HOW CAN WE IDENTIFY GALAXIES THAT HAVE STOPPED FORMING STARS IN THE EARLY UNIVERSE?

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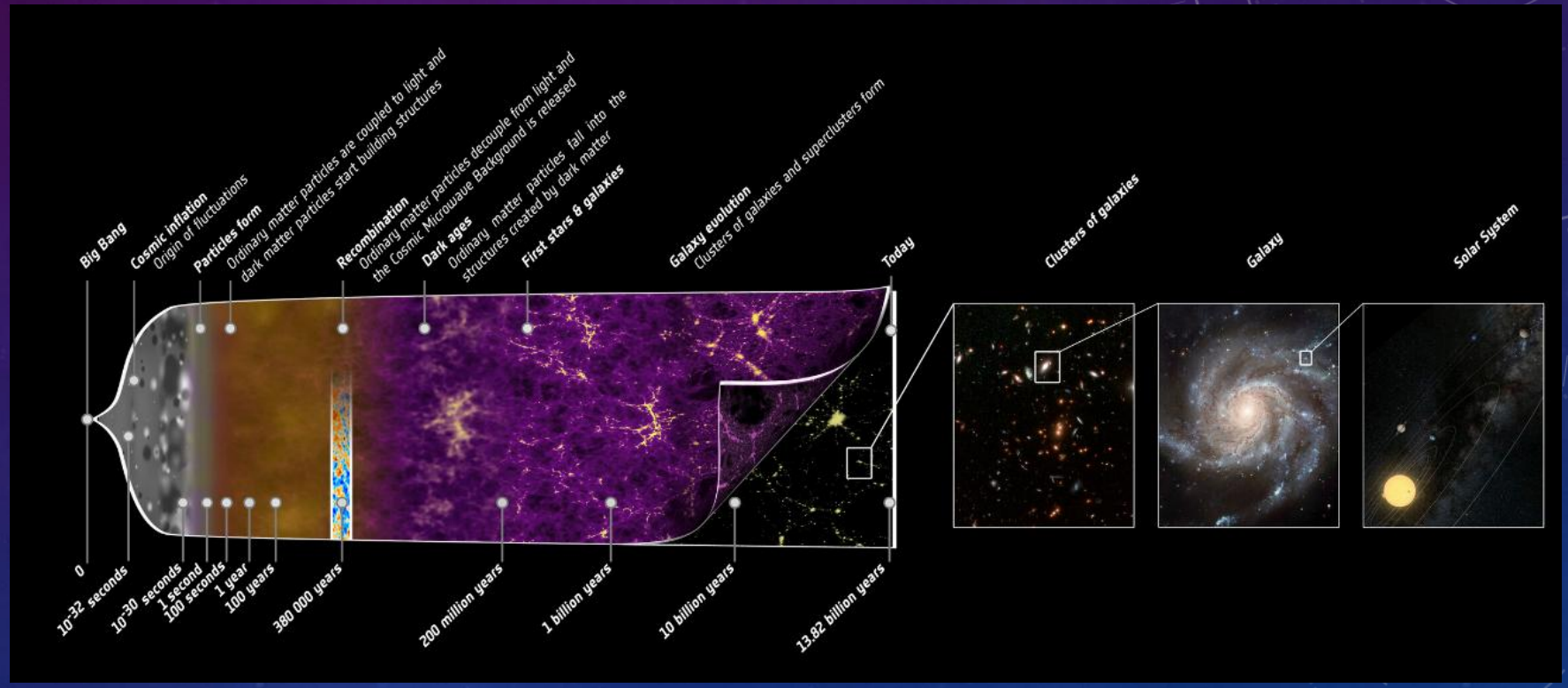
YOUNG ASTRONOMERS MEETING - 2026

