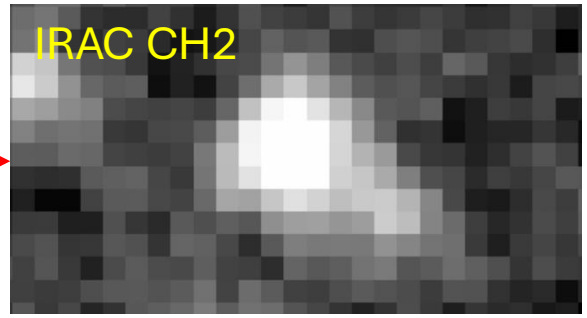



SPITZER

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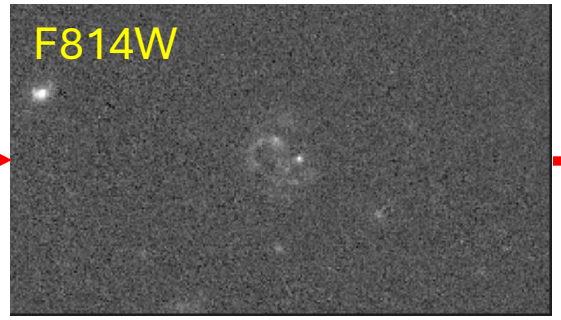


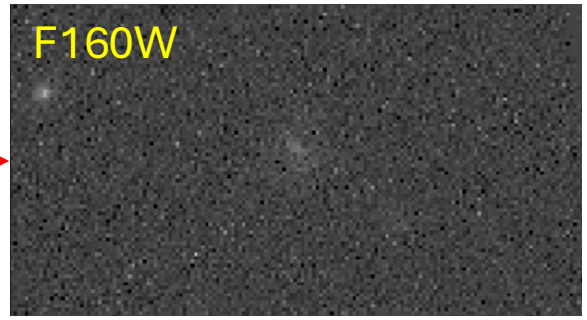


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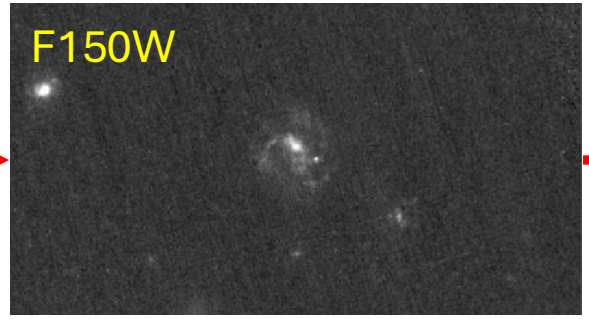


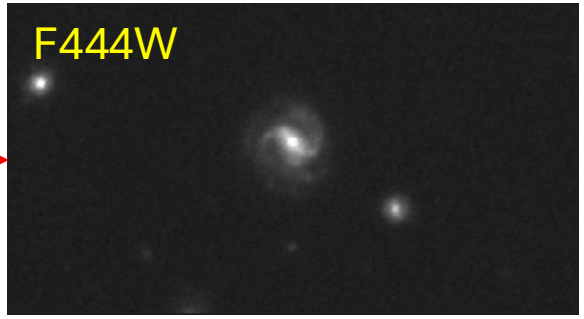


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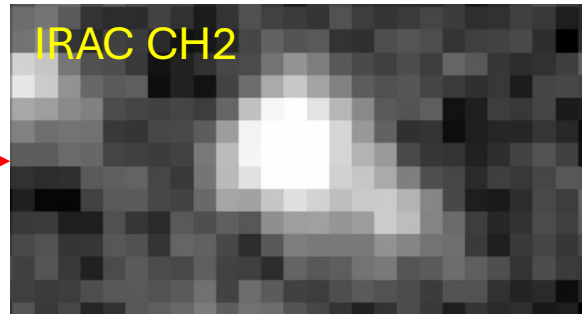


ULTRAVIOLET OPTICAL NEAR-IR

# LET’S BUILD GALAXY IMAGES

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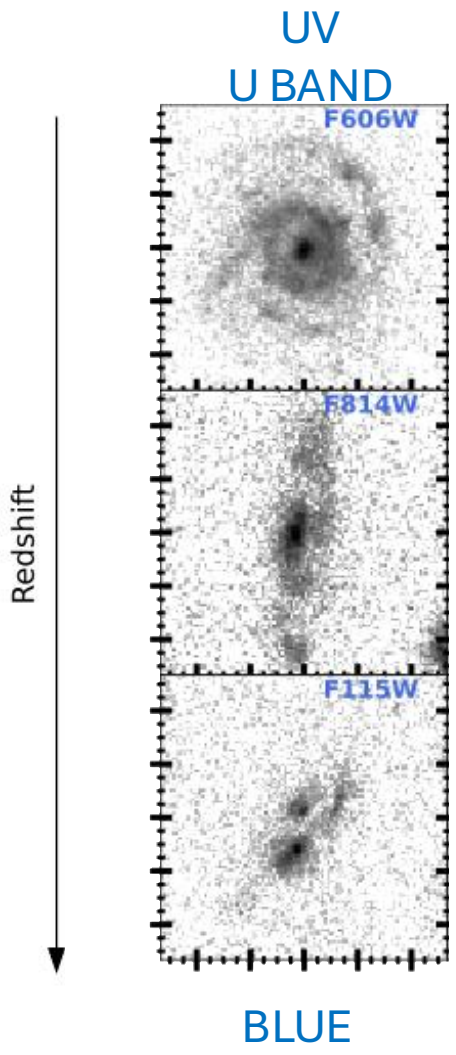


Light in the UV is dominated by star forming regions

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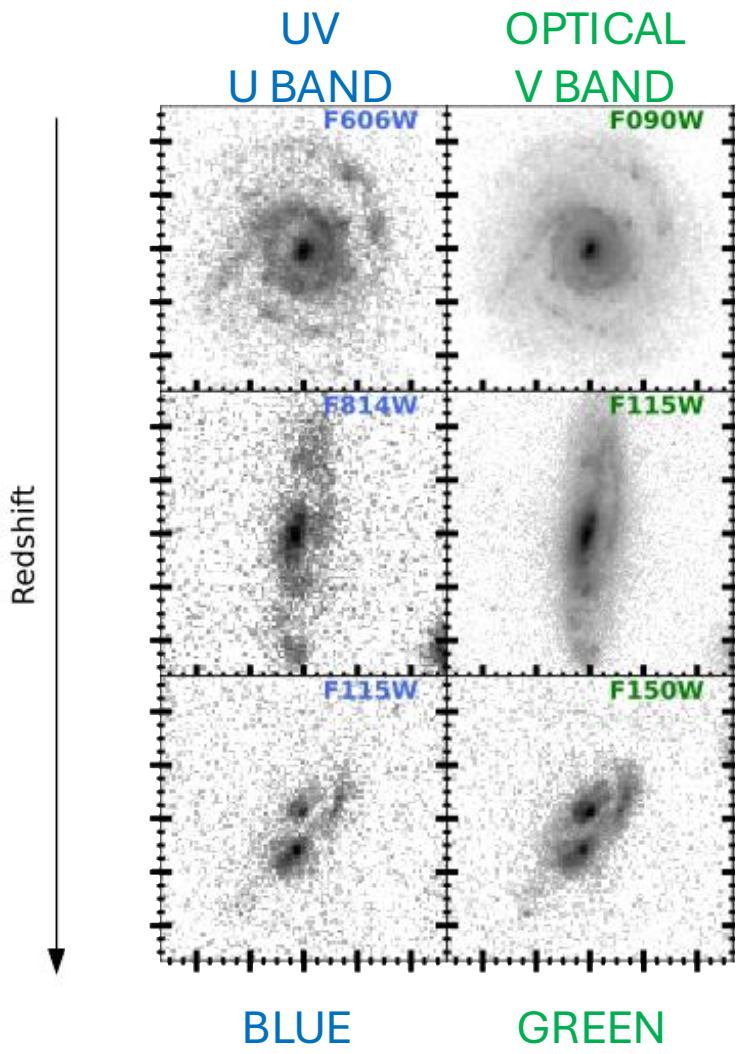


Light in the UV is dominated by star forming regions

Light in the optical reflects a combination of young and evolved populations

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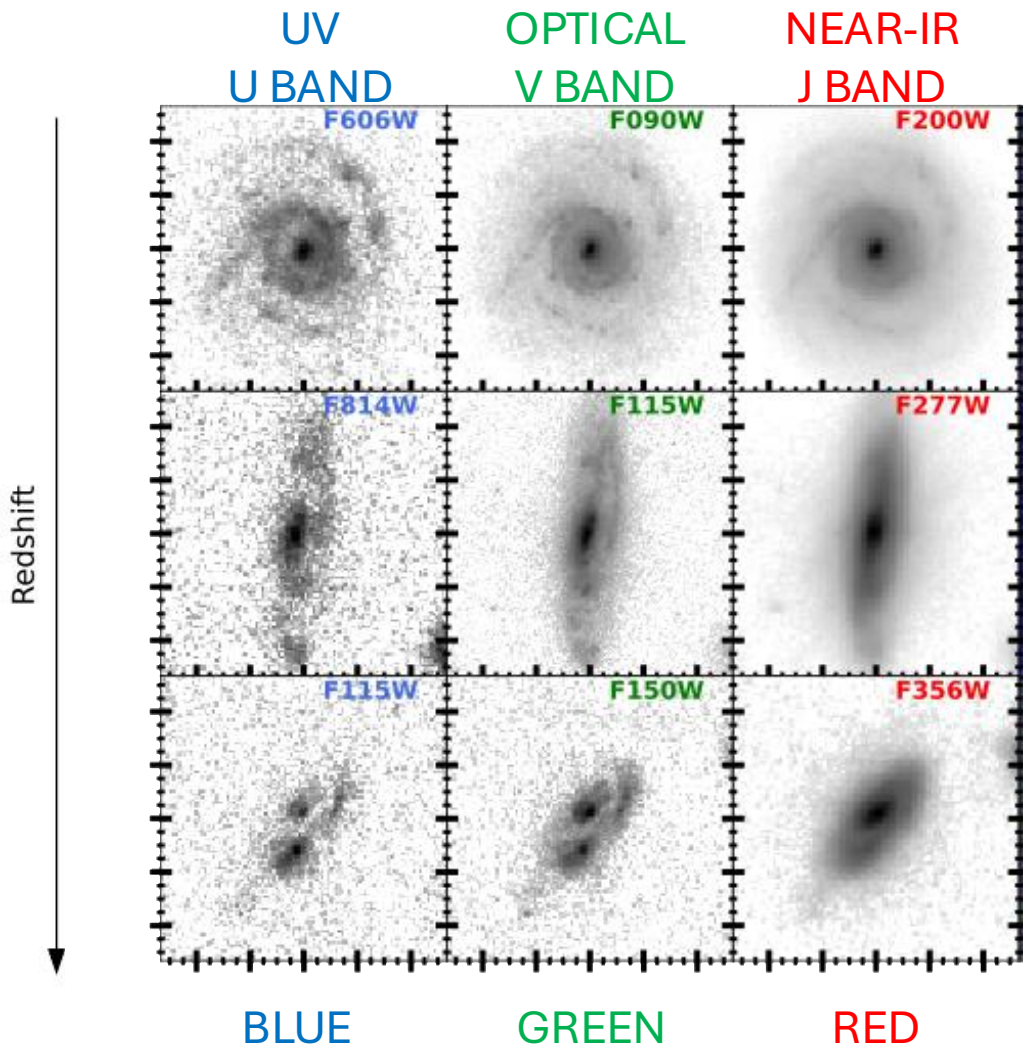


