The Effect of Local Environment on Type Ia Supernovae in the Dark Energy Survey

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On behalf of the Dark Energy Survey

Why Local Environment?

- Could local properties give a more accurate picture of the environmental dependence of SNIa?

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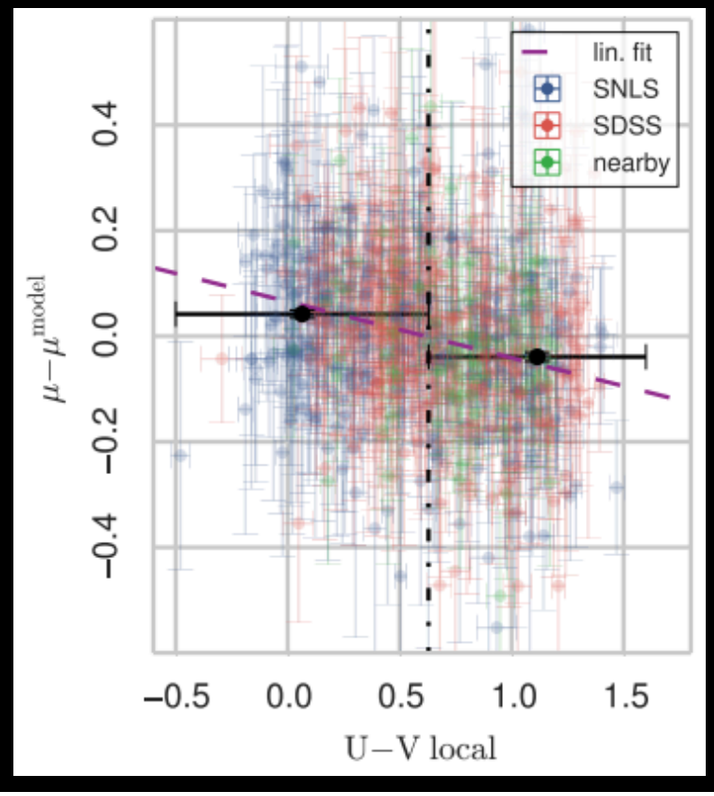
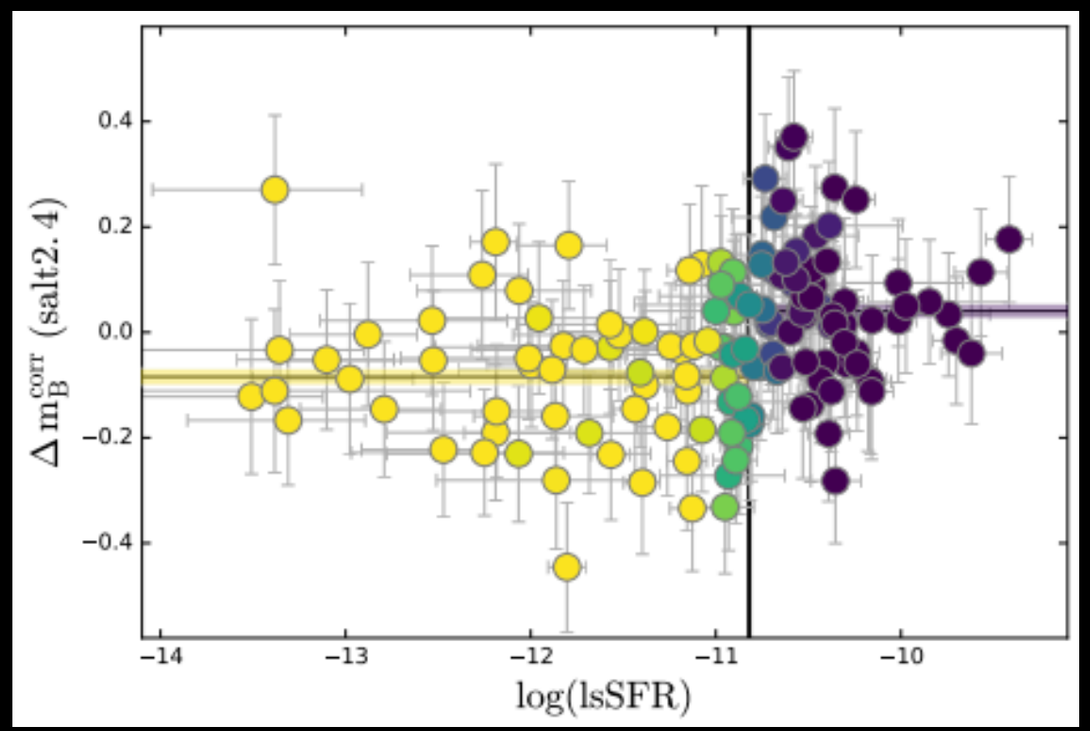
- Correlations found, e.g.:

    - Local rest-frame U-V colour *(Roman et al. 2018)*

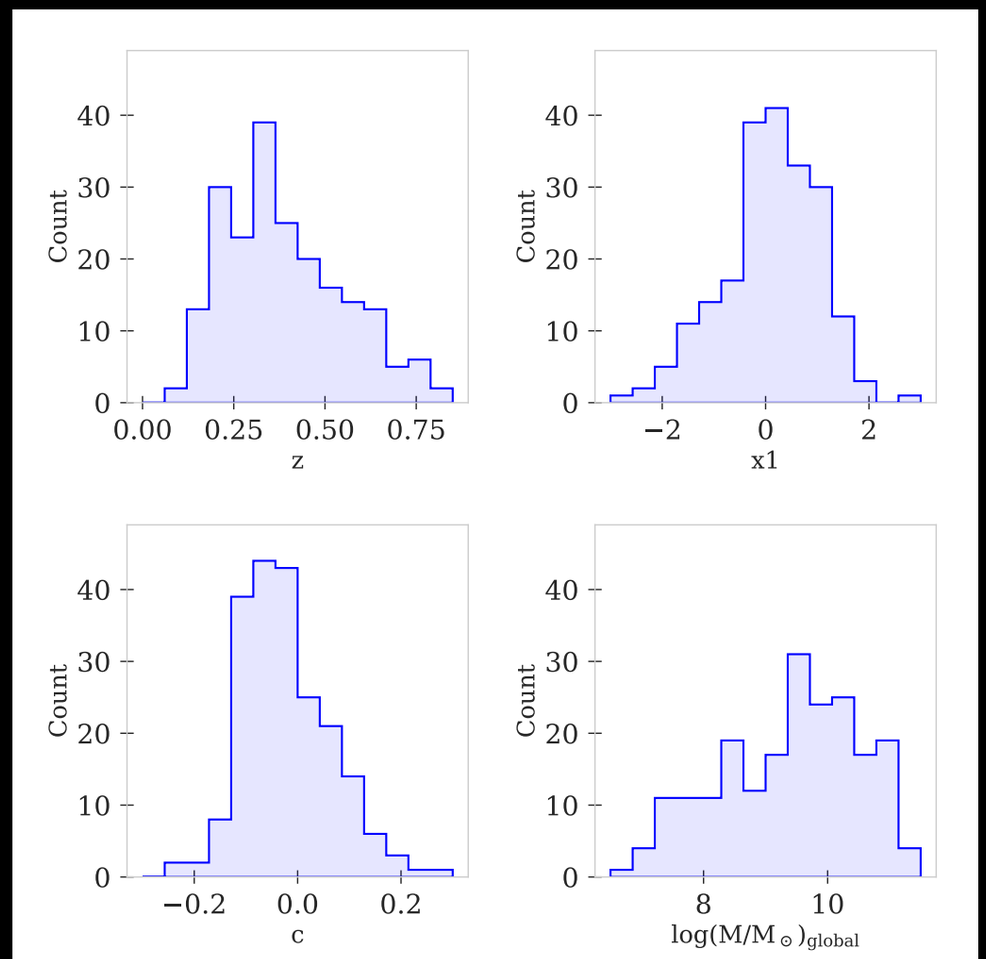
    - Local sSFR *(Rigault et al. 2018)*