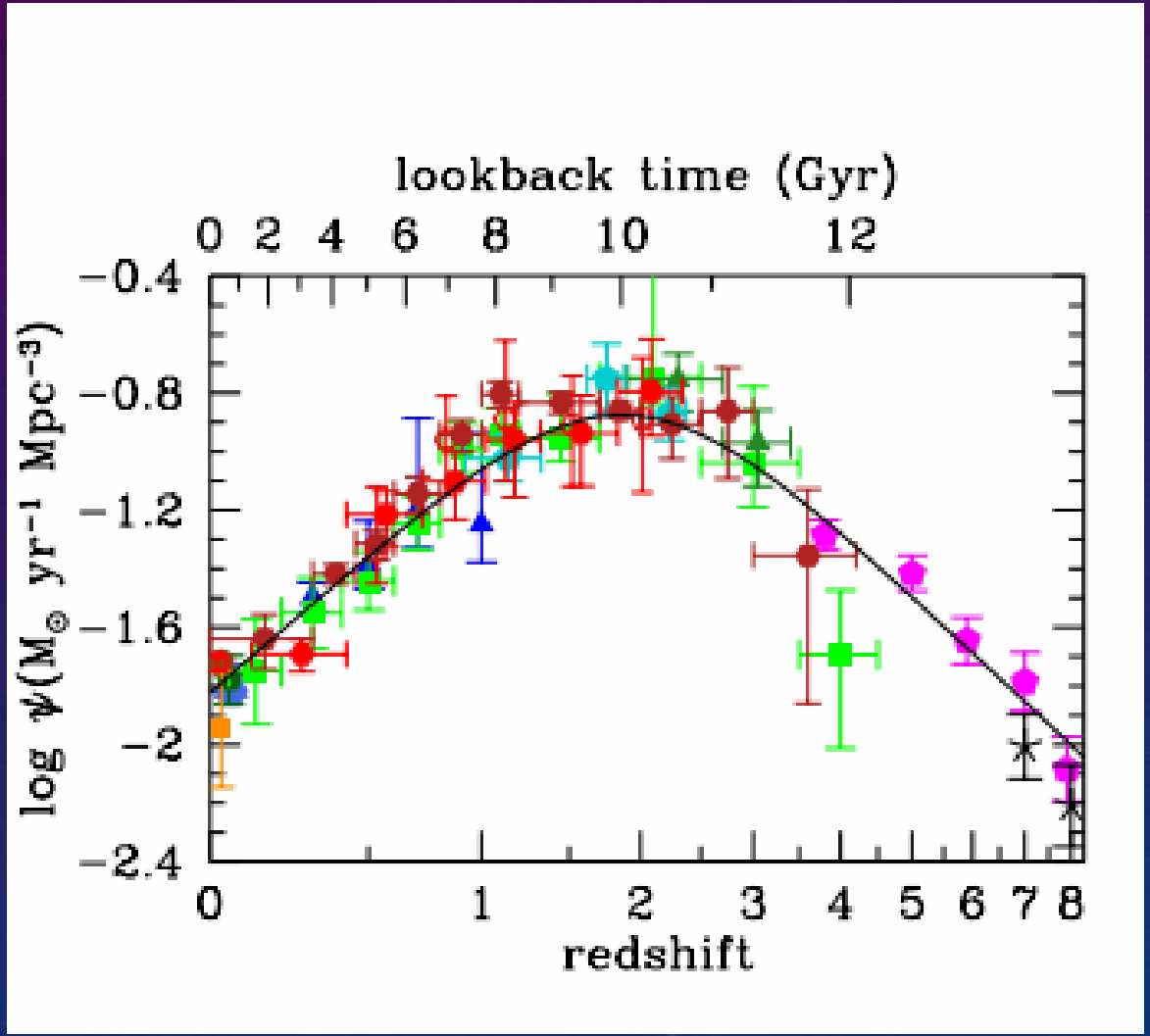
THE COSMIC CONTEXT

- Big Bang
- First stars
- First galaxies
- The present-day Universe



Credits: https://www.esa.int/ESA_Multimedia/Images/2013/03/Planck_history_of_Universe