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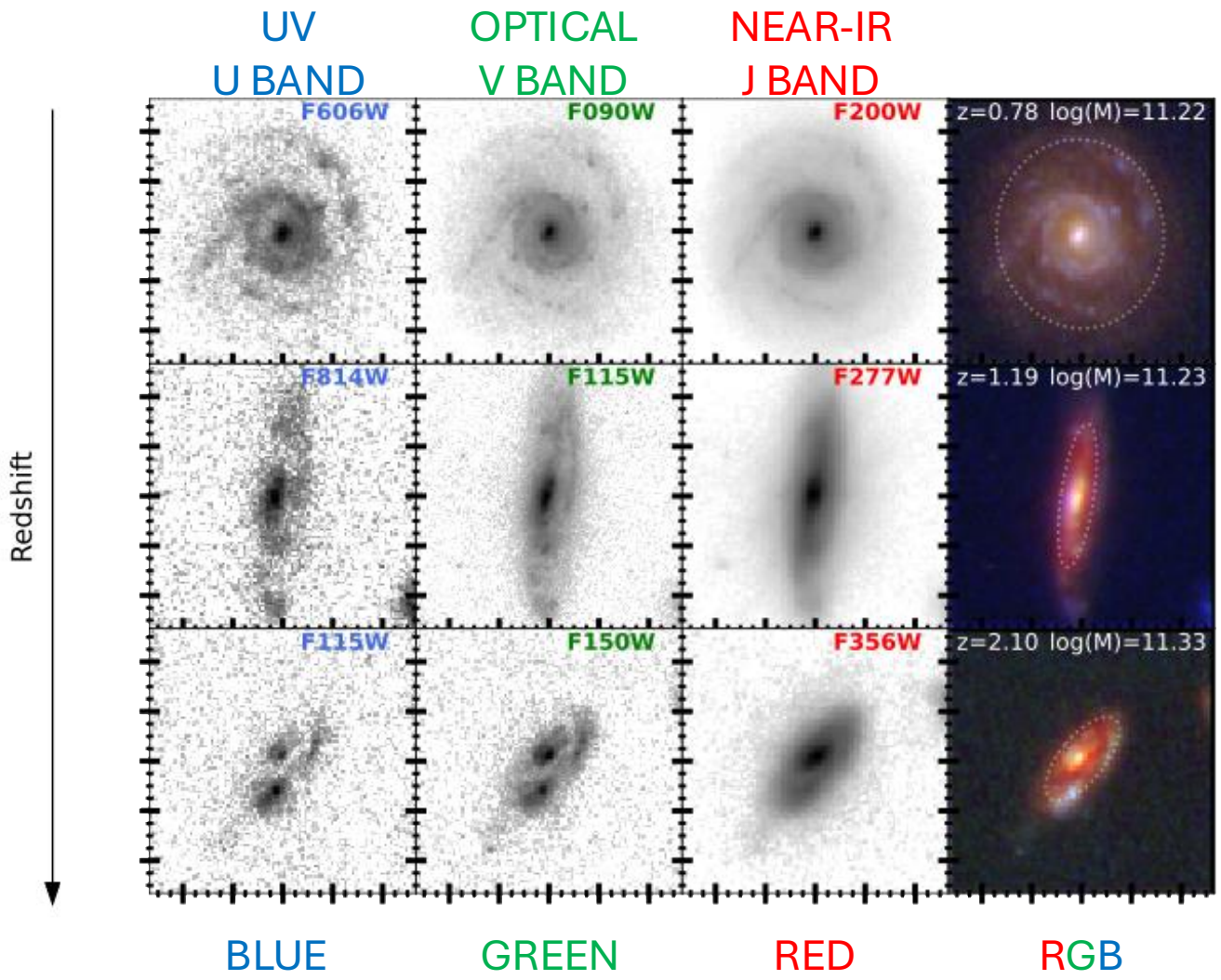


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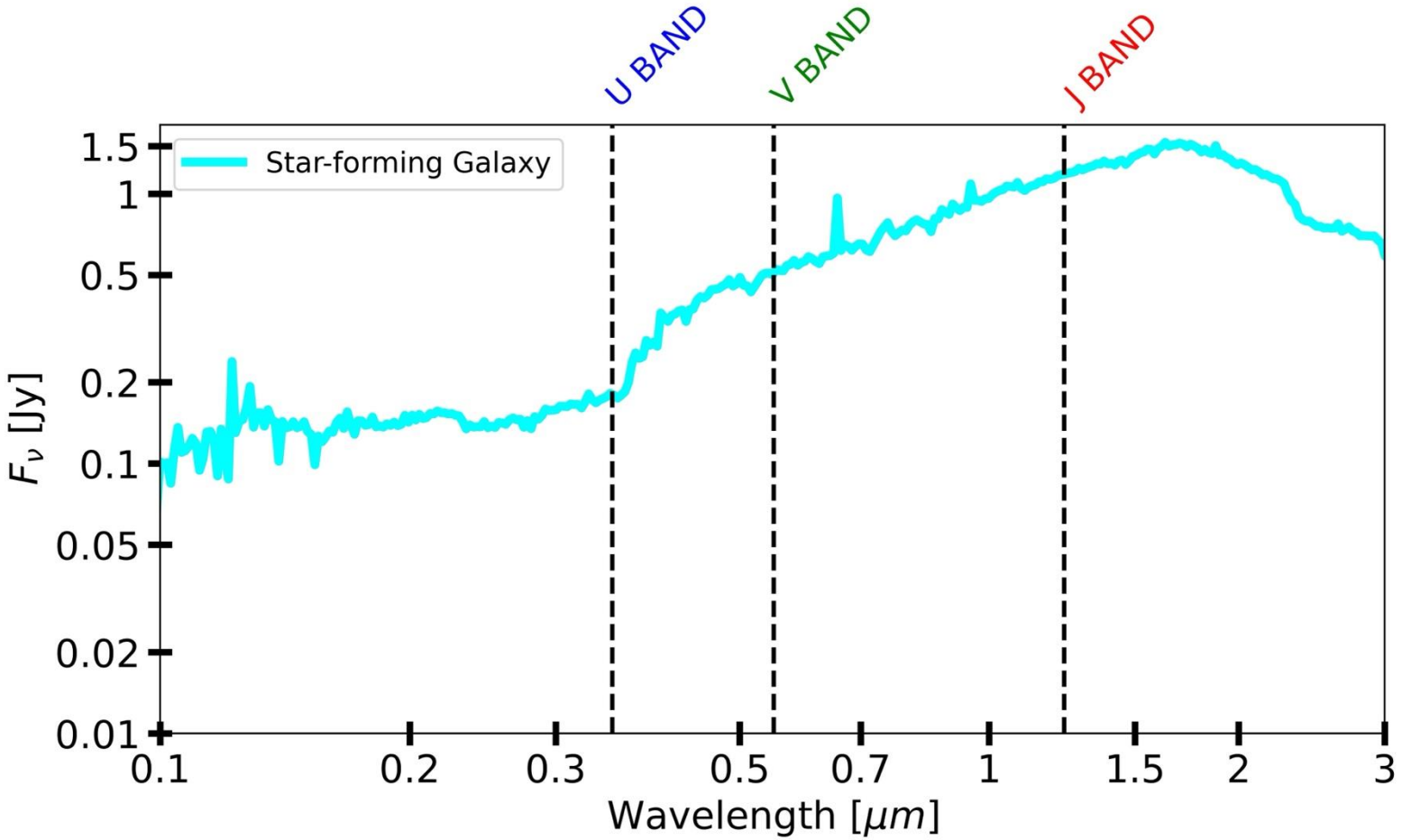

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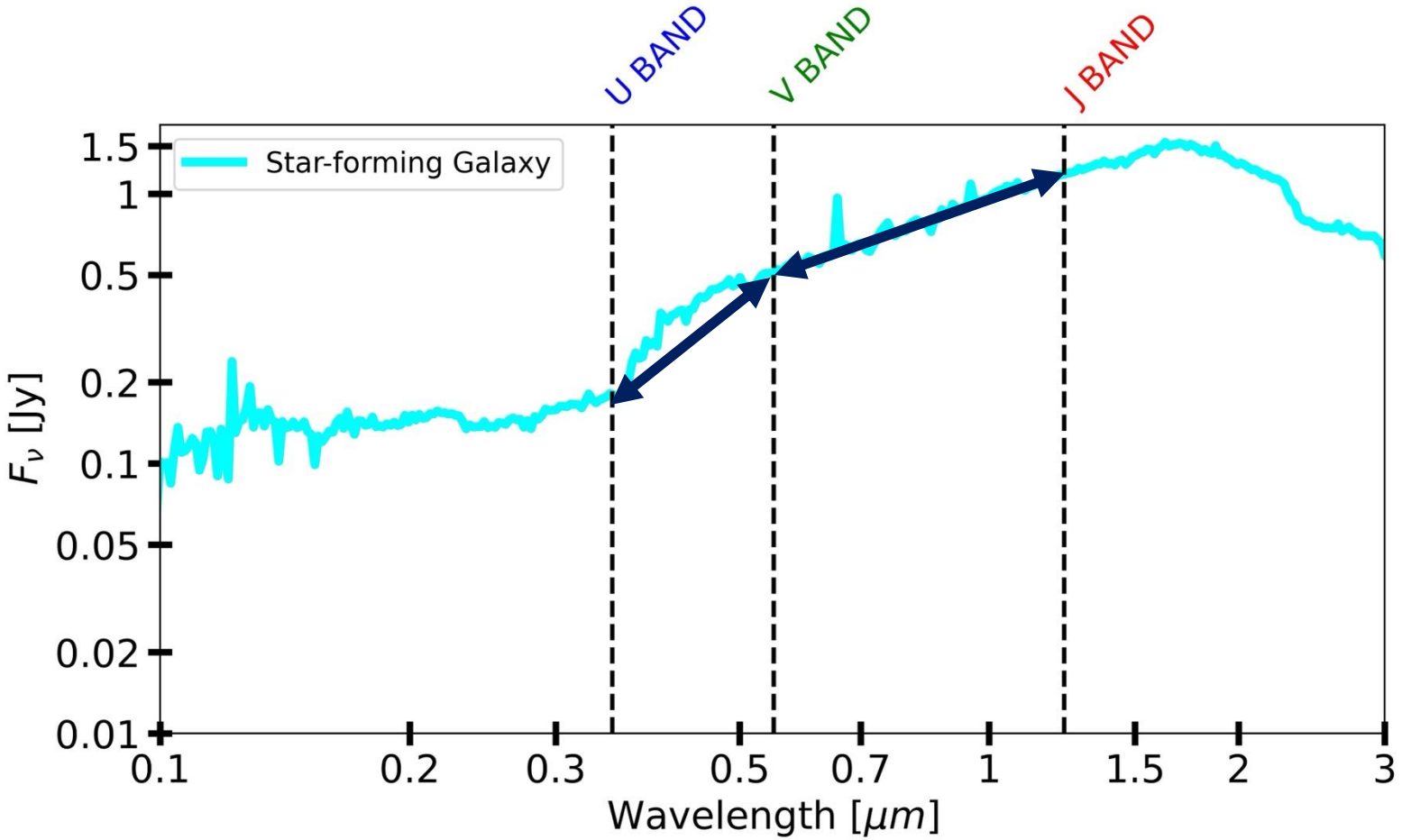