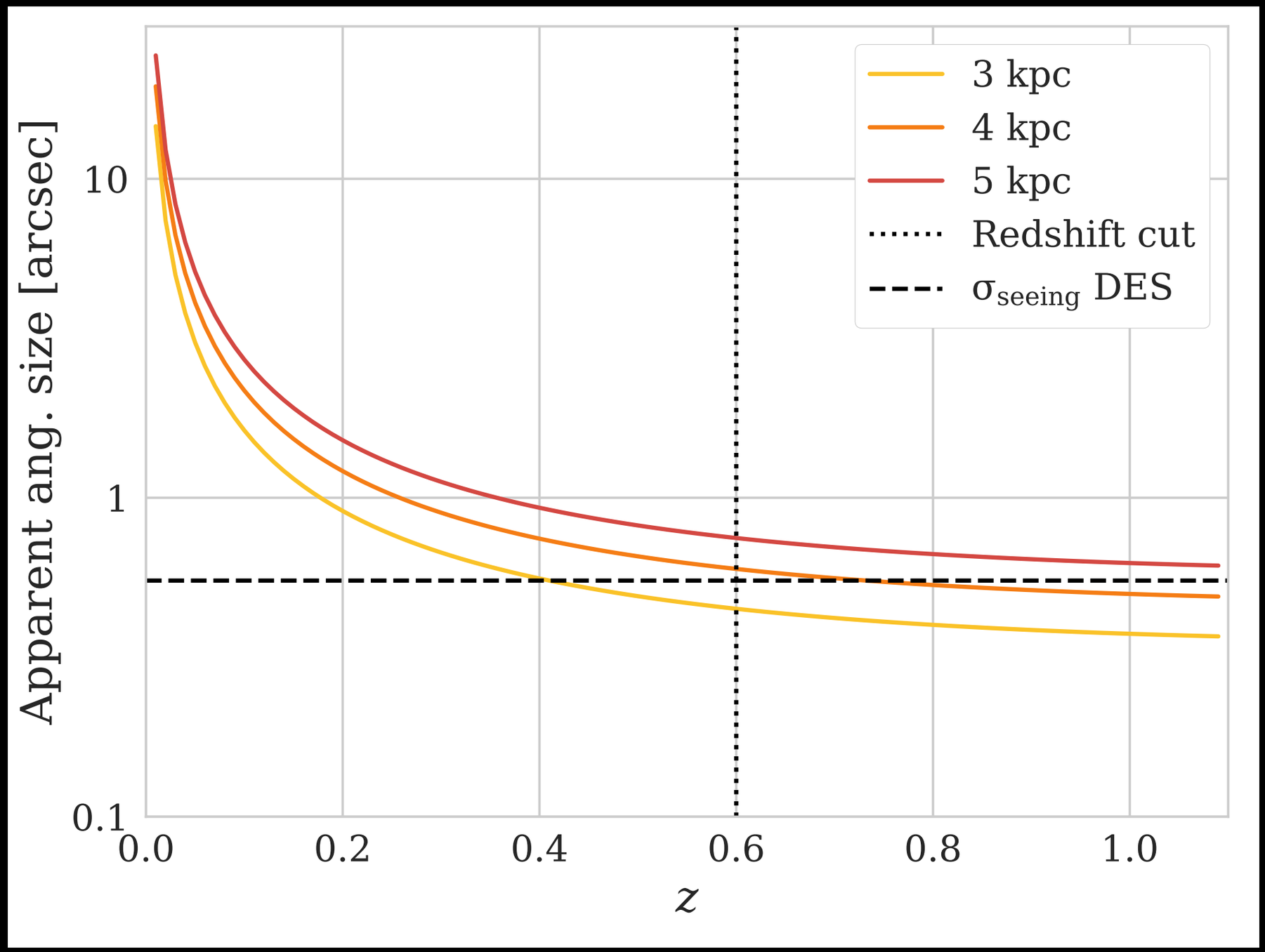


Why DES?

- DES-SN observed 27 square degrees with 6-day cadence
- Spectroscopically confirmed Ia sample
  - ~ 200 objects (3yr)
  - z ~ 0.05-0.85
- Stacked images in *griz* filters



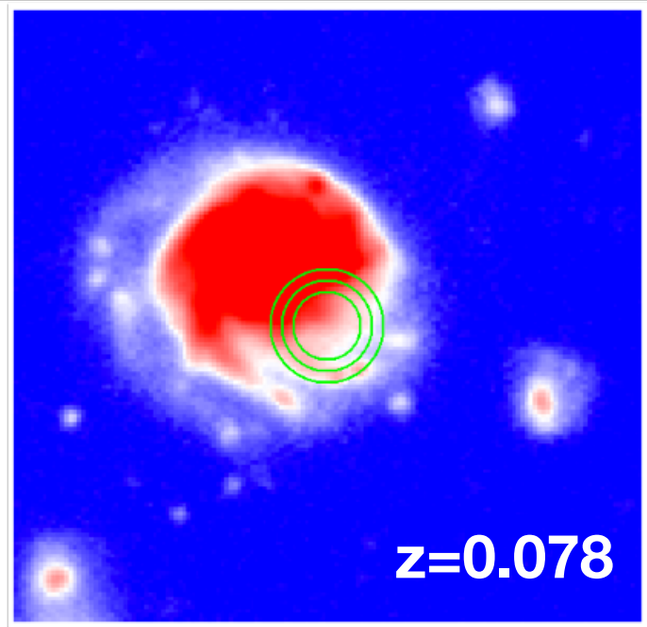
Method

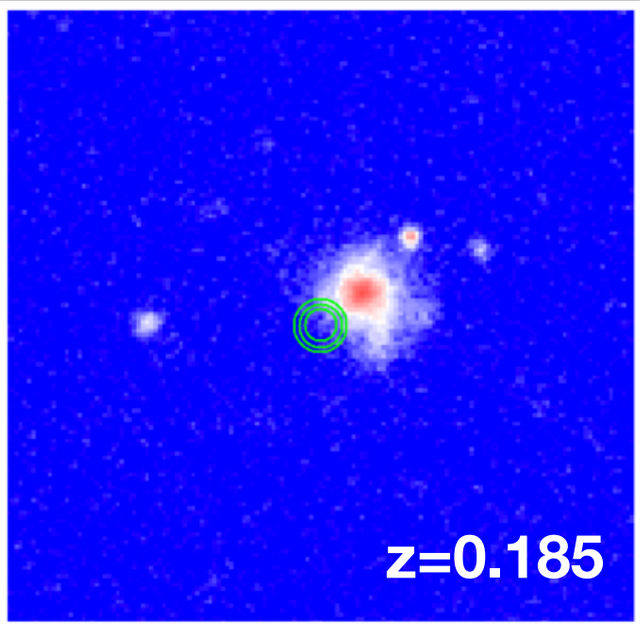


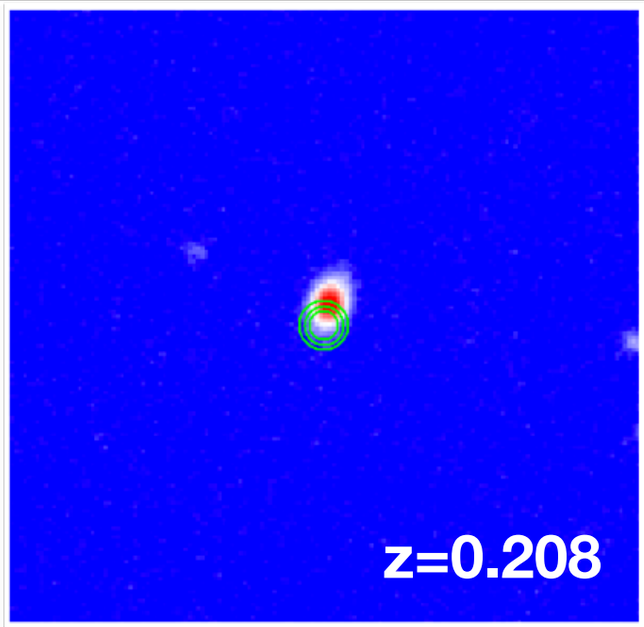
Redshift cut at z=0.6 for seeing-optimised stacks