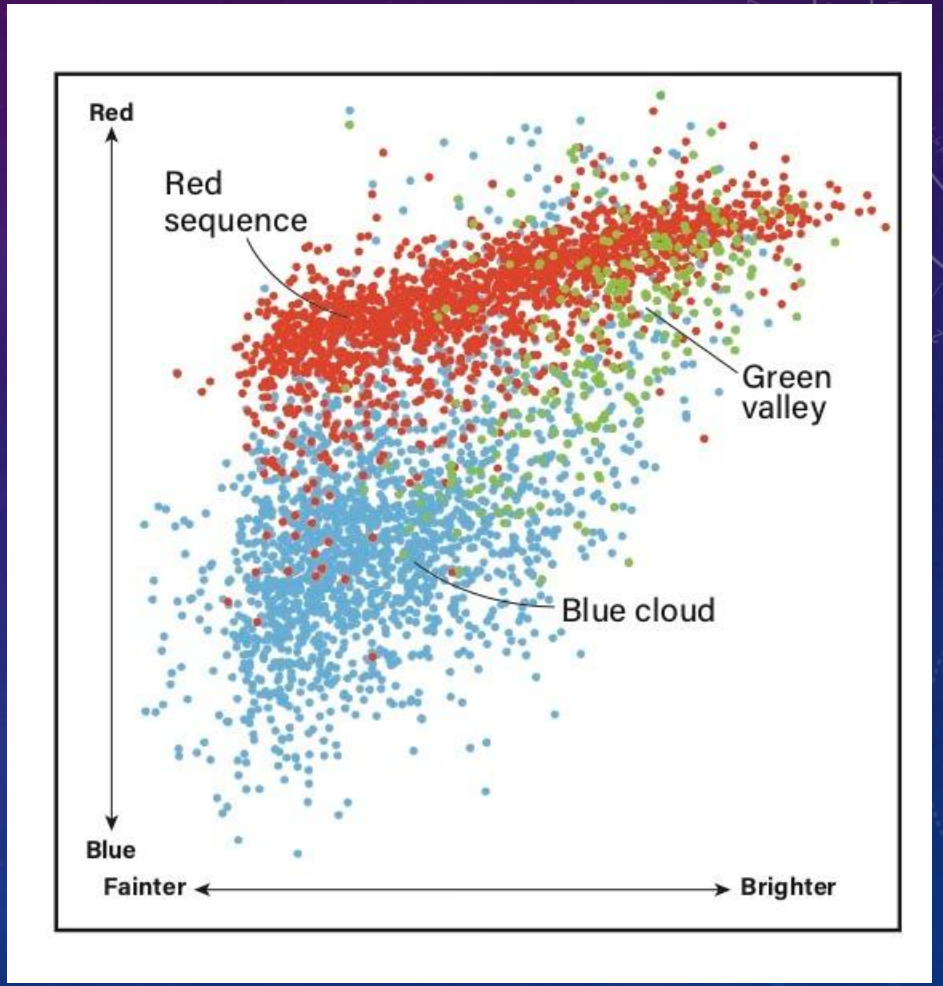
EVOLUTION OF STAR FORMATION



Credits: Madau+14

TYPES OF GALAXIES TODAY

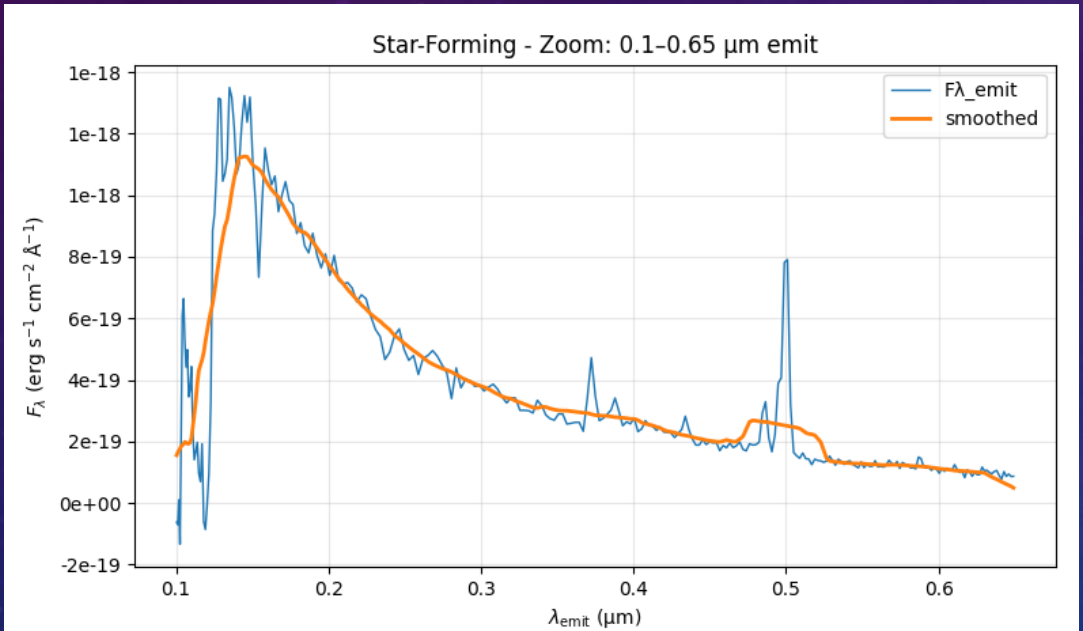
- Star-forming galaxies → blue
- Quiescent galaxies → red



Credits: https://www.astronomy.com/science/the-beginning-to-the-end-of-the-universe-how-to-build-a-galaxy/

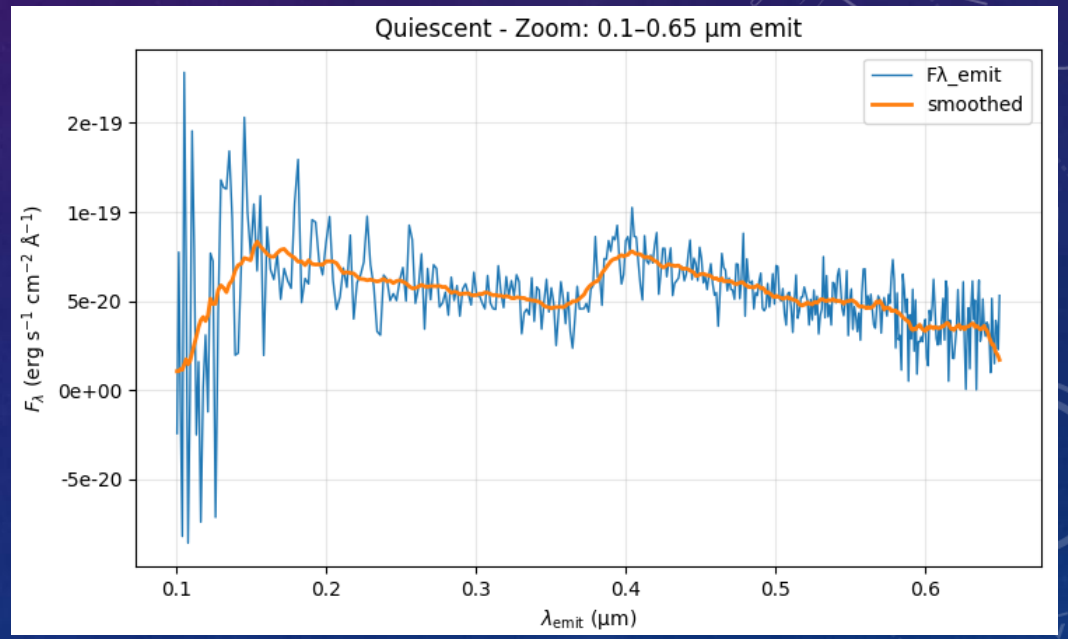
WHAT IS A QUIESCENT GALAXY?

- Young stars → strong UV emission
- Old stars → weaker UV emission



Credits: Arroyo, in prep.

UV



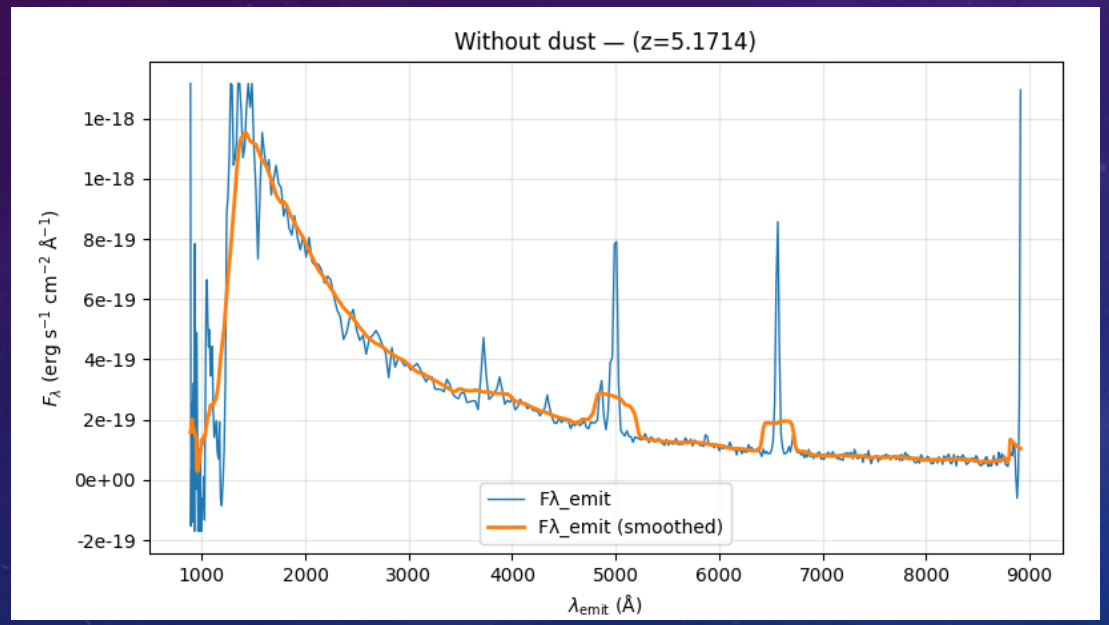
Credits: Arroyo, in prep.