- **STAR-FORMING GALAXY**
  - MILD U-V
  - MILD V-J

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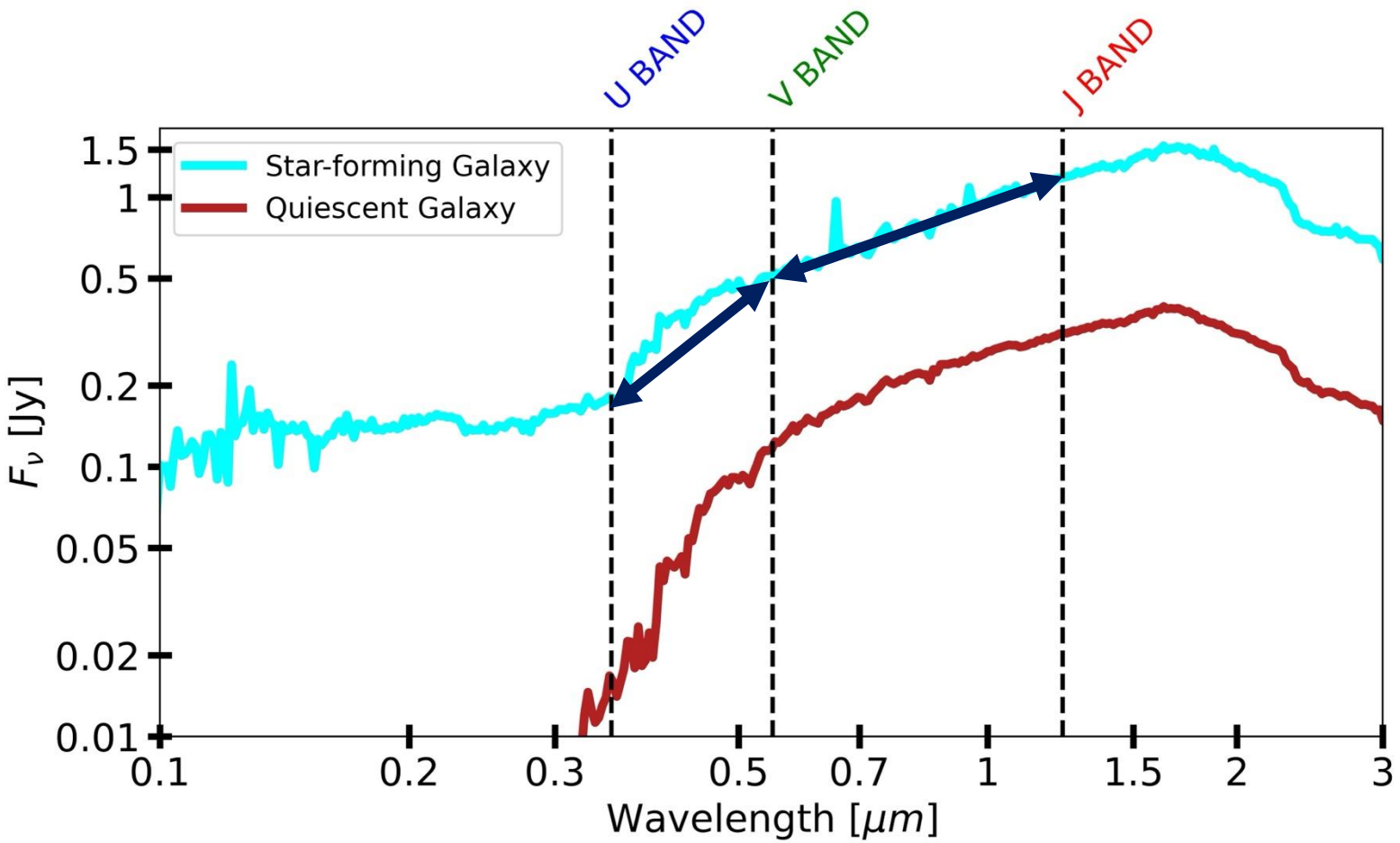


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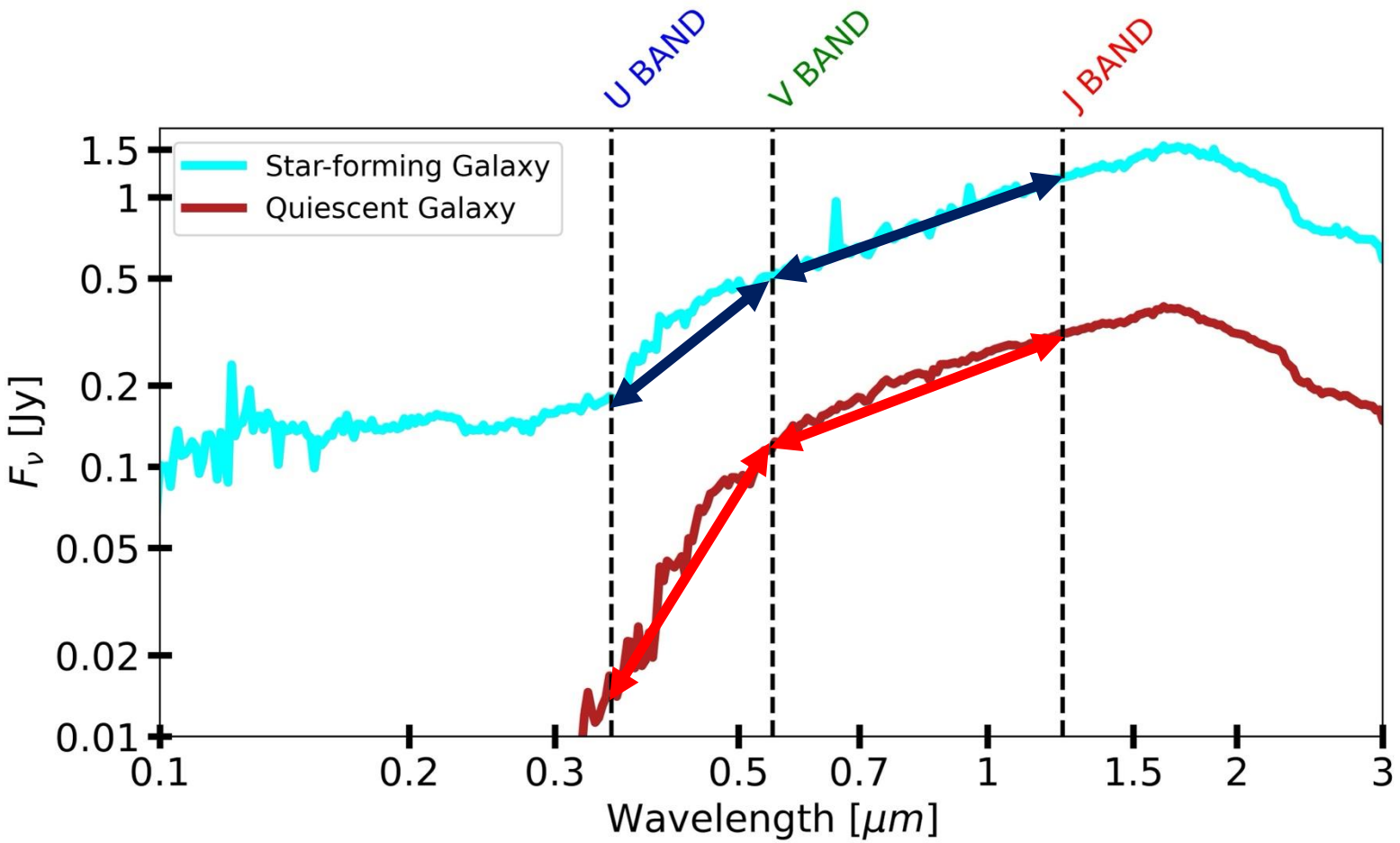


- **STAR-FORMING GALAXY**
  - MILD U-V
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- **QUIESCENT GALAXY**
  - STRONG U-V
  - MILD V-J

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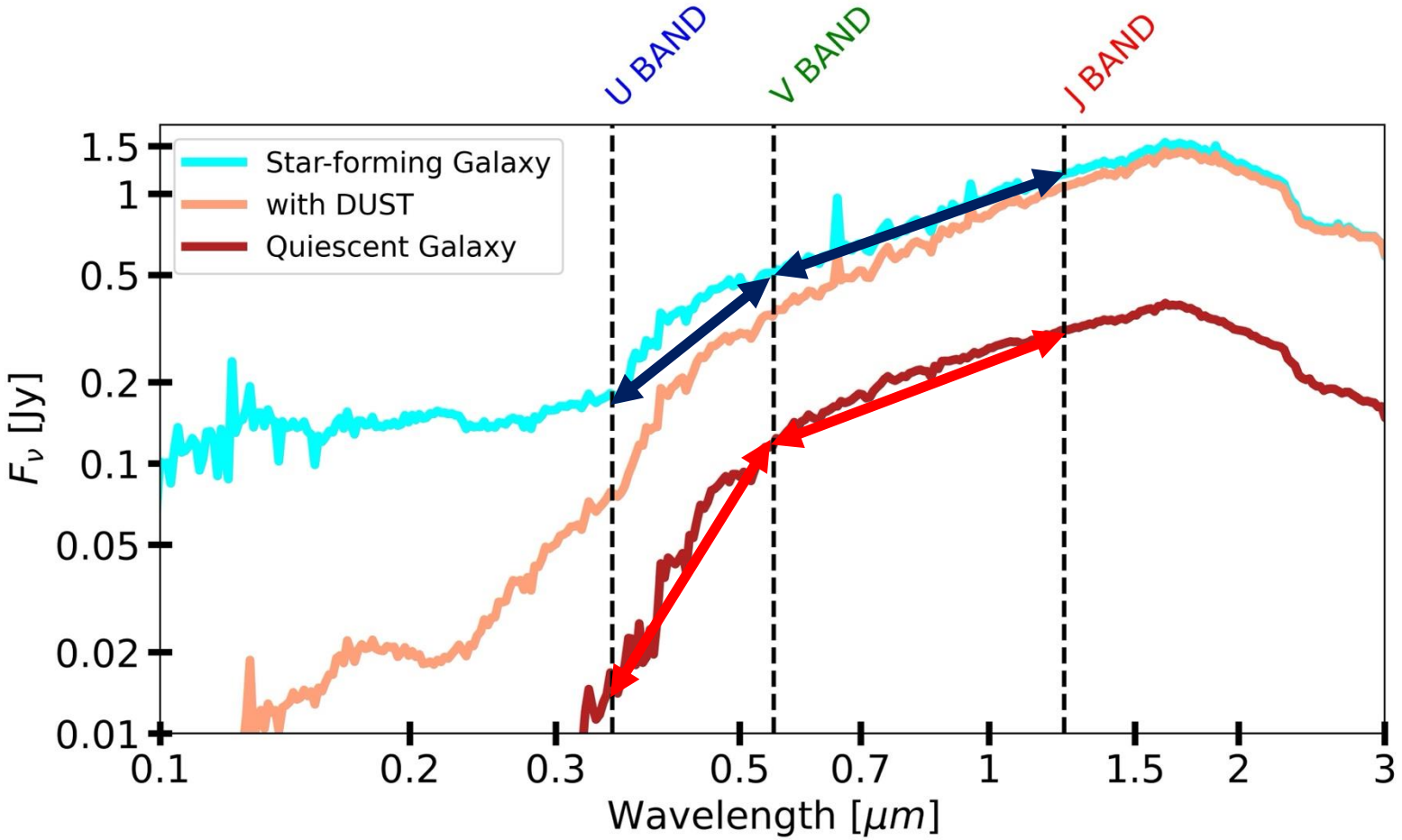