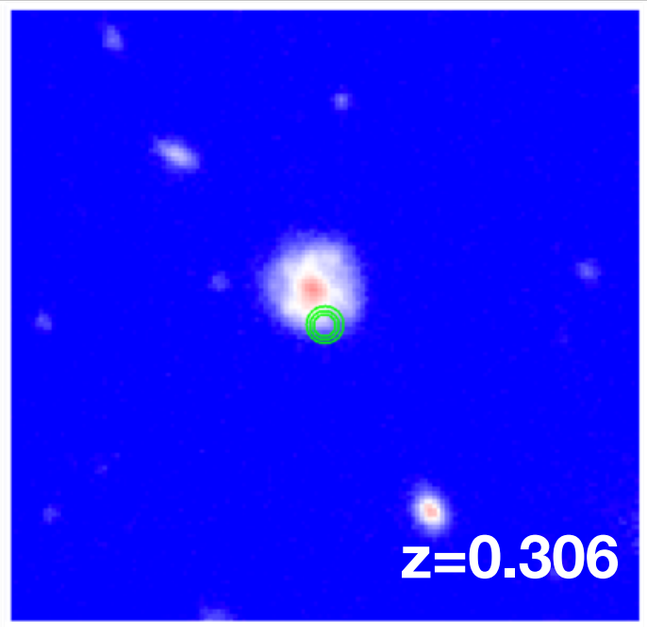
Method

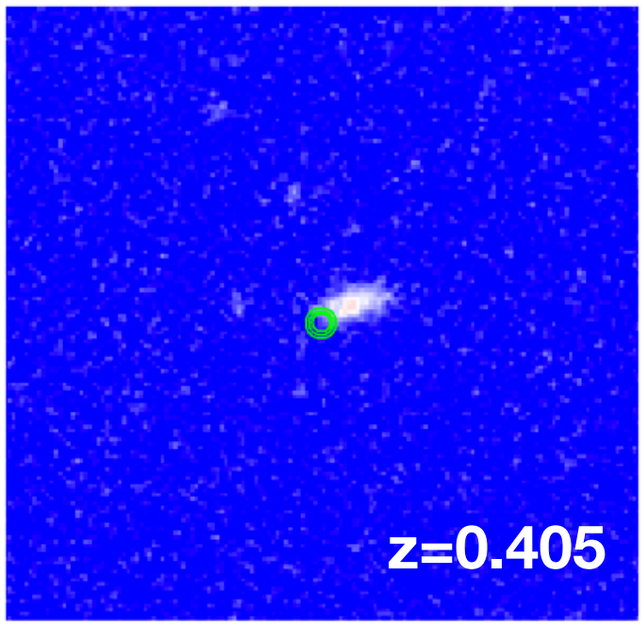
Global vs. local aperture 4-band *griz* photometry
SED fitting using PÉGASE templates