UV

DUST COMPLICATION

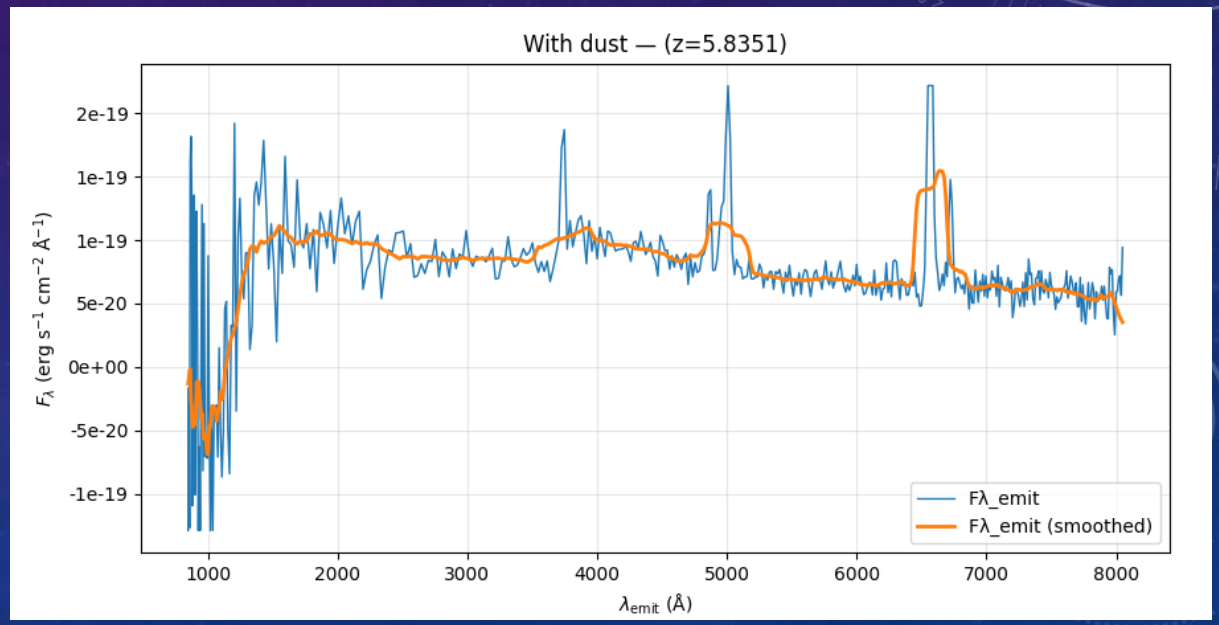
The dust absorbs UV light

- Galaxy looks redder
- Star-forming galaxy can look like a quiescent one



UV

Credits: Arroyo, in prep.

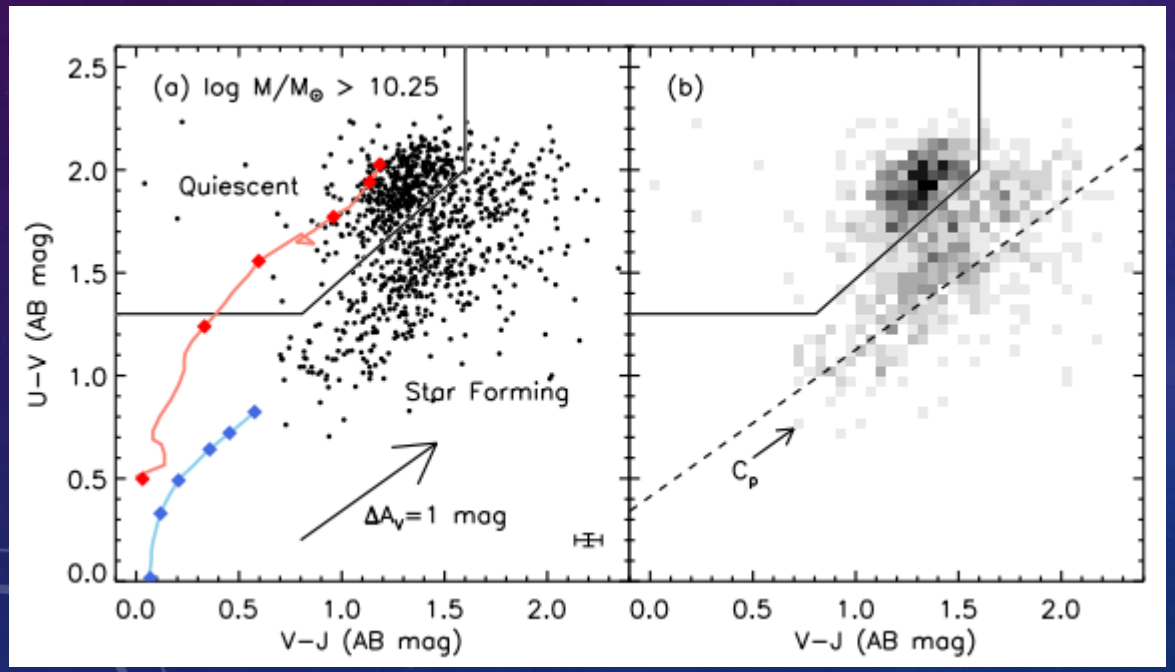


UV

Credits: Arroyo, in prep.