- **STAR-FORMING GALAXY**
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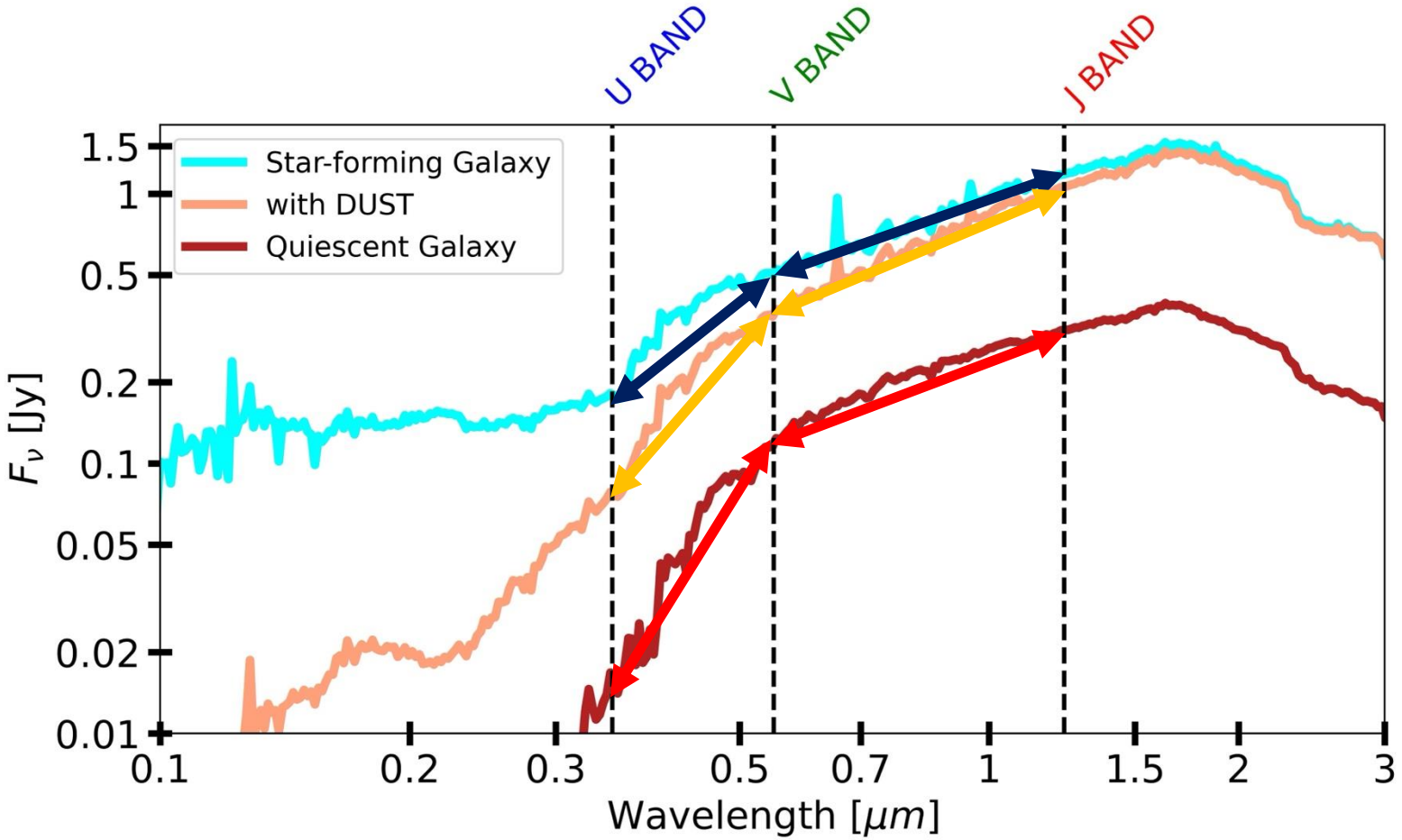


- **STAR-FORMING GALAXY**
  - MILD U-V
  - MILD V-J
- **QUIESCENT GALAXY**
  - STRONG U-V
  - MILD V-J
- **DUSTY STAR-FORMING GALAXY**
  - STRONG U-V
  - STRONG V-J

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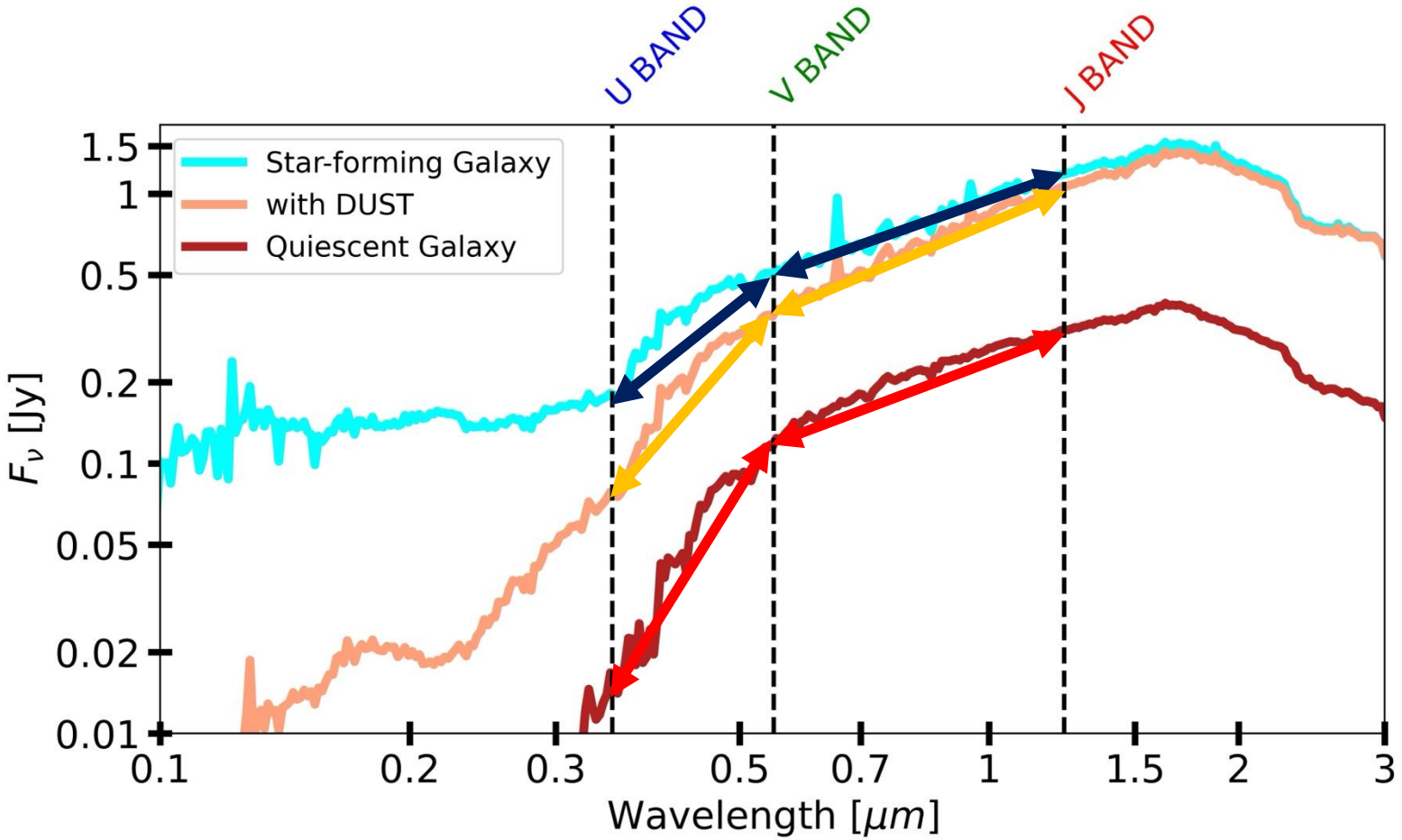


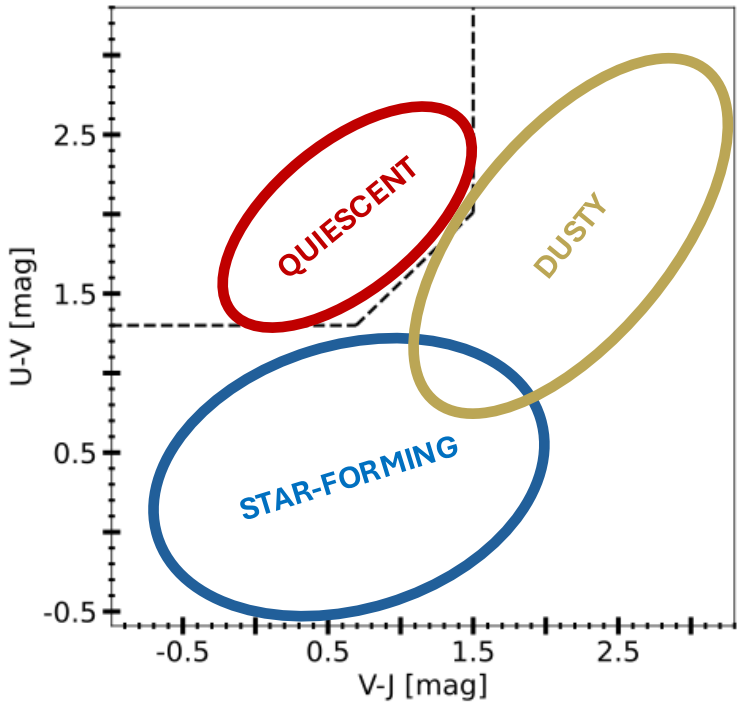

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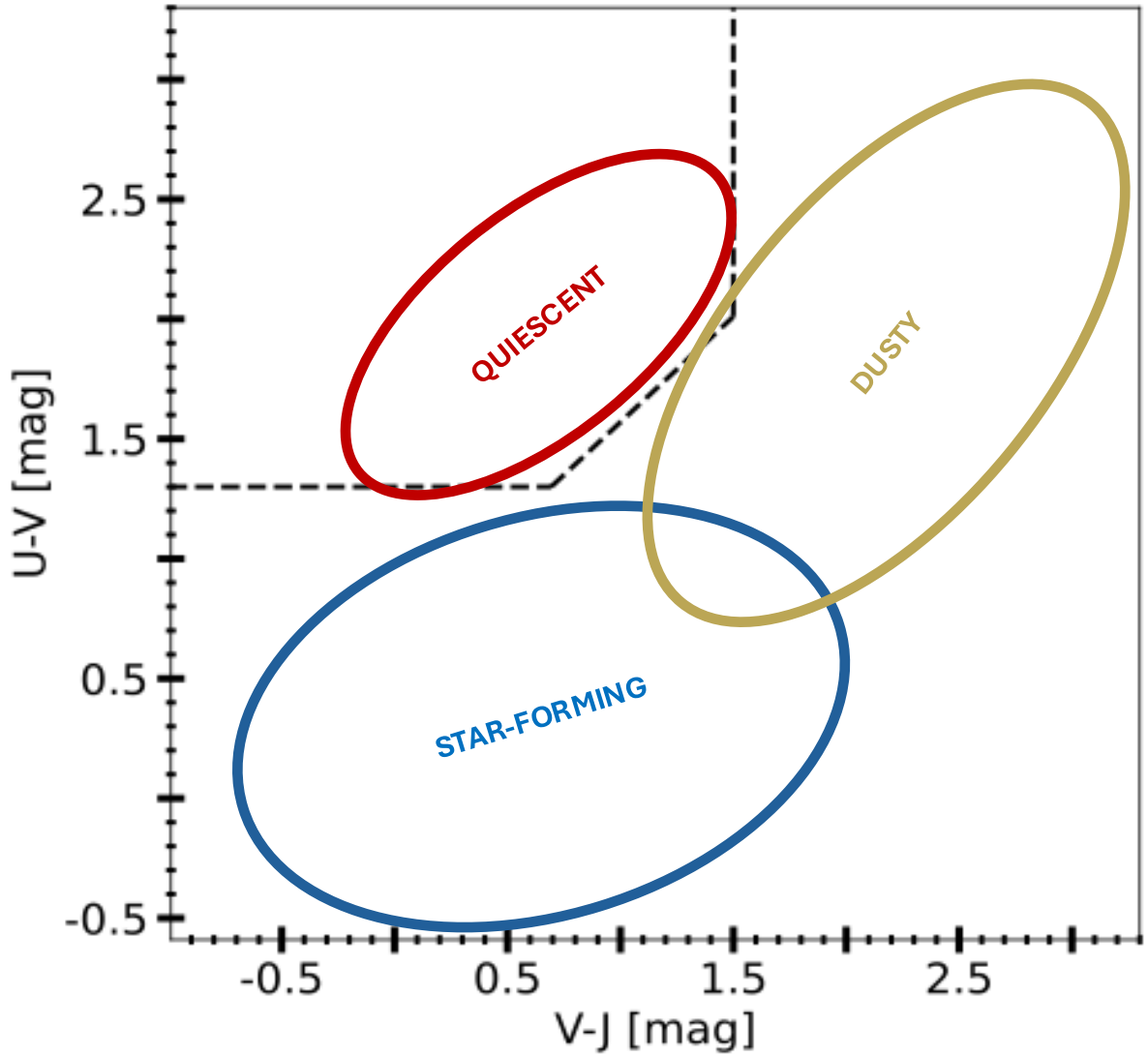