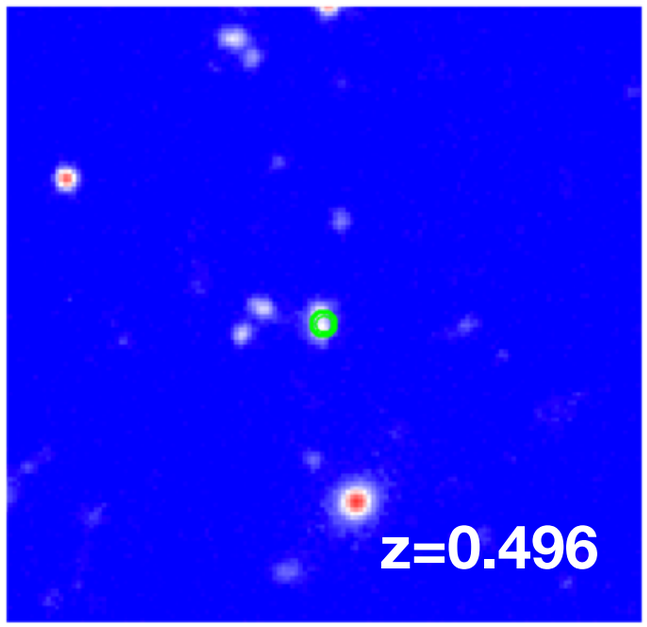


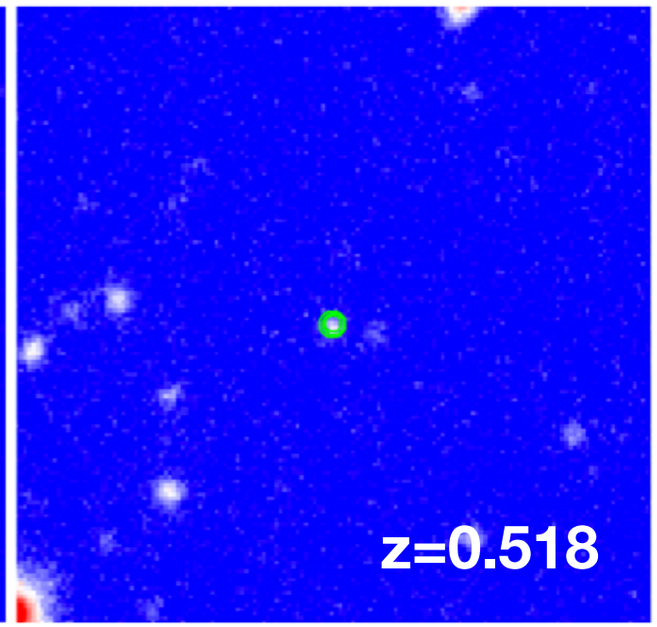


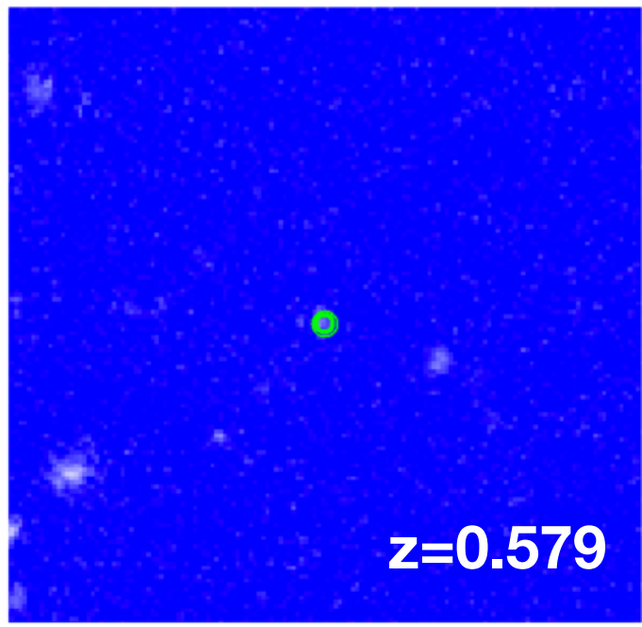












Method

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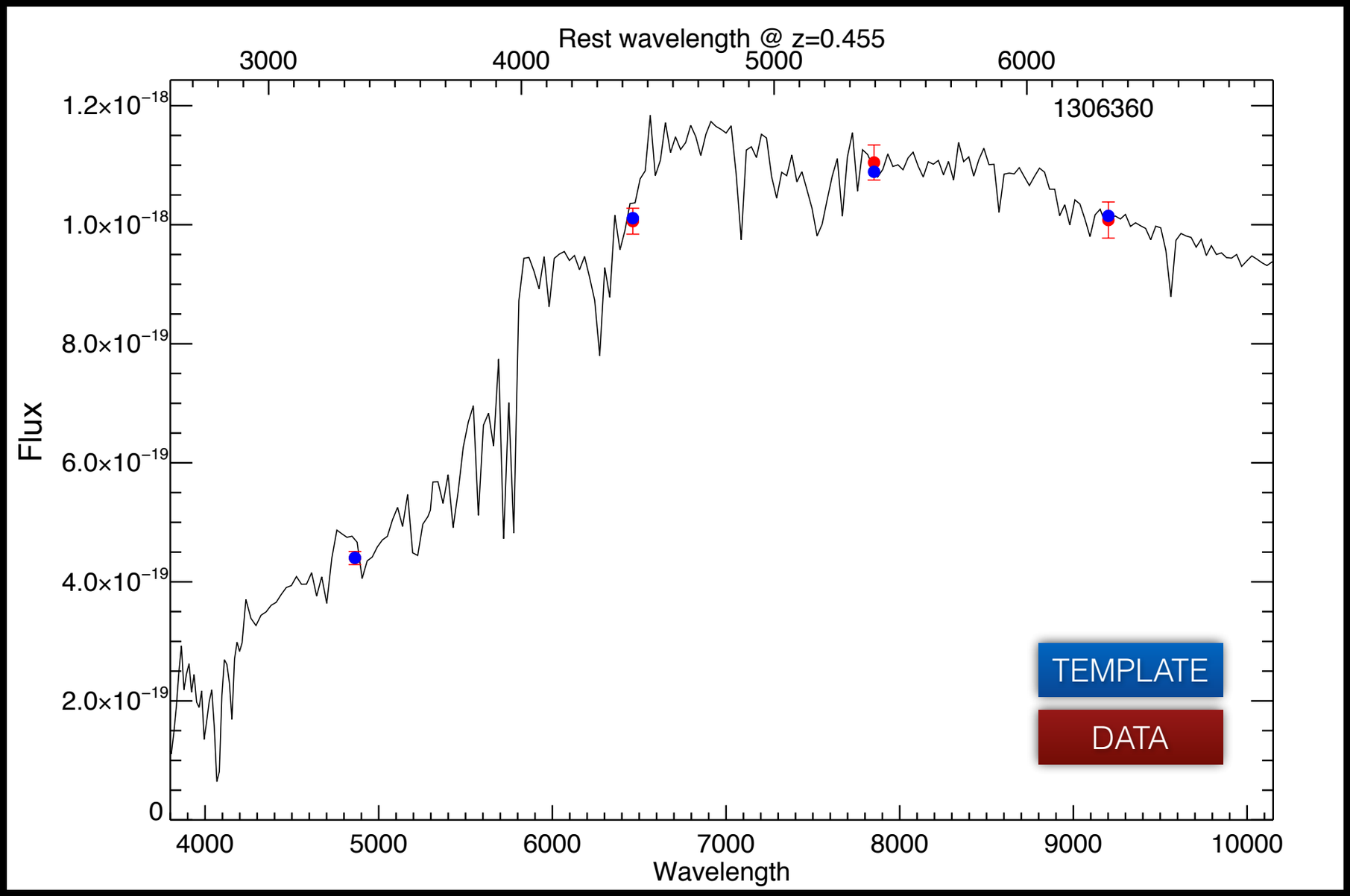
SED fitting using PÉGASE templates



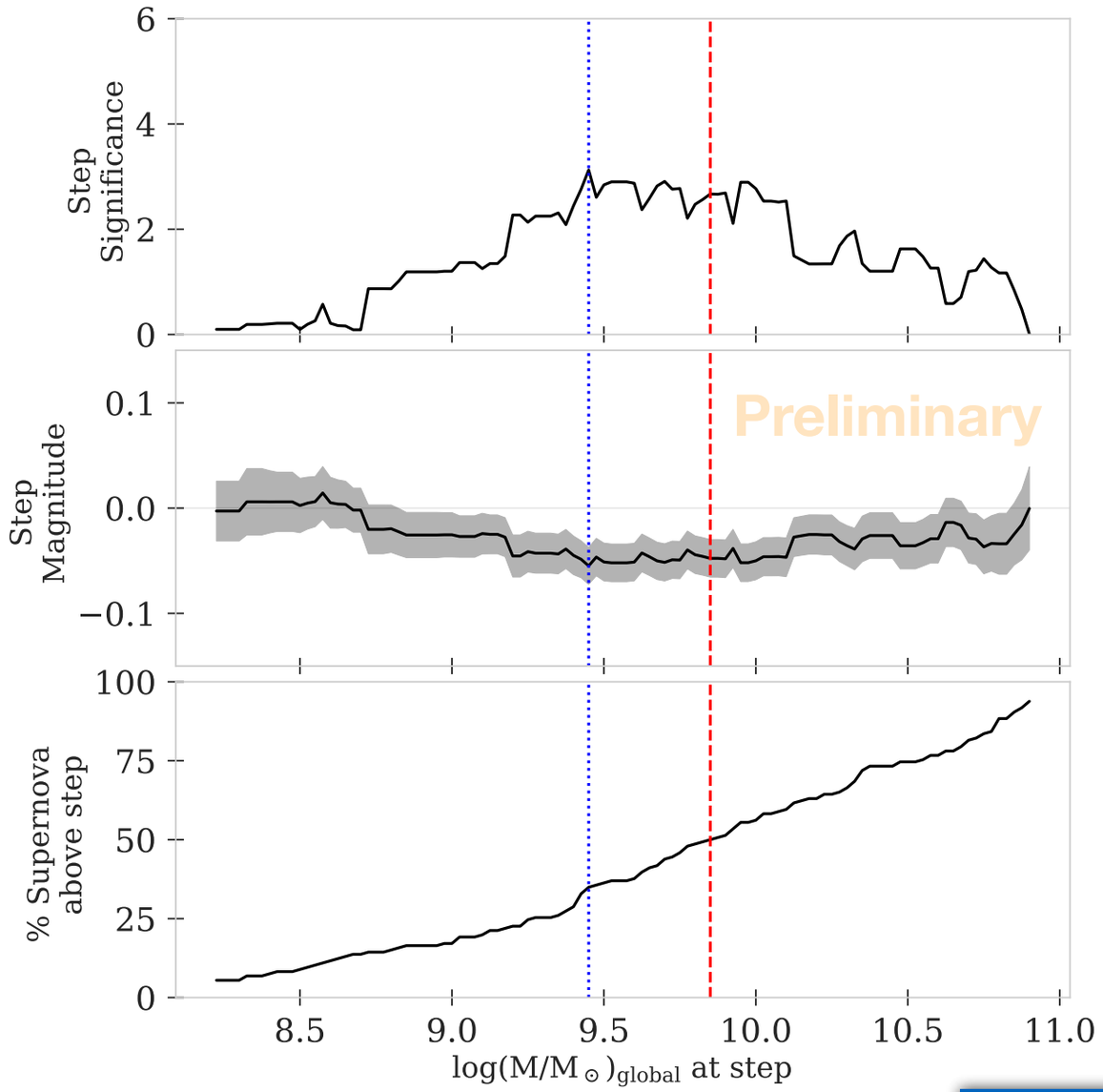
Allows properties to be determined:

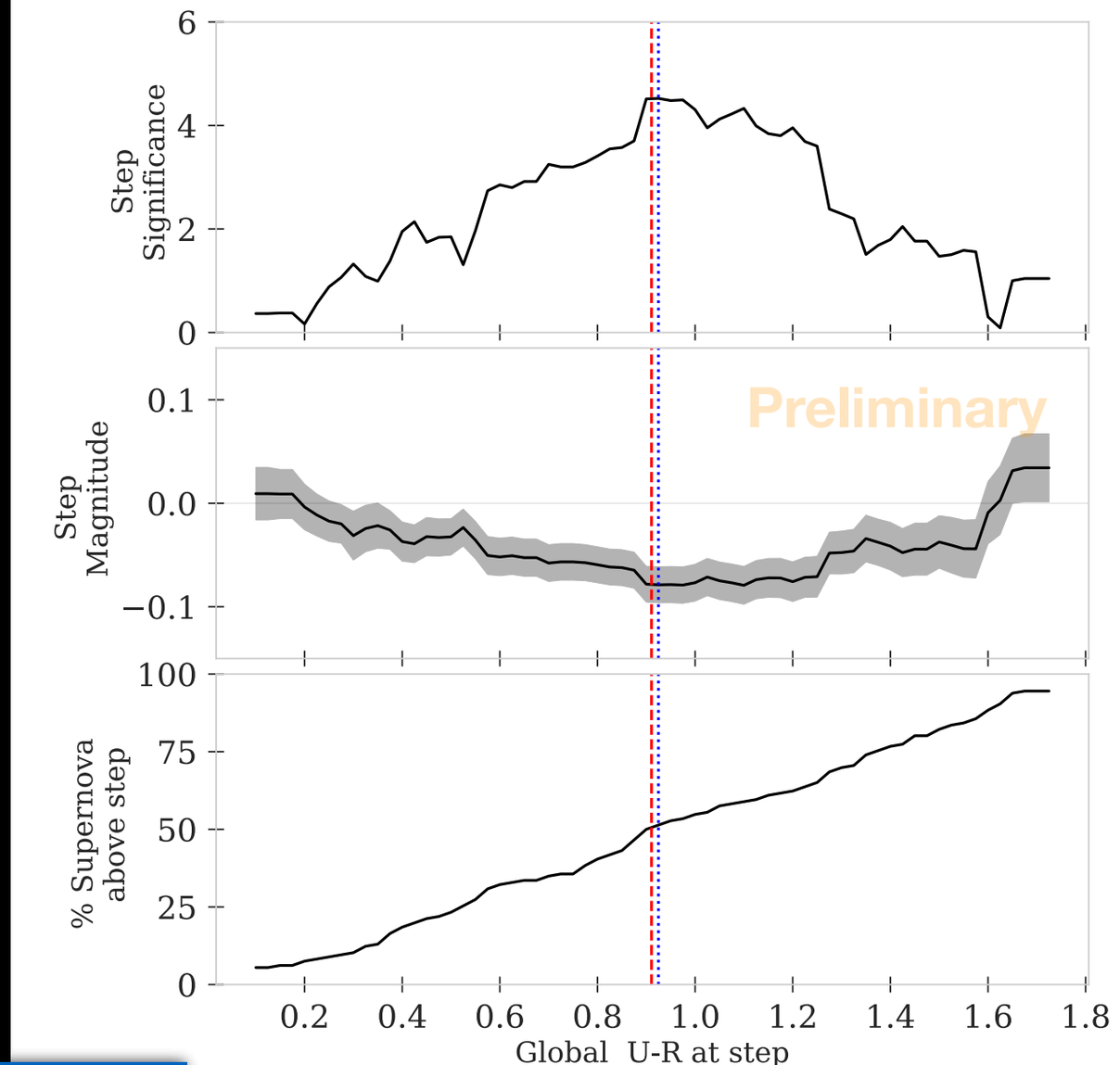
- Age
- SFR
- Stellar Mass
- UBVR Magnitudes

We focus on stellar mass and rest frame U-R colour.