UVJ DIAGRAM

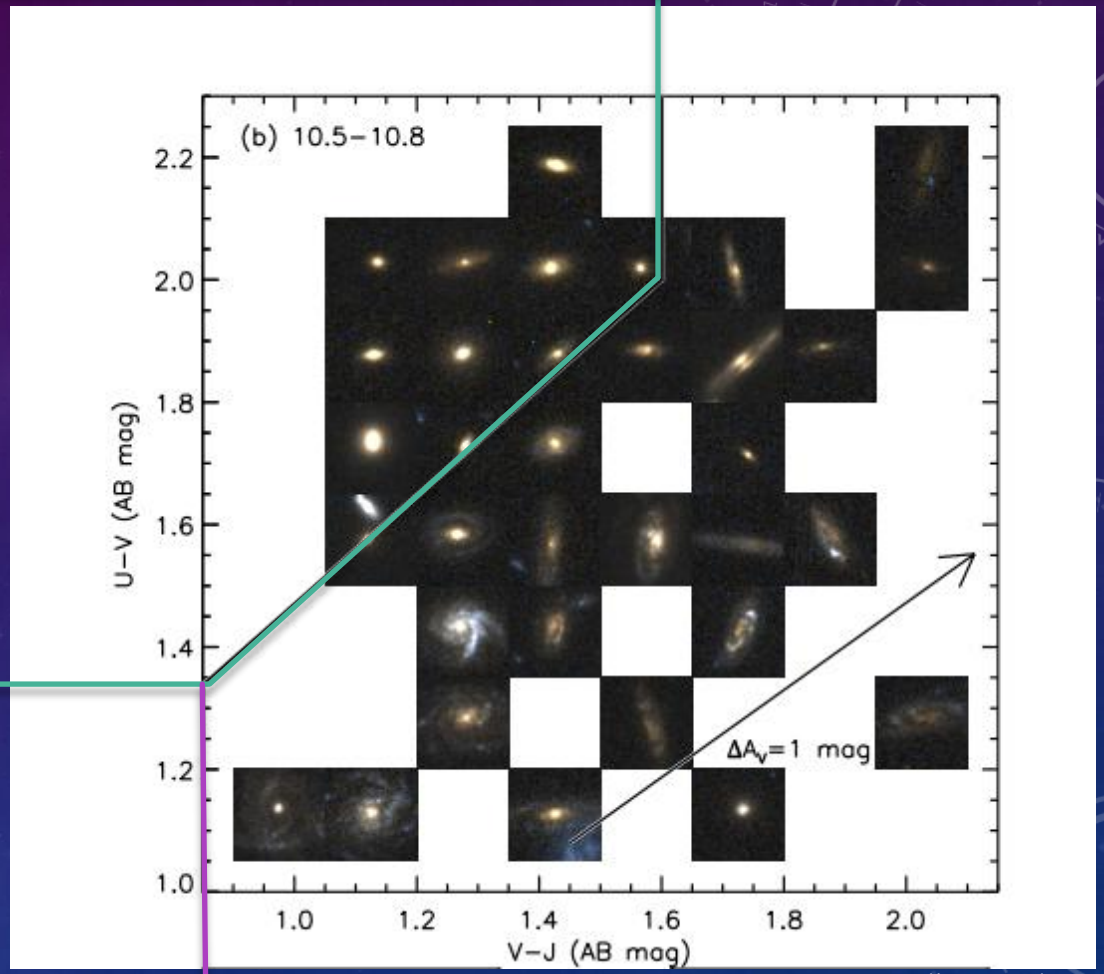
- Star-forming
- Dusty star-forming
- Quiescent