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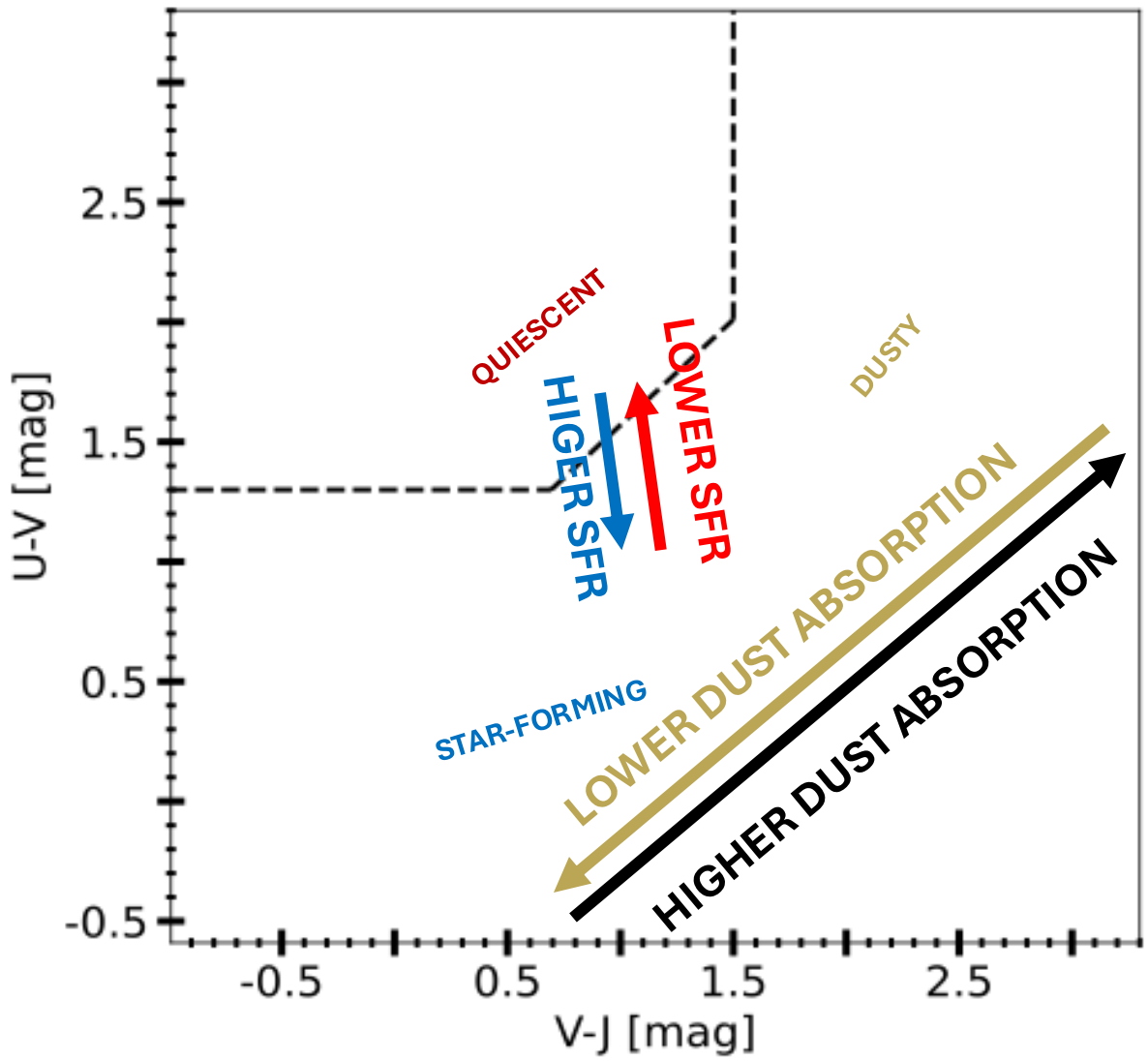
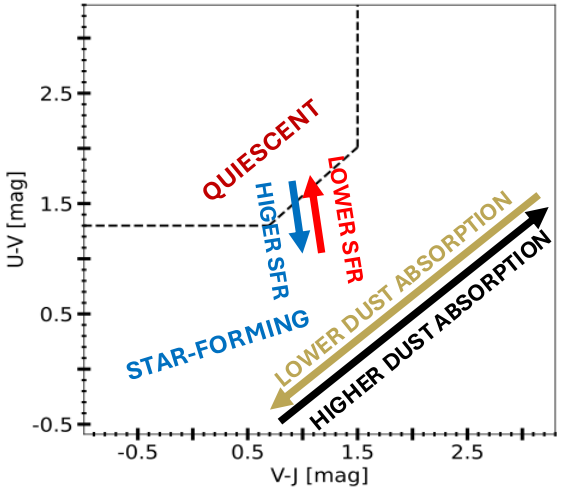
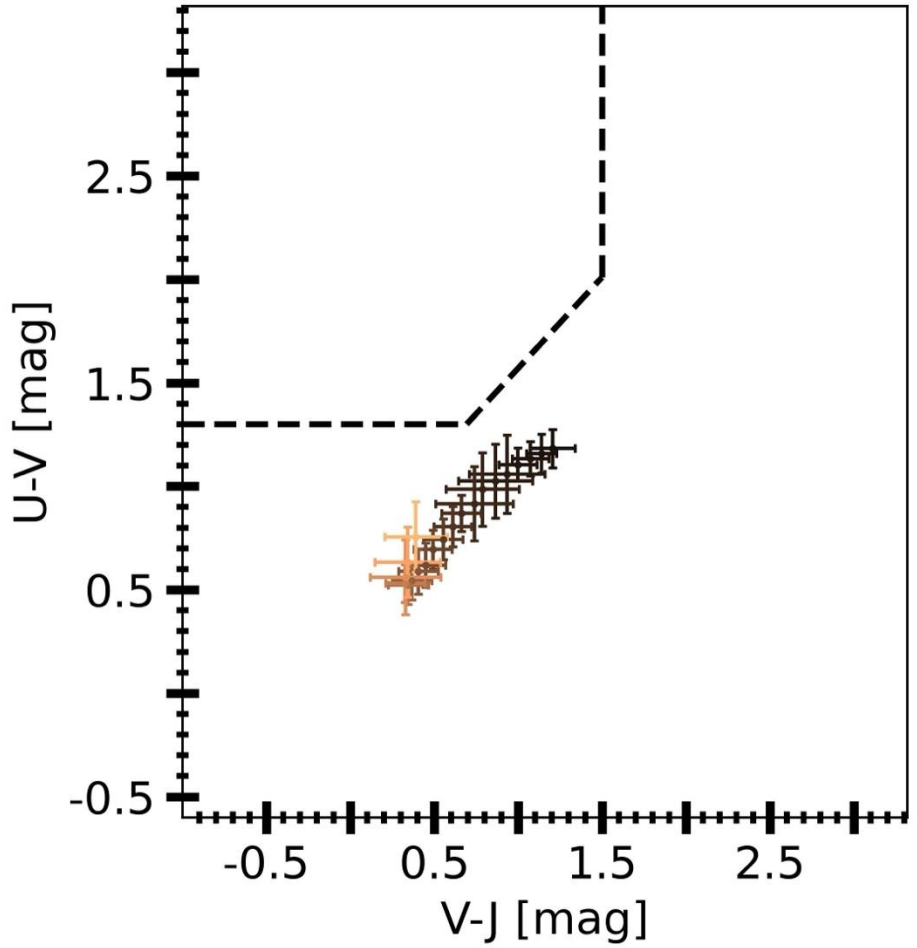
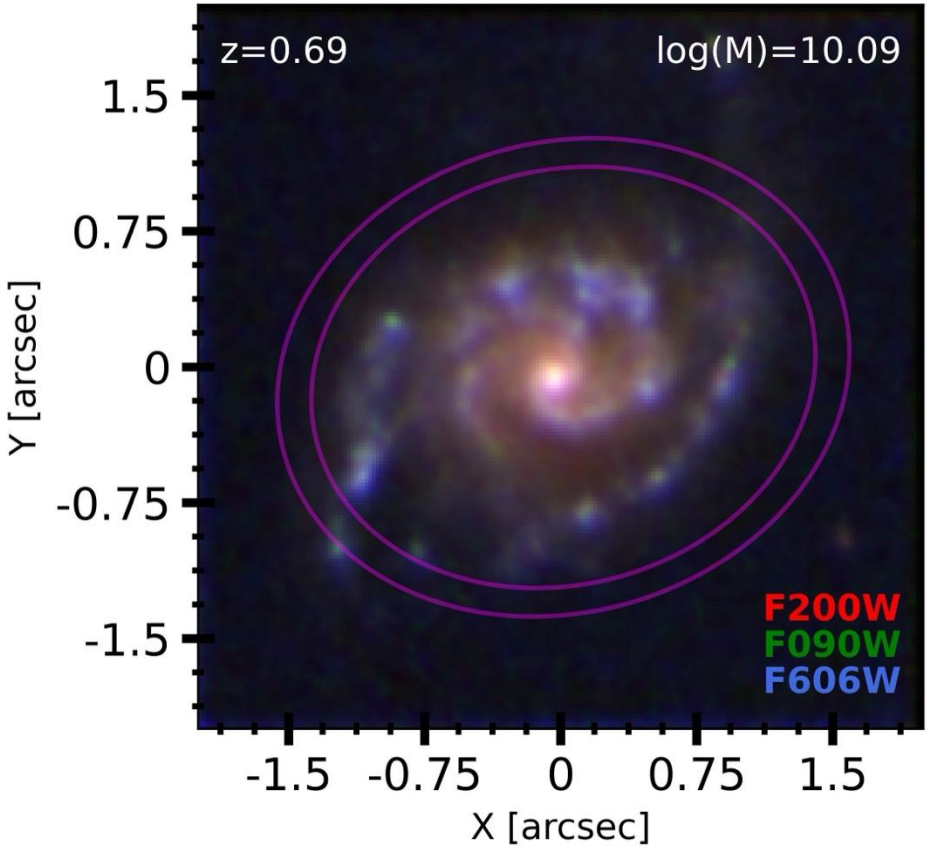


# UVJ GRADIENTS WITHIN GALAXIES



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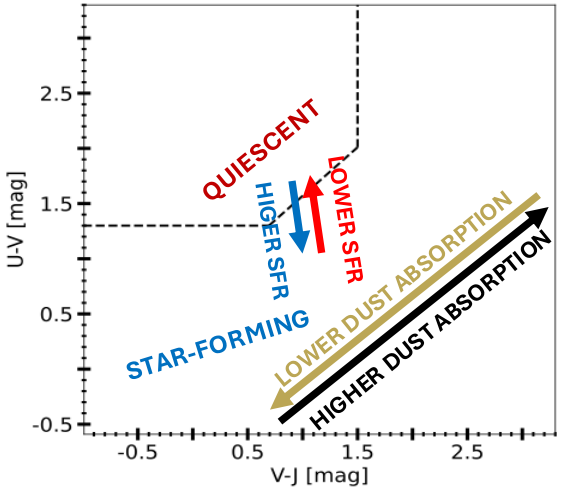