Results

Global



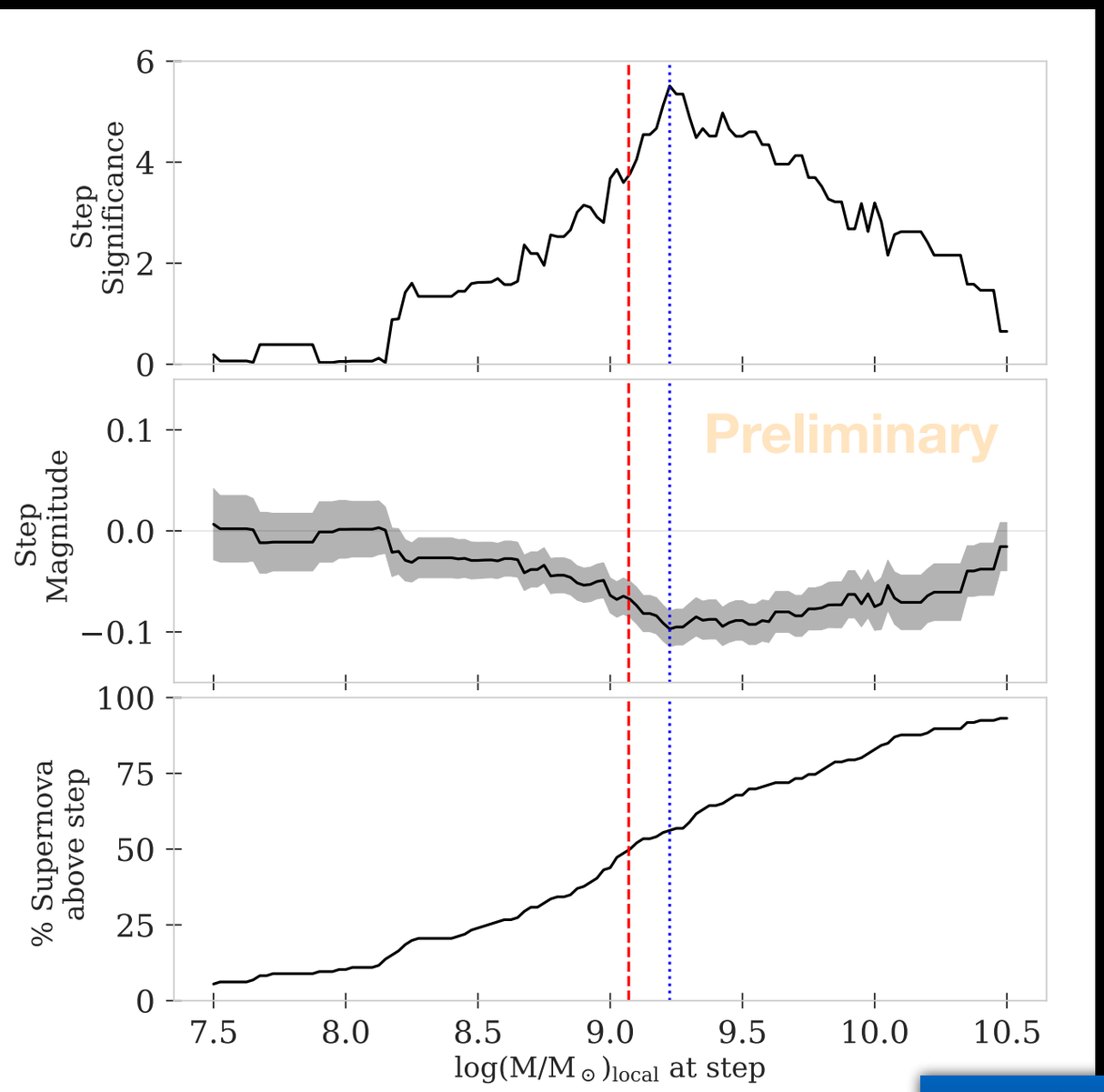


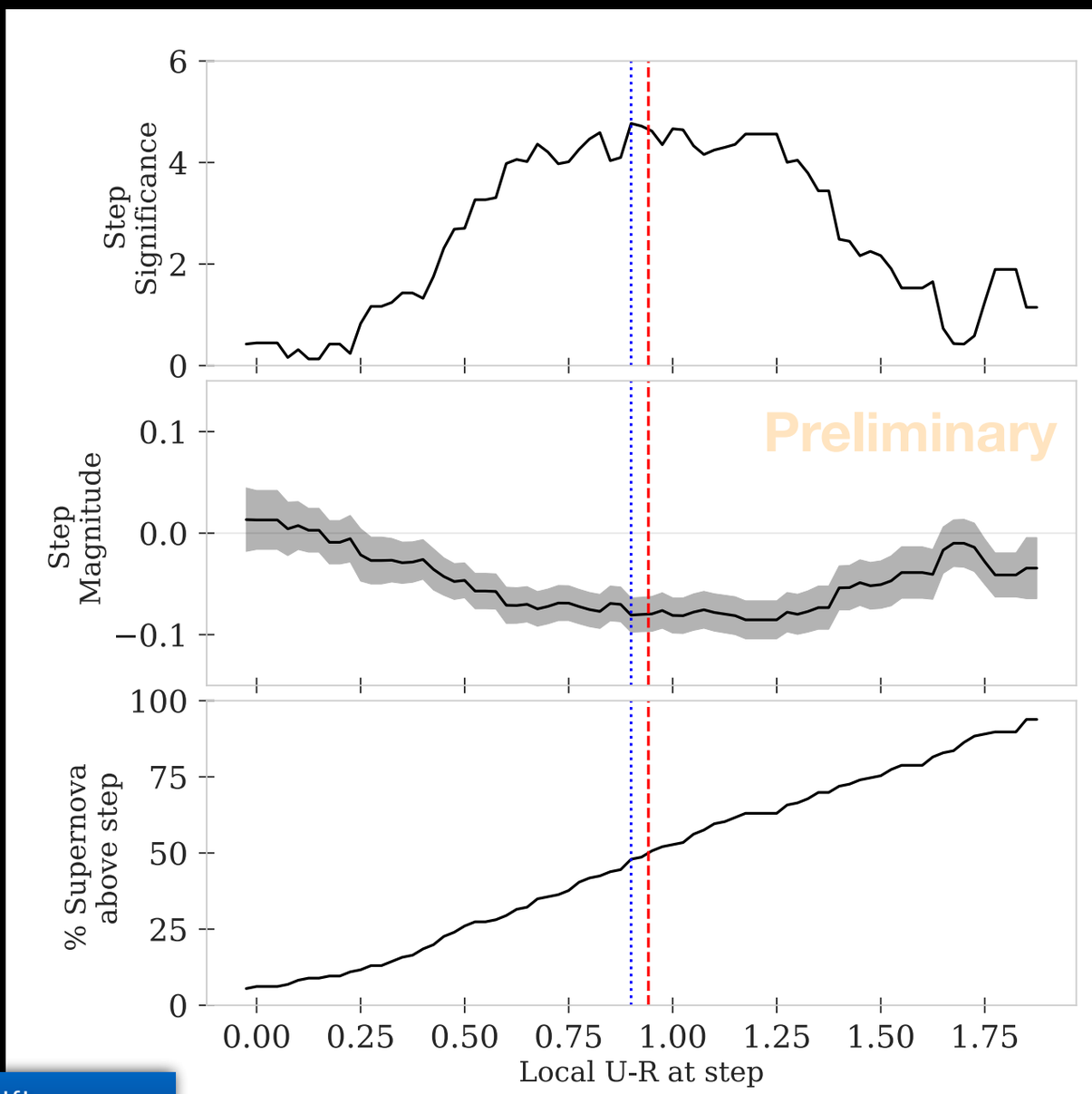
Max Significance

Median of Sample

Results

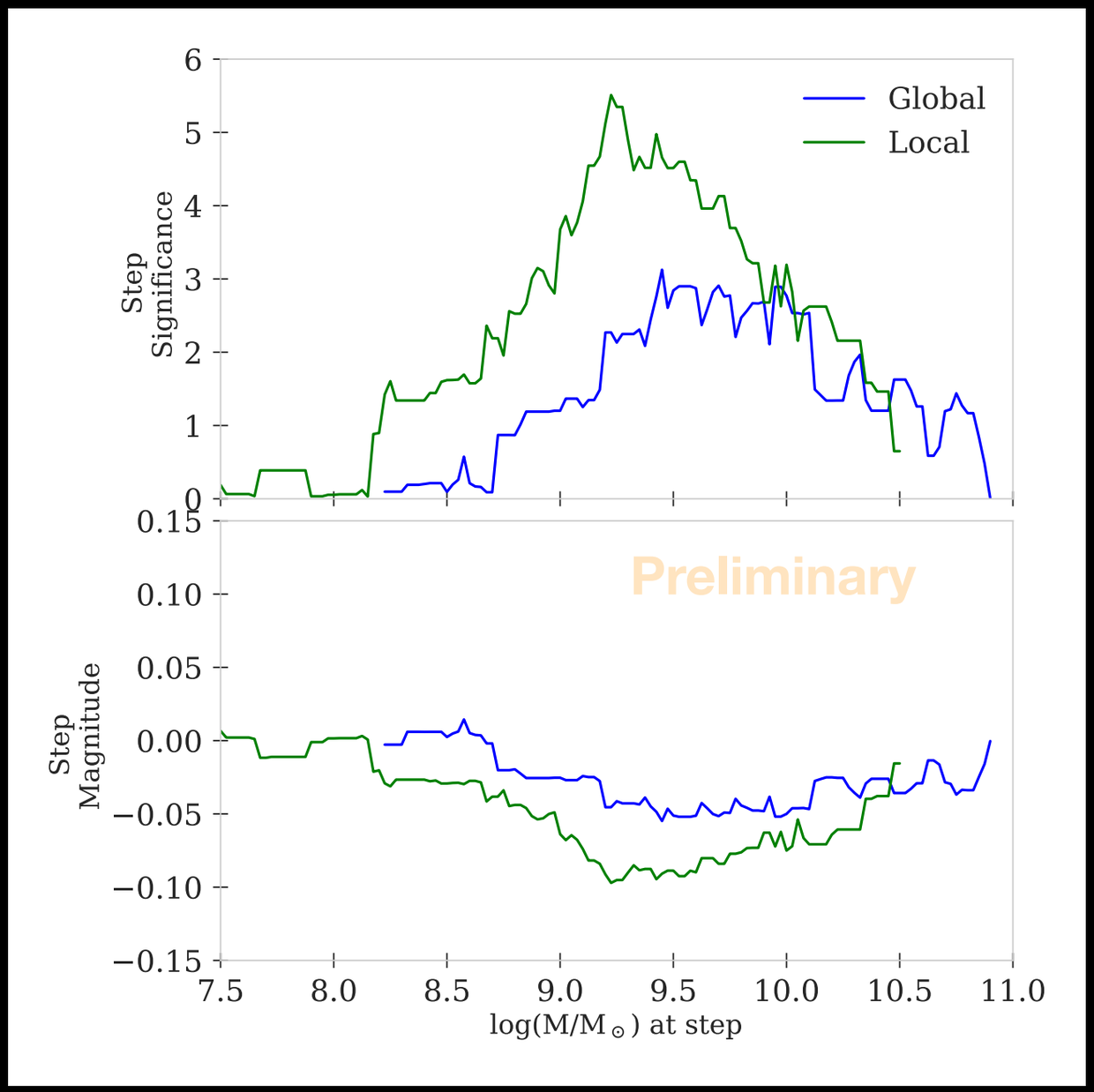
Local - 4kpc radius aperture