Credits: Patel+24

Elliptical galaxies

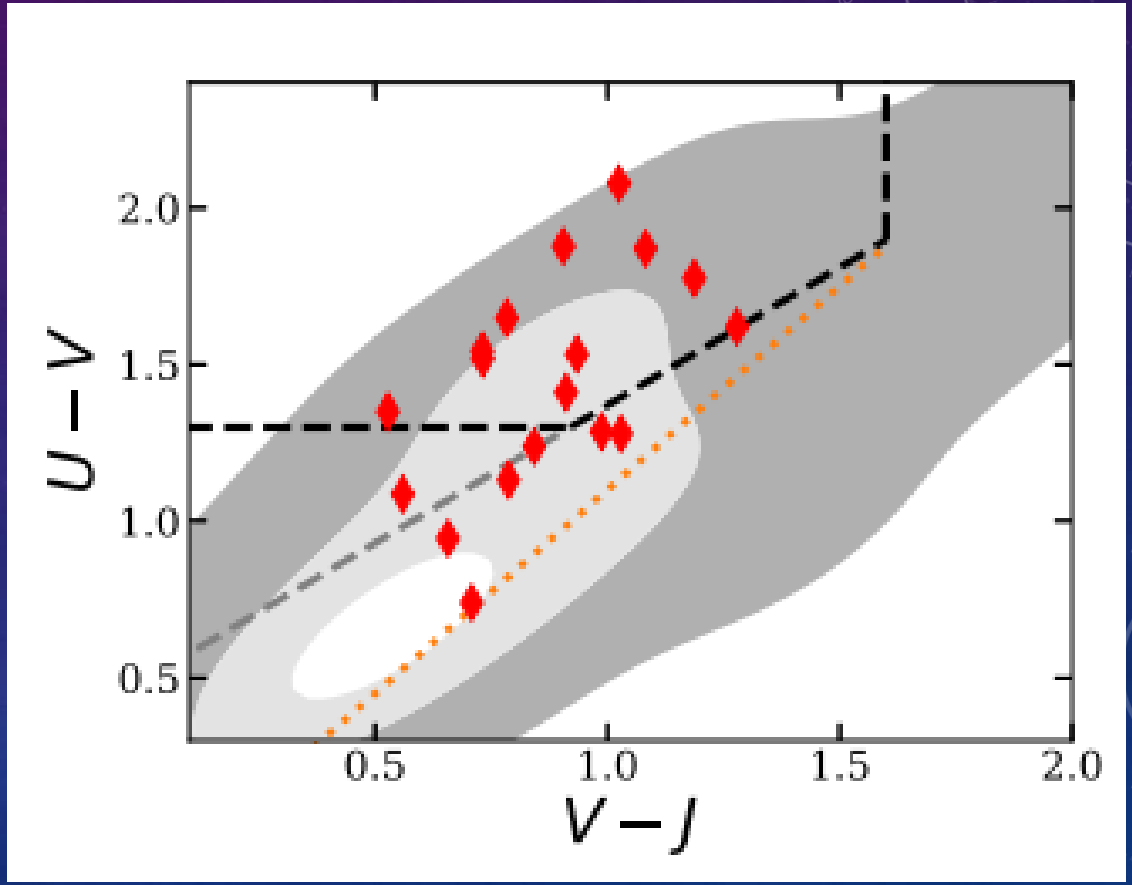
Spiral galaxies



Credits: Patel+24

PROBLEM AT HIGH REDSHIFT

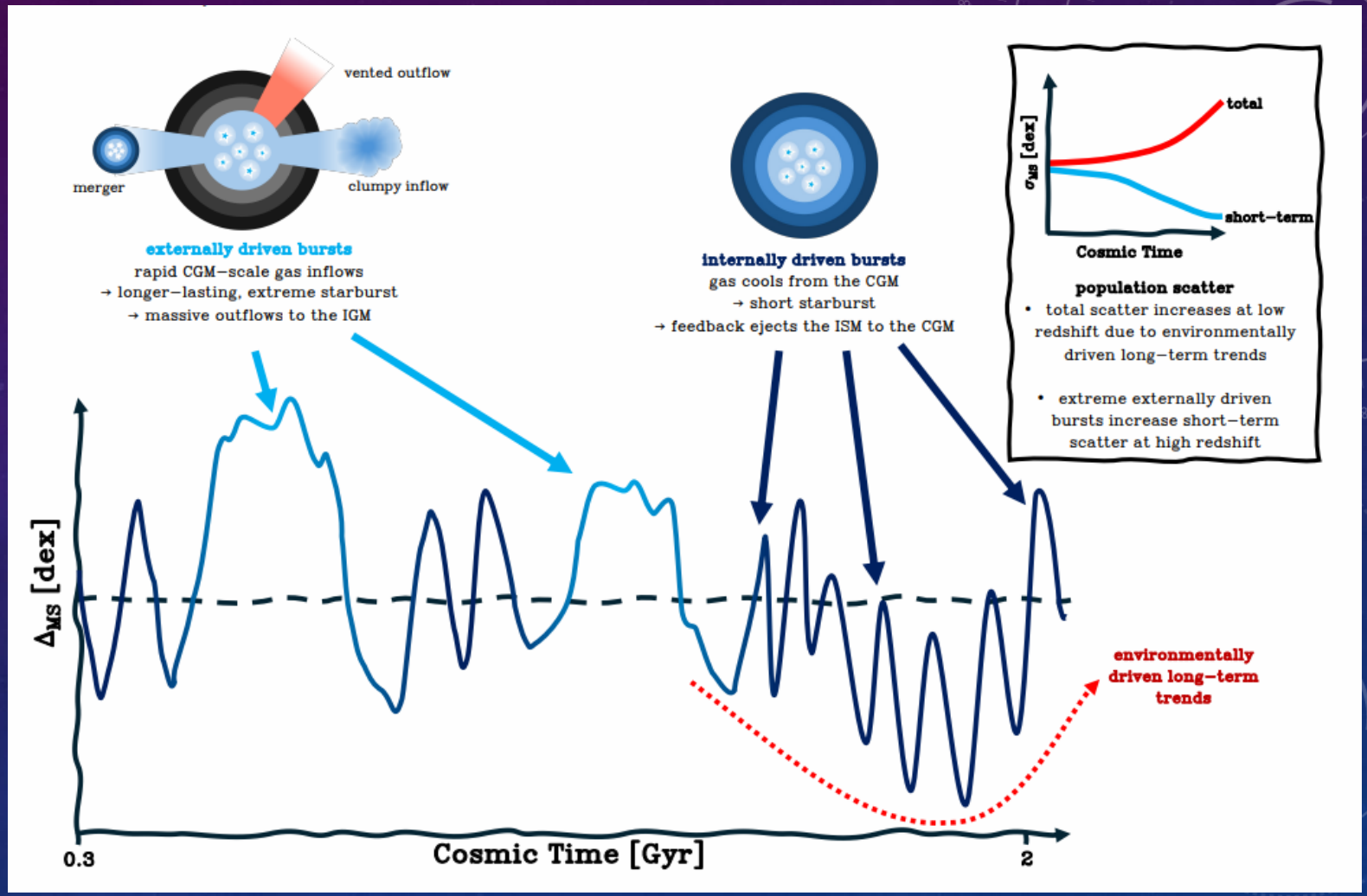
Simulations suggest that UVJ diagram is changing



Credits: Baker+25

WHY?