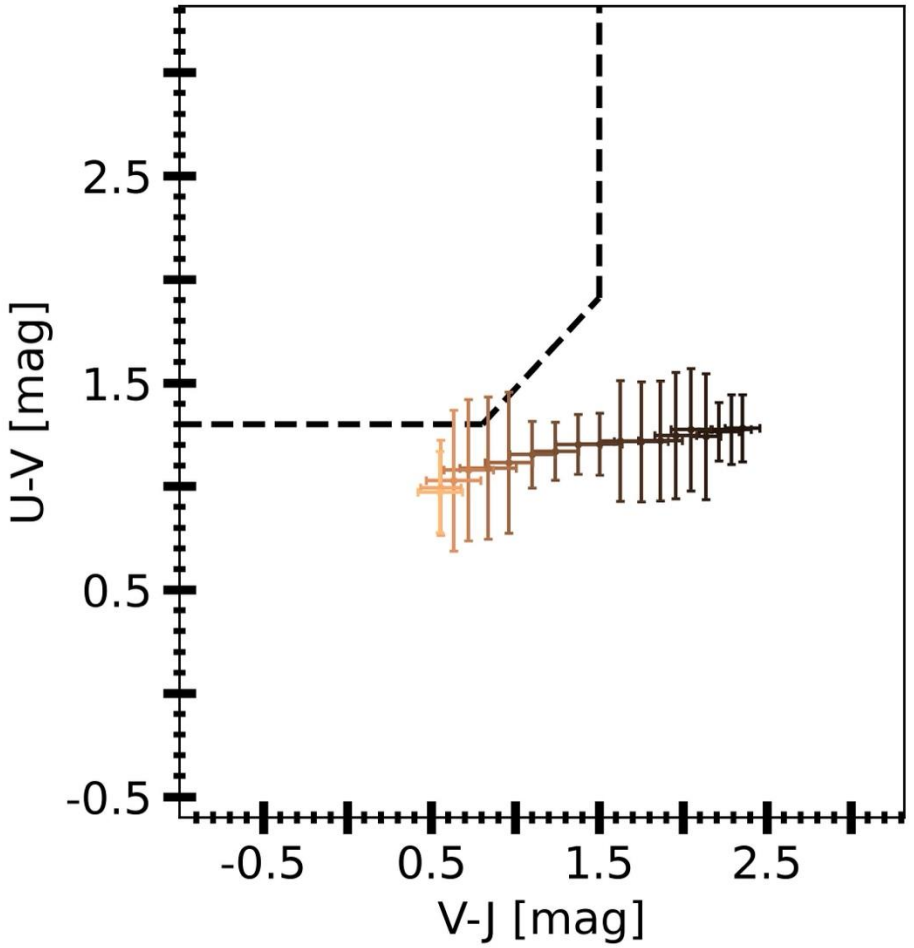


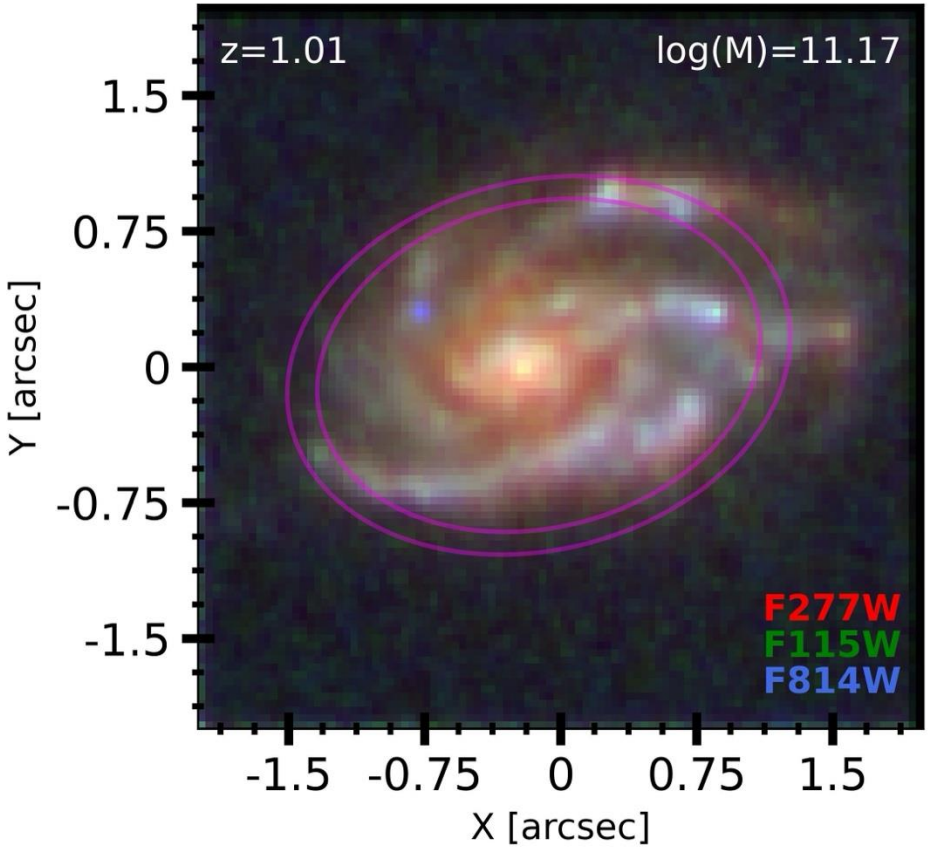

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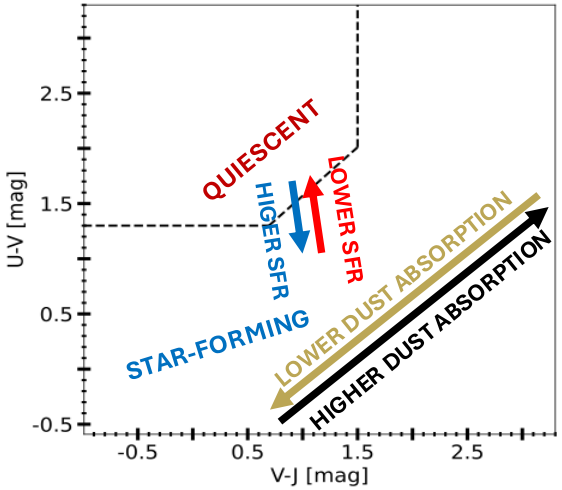


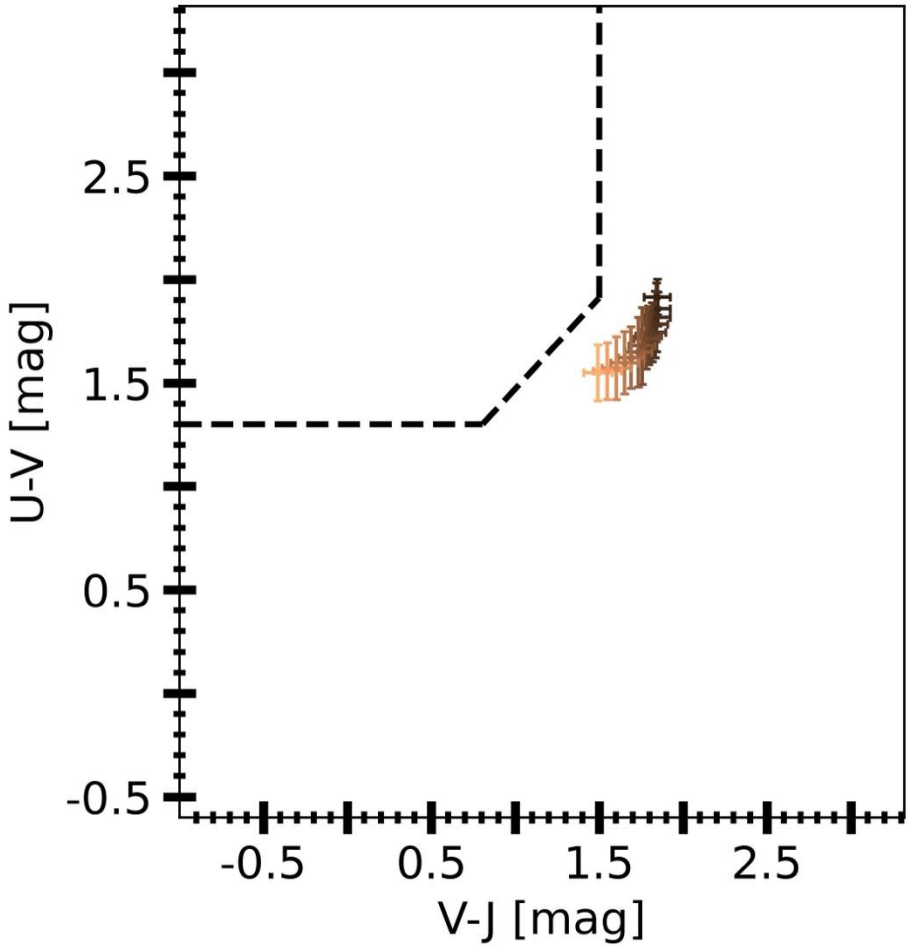


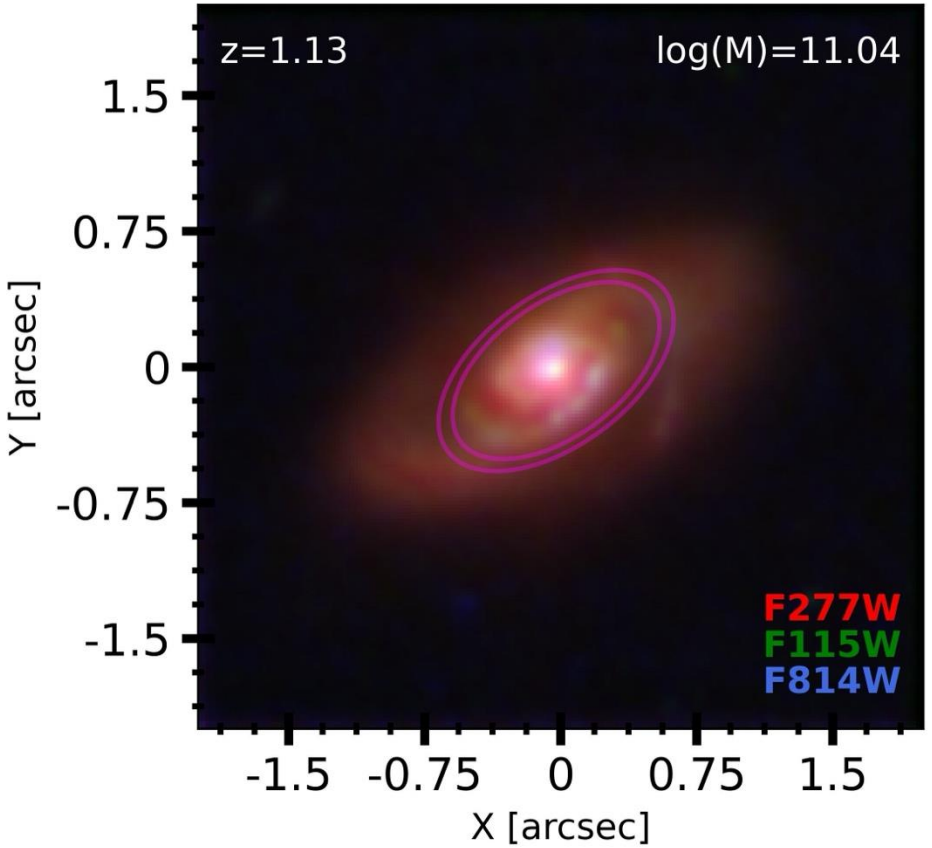

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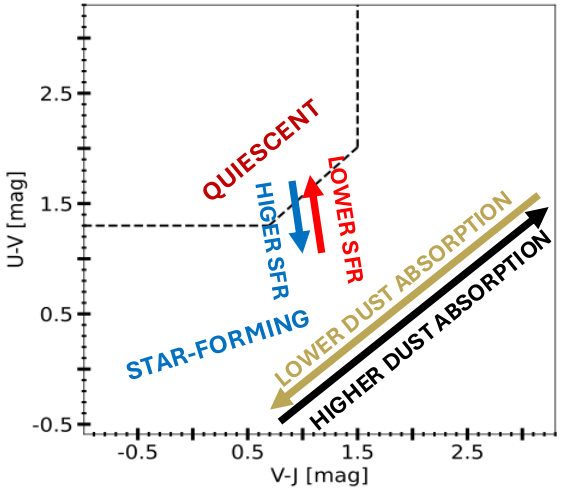


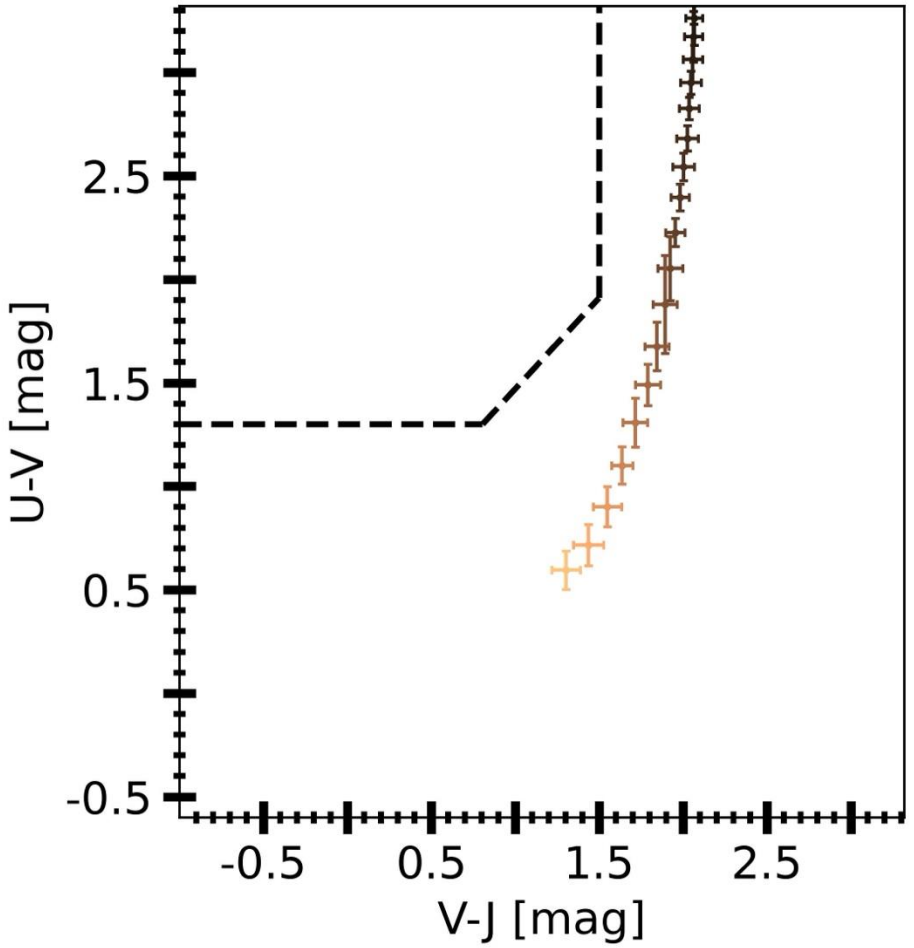


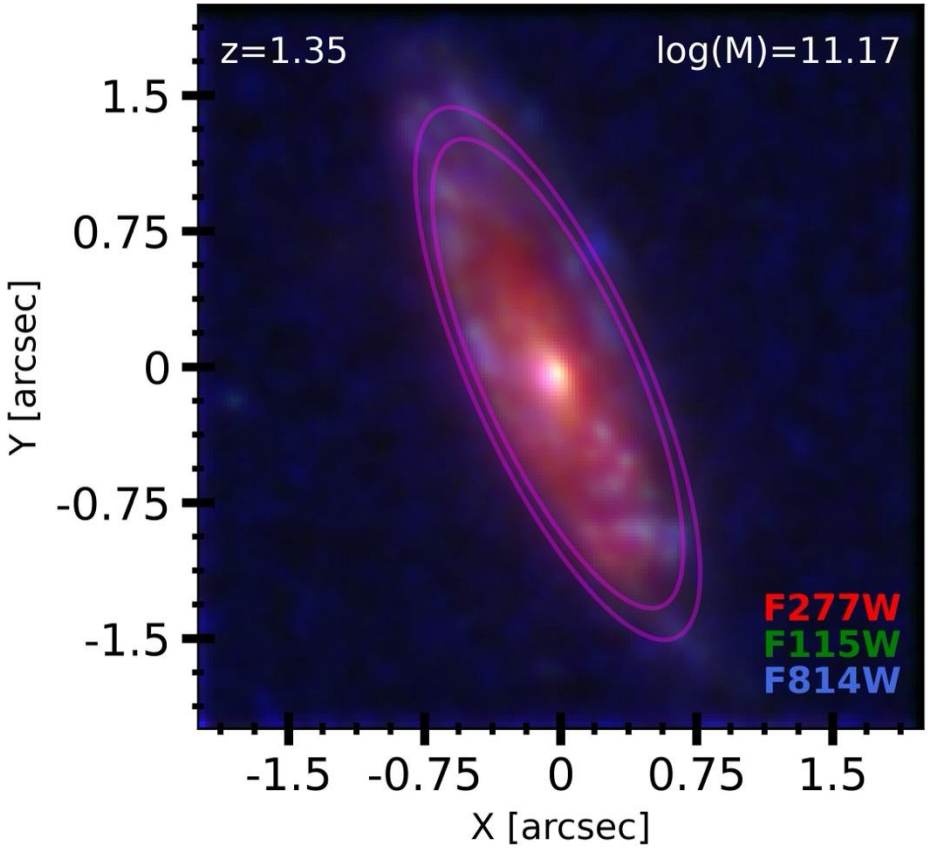

# AN OVERVIEW OF OUR SAMPLE

**GALAXIES :**
~10 200

**MASS RANGE:**
$M_{\star} > 10^{9.5} M_{\odot}$

**REDSHIFT RANGE:**
0.5-2.5

# COLOR GRADIENTS IN THE UVJ DIAGRAM

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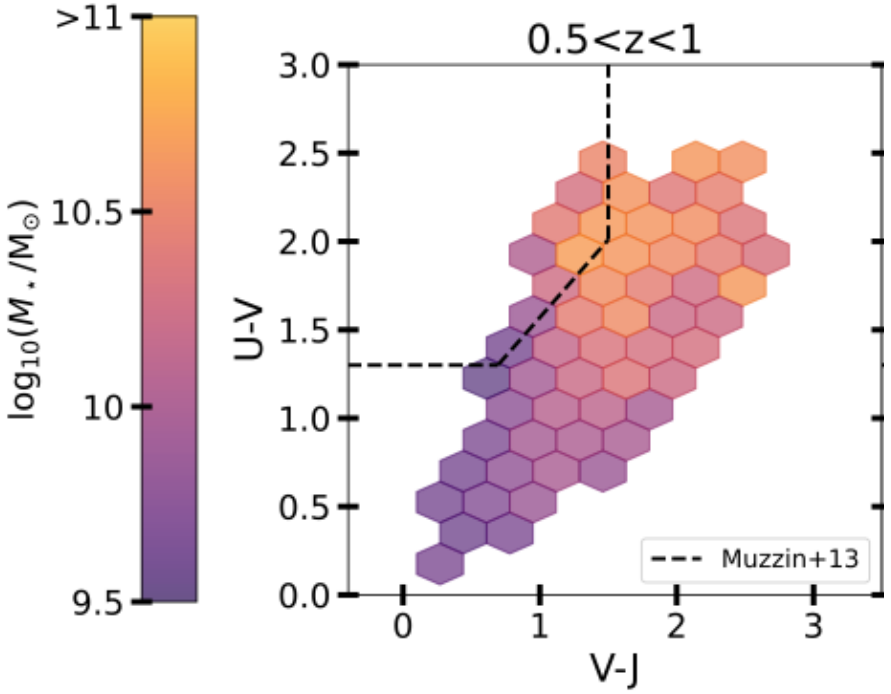
UVJ DIAGRAM OF THE GALAXIES' CORE

Arrows = Color gradients



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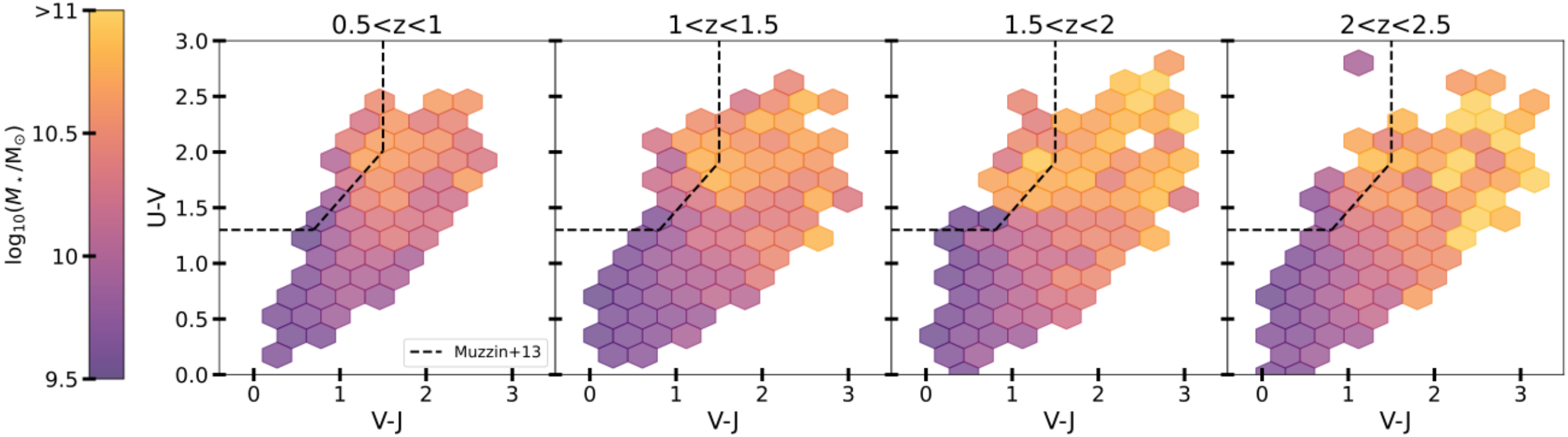

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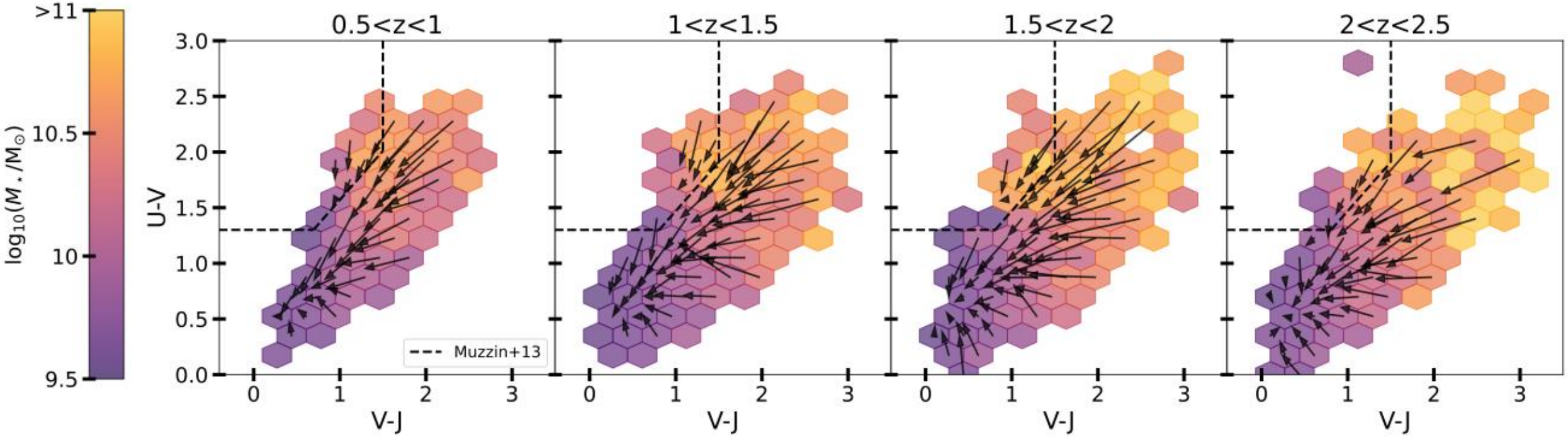
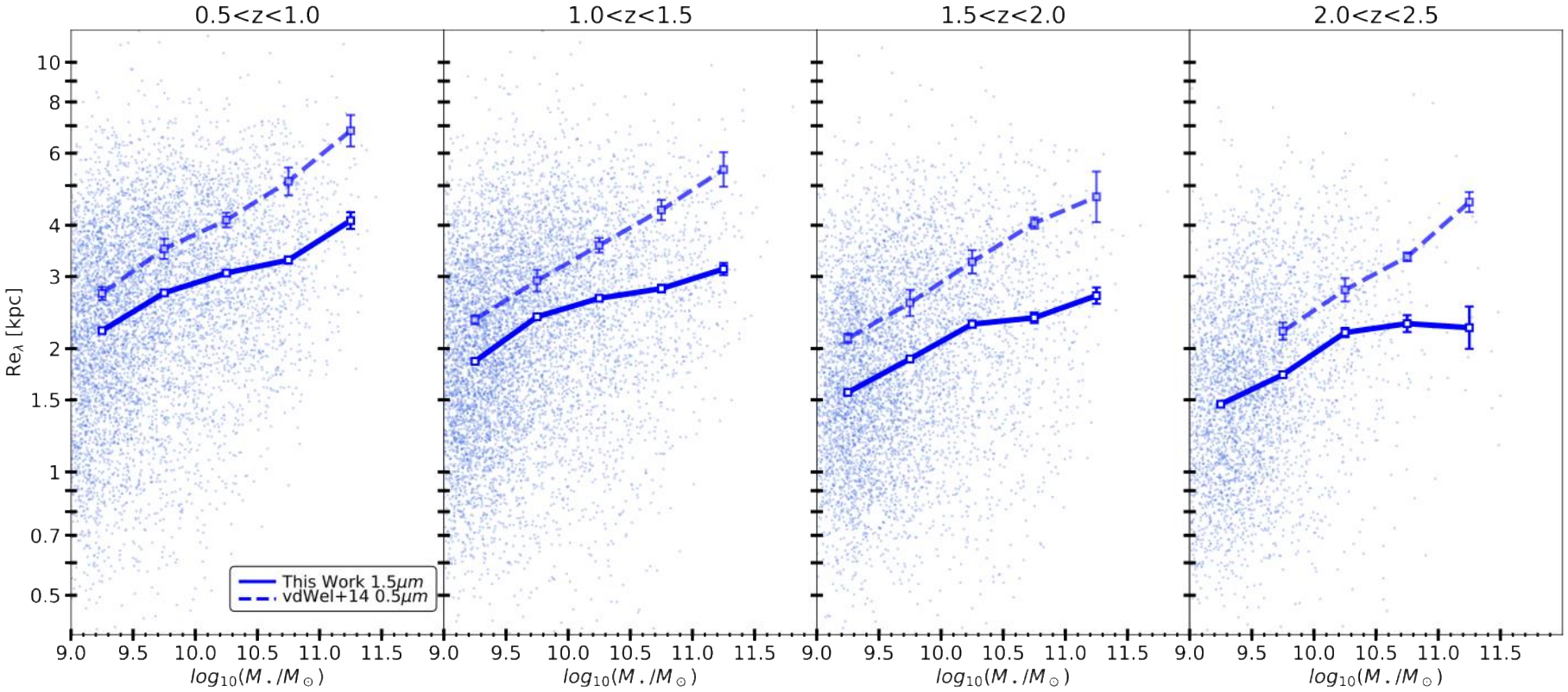


# DO OBSERVATIONS CONFIRM THIS MODEL?

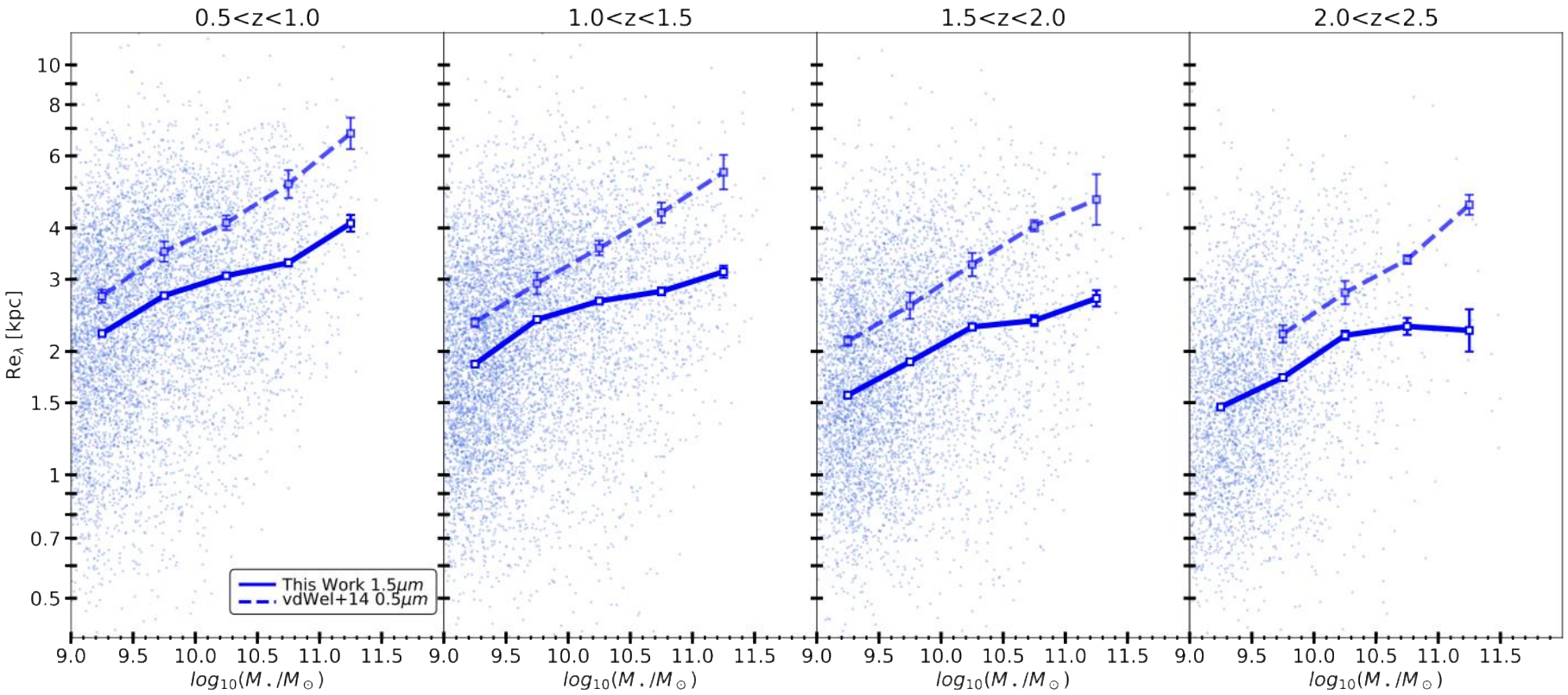



**WHY?**

$$d\log(R_{0.5\mu m}) \propto 0.2 d\log(M_\star)$$

~~$$d\log(R_{1.5\mu m}) \propto 0.2 d\log(M_\star)$$~~

# DO OBSERVATIONS CONFIRM THIS MODEL?



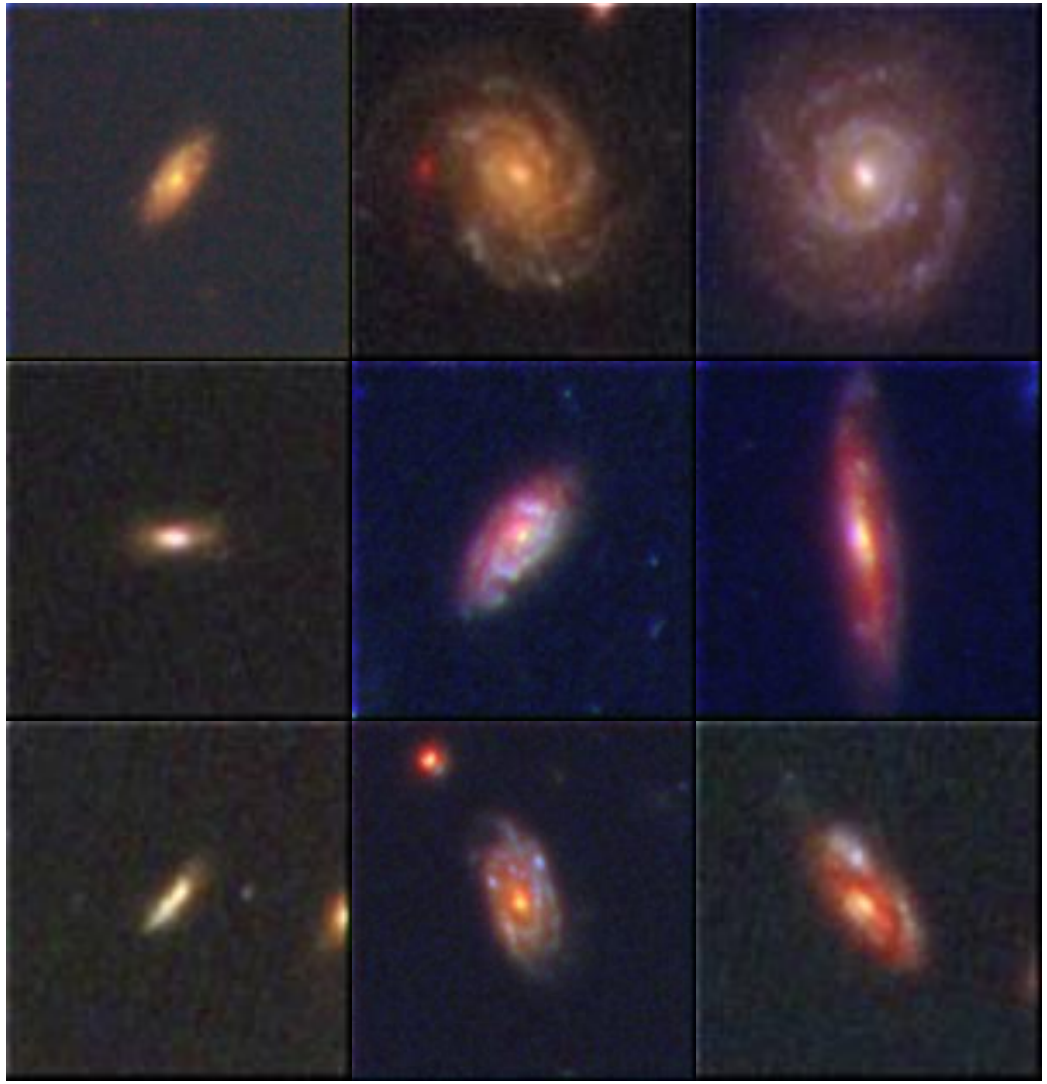

**WHY?**

$$dlog(R_{0.5\mu m}) \propto 0.2 dlog(M_\star)$$

~~$$dlog(R_{1.5\mu m}) \propto 0.2 dlog(M_\star)$$~~

**COLOR GRADIENTS!**

# CONCLUSIONS



- GALAXIES ARE **MORE COMPACT** IN THE NEAR-IR
- JWST UNVEILS THE DUSTY CORE OF HIGH-Z GALAXIES
- DUST PLAYS A KEY ROLE IN THE **COLOR GRADIENTS** WE OBSERVE AT HIGH REDSHIFT