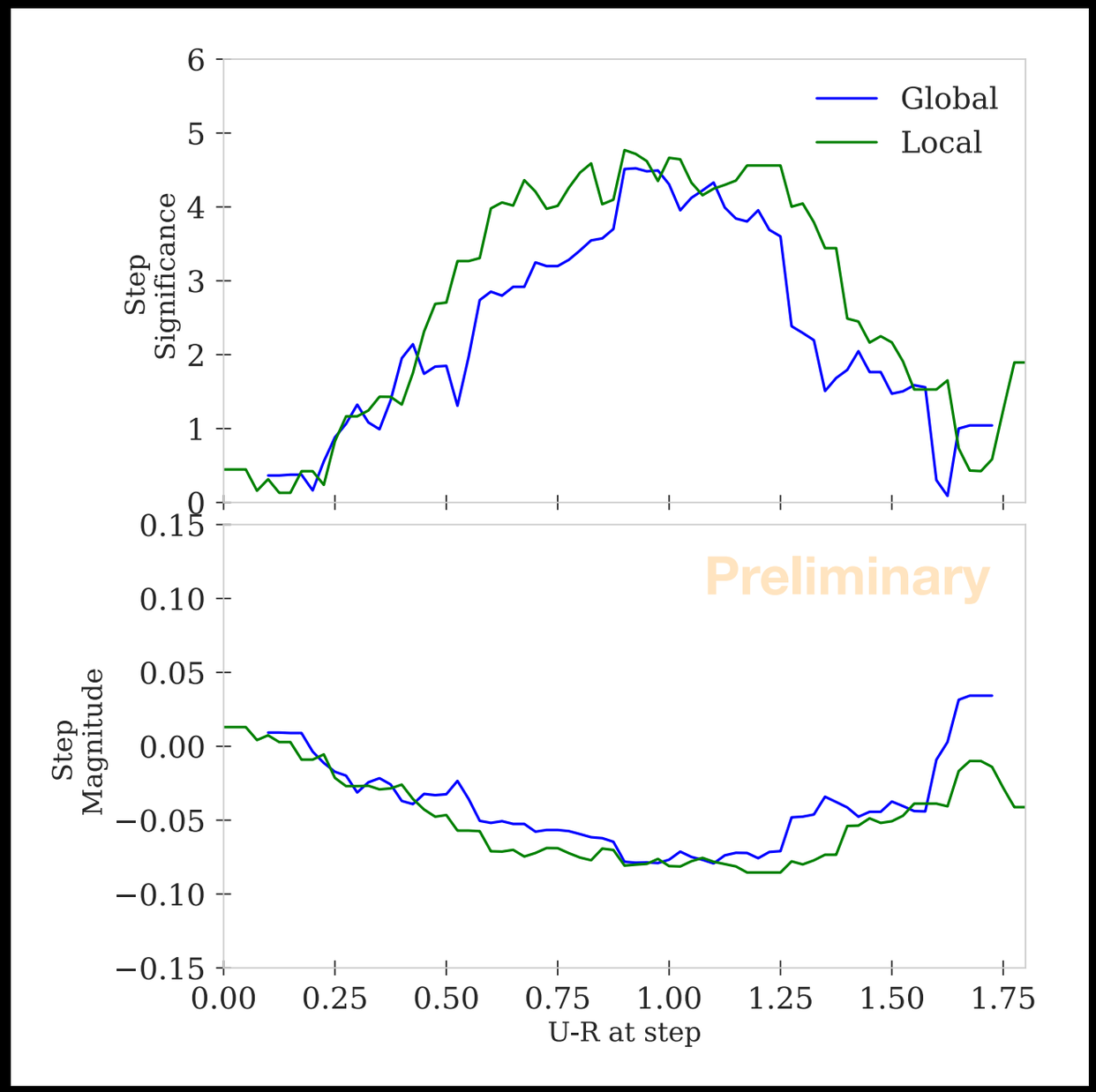


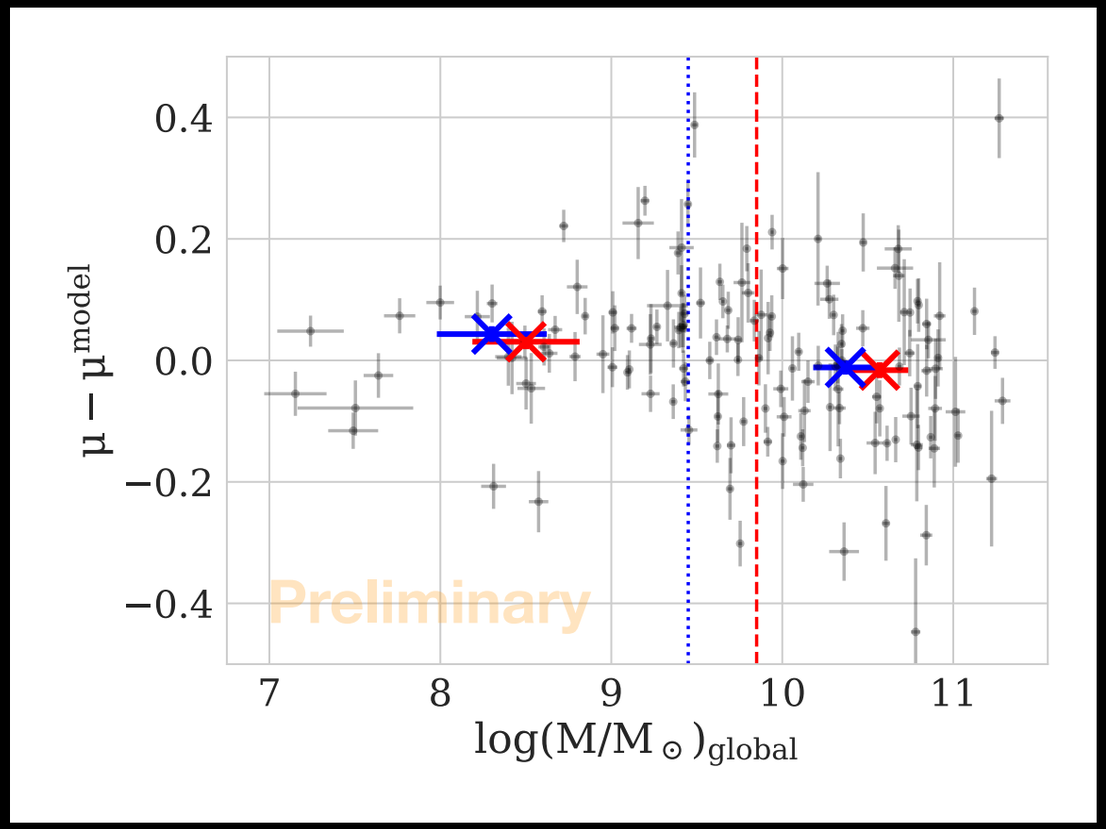


Max Significance

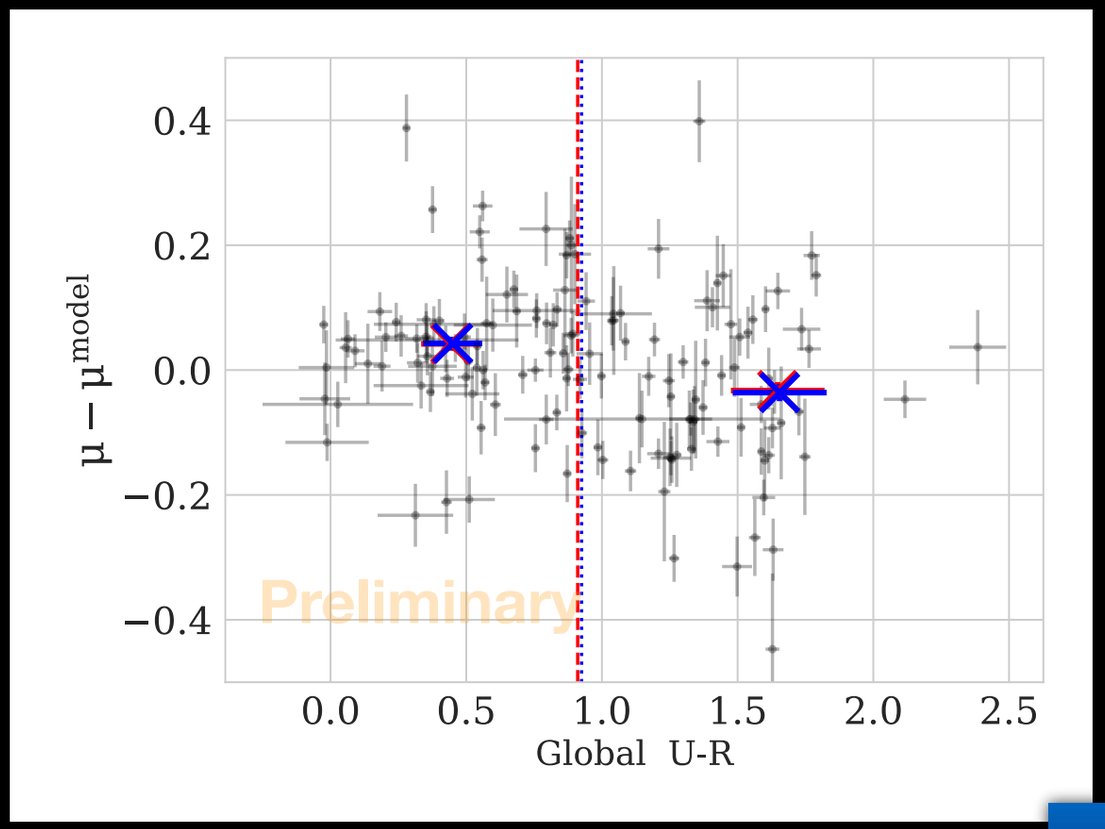
Median of Sample


Global
Local
Step Significance
Step Magnitude
Preliminary
log(M/M⊙) at step


Global
Local
Step Significance
Step Magnitude
Preliminary
U-R at step



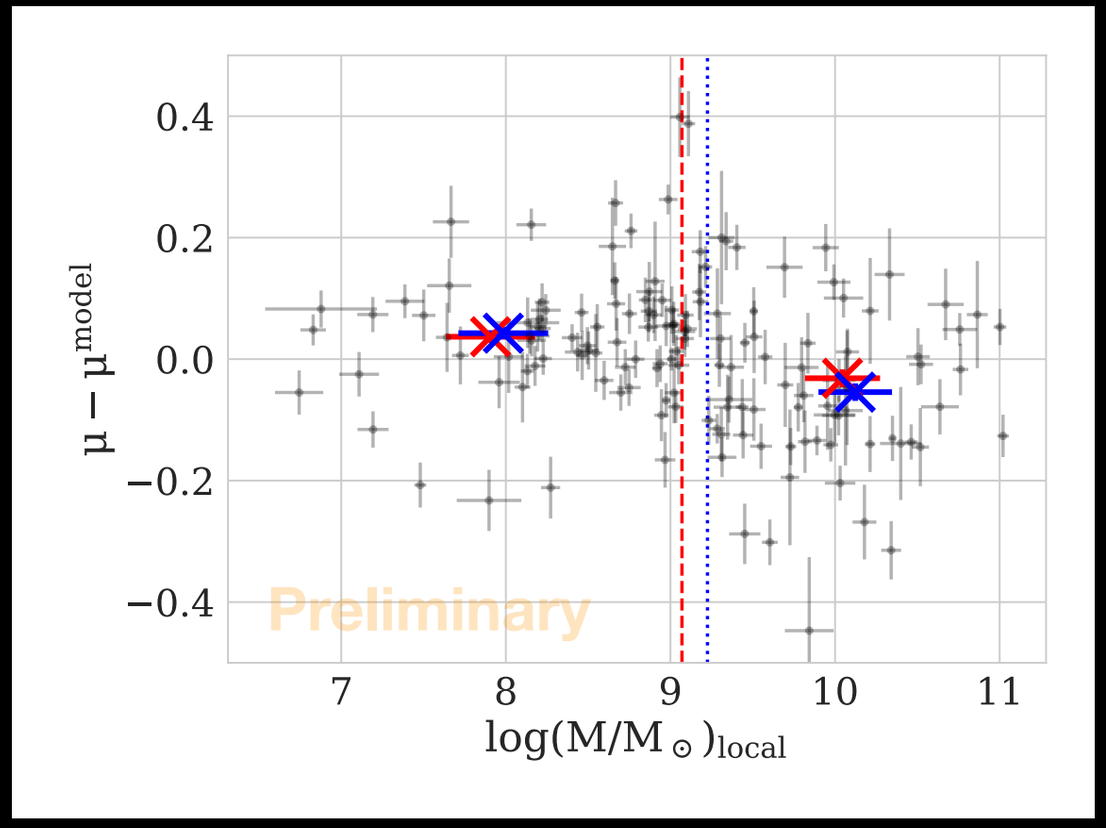
Host Mass = -0.047±0.018 (2.6σ)



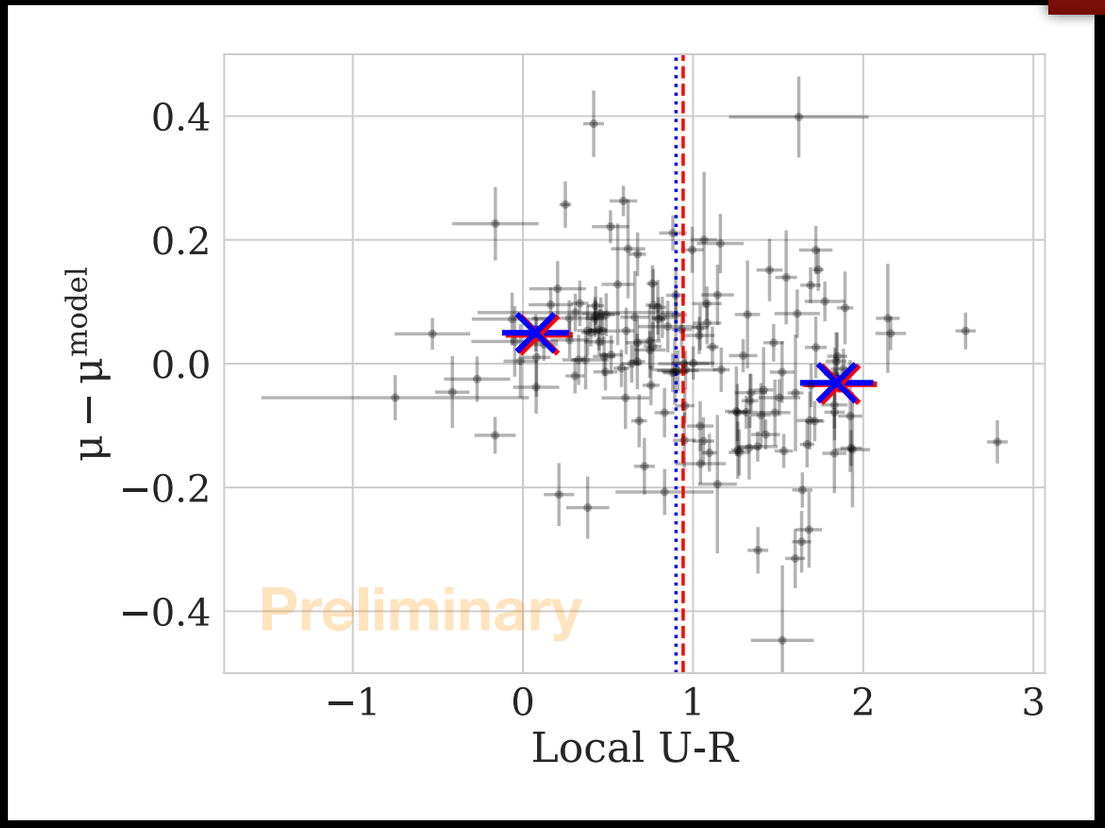
Host U-R = -0.075±0.017 (4.3σ)

Max