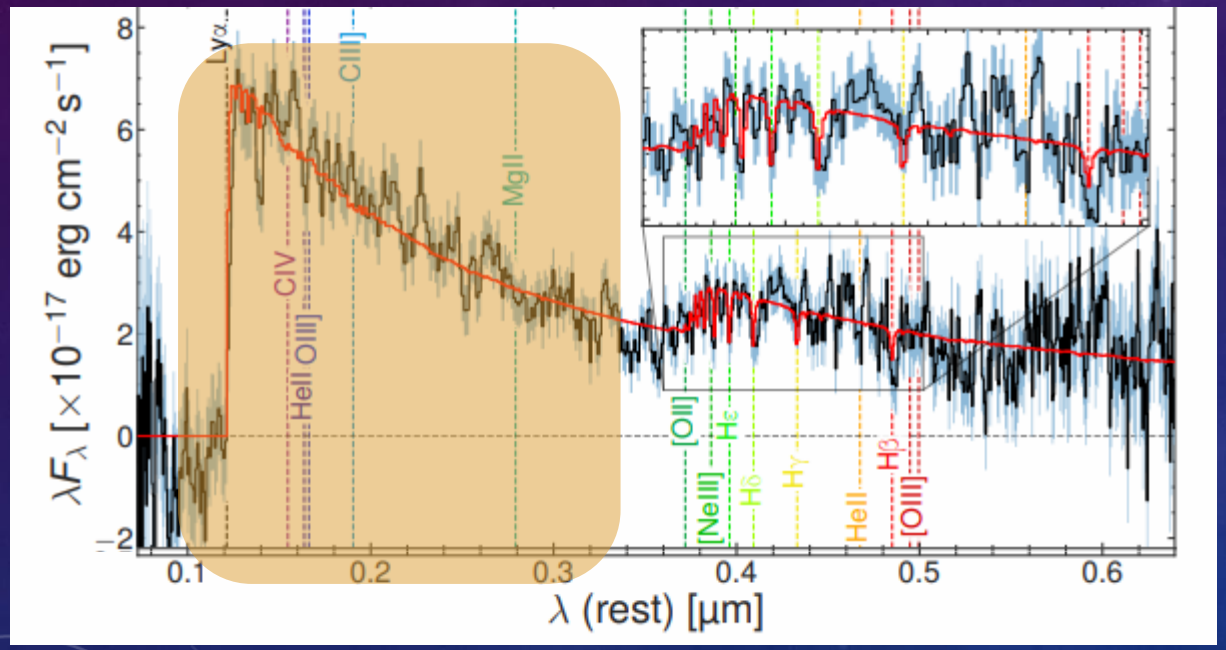
- Bursty star formation
- On/Off phases



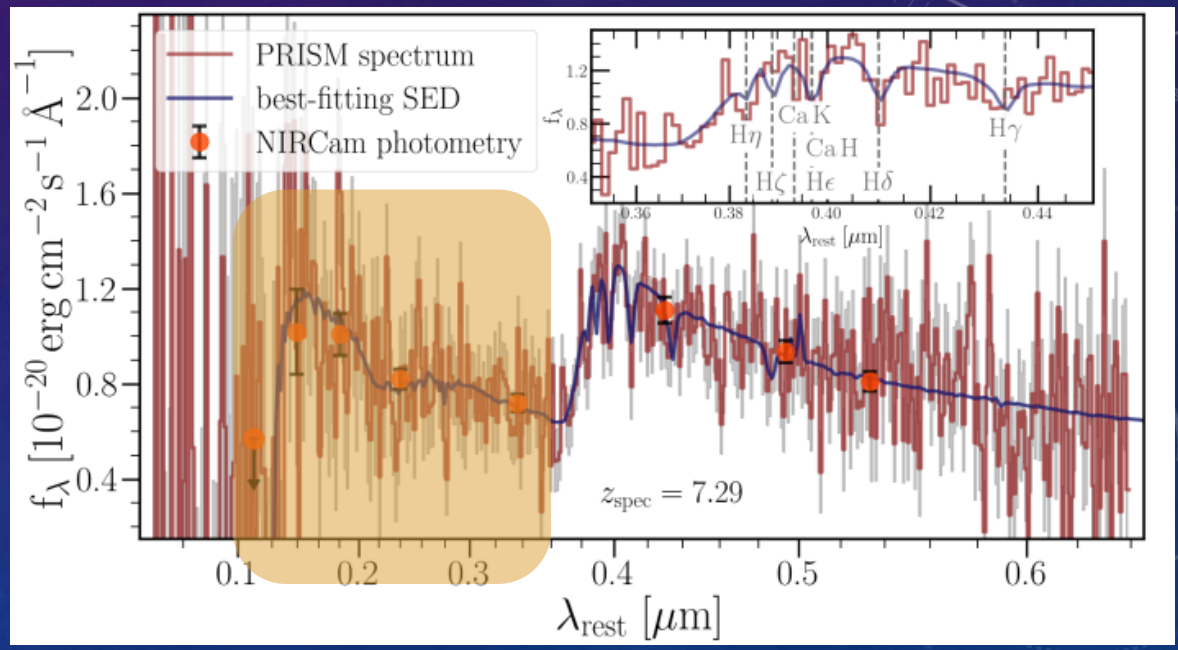
Credits: McClymont+25

DISCOVERY WITH JWST

Dormant Galaxy vs Quiescent Galaxy



Credits: Looser+24



Credits: Weibel+25

OUR QUESTION

Can we still use UVJ diagrams to identify quiescent galaxies in the early Universe?

MY PROJECT

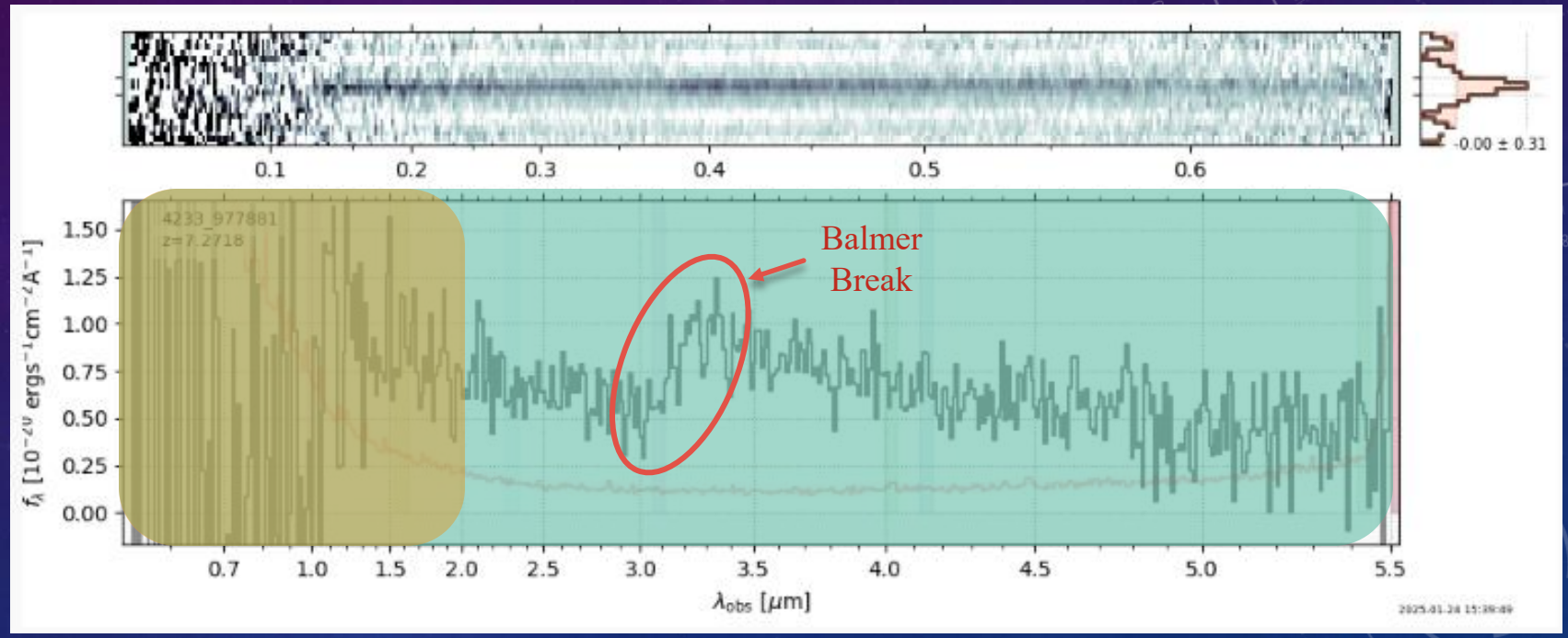
Analyze all public JWST spectra at $z > 4$

Study continuum features and emission lines

Determine star-formation histories with **SED fitting**

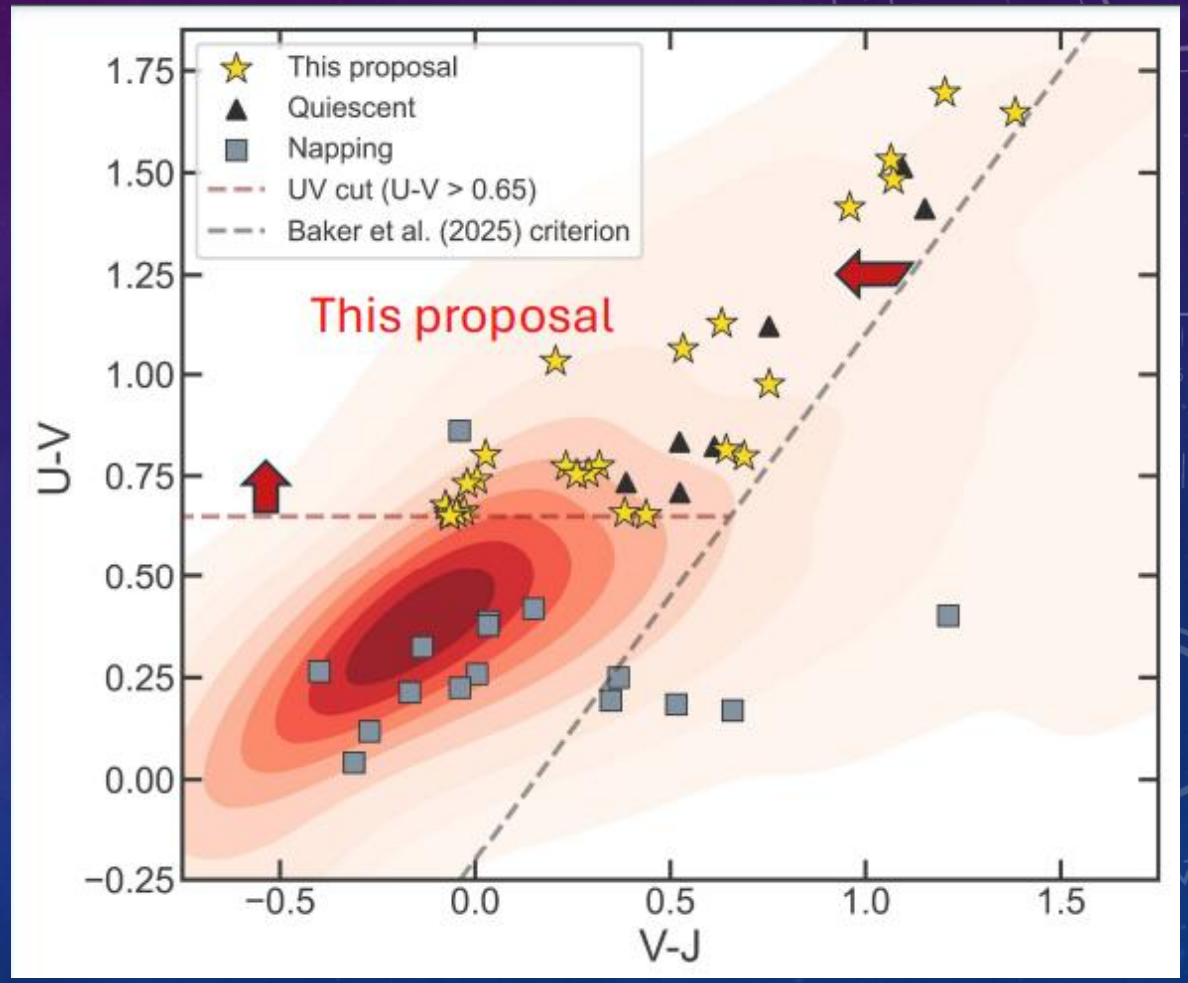
DATA

- Dawn JWST archive
- NIRSpec spectra
- Rest-frame optical diagnostics



PRELIMINARY RESULTS

- Photometric UVJ distribution
- Possible quiescent candidates
- Spectroscopy will test these selections



CONCLUSIONS

Our ‘3 bullets’ are:

- Early quiescent galaxies challenge galaxy evolution models
- UVJ may not work at high redshift
- JWST spectroscopy allows us to test this
- To be continued…

THANK YOU FOR YOUR ATTENTION

QUESTIONS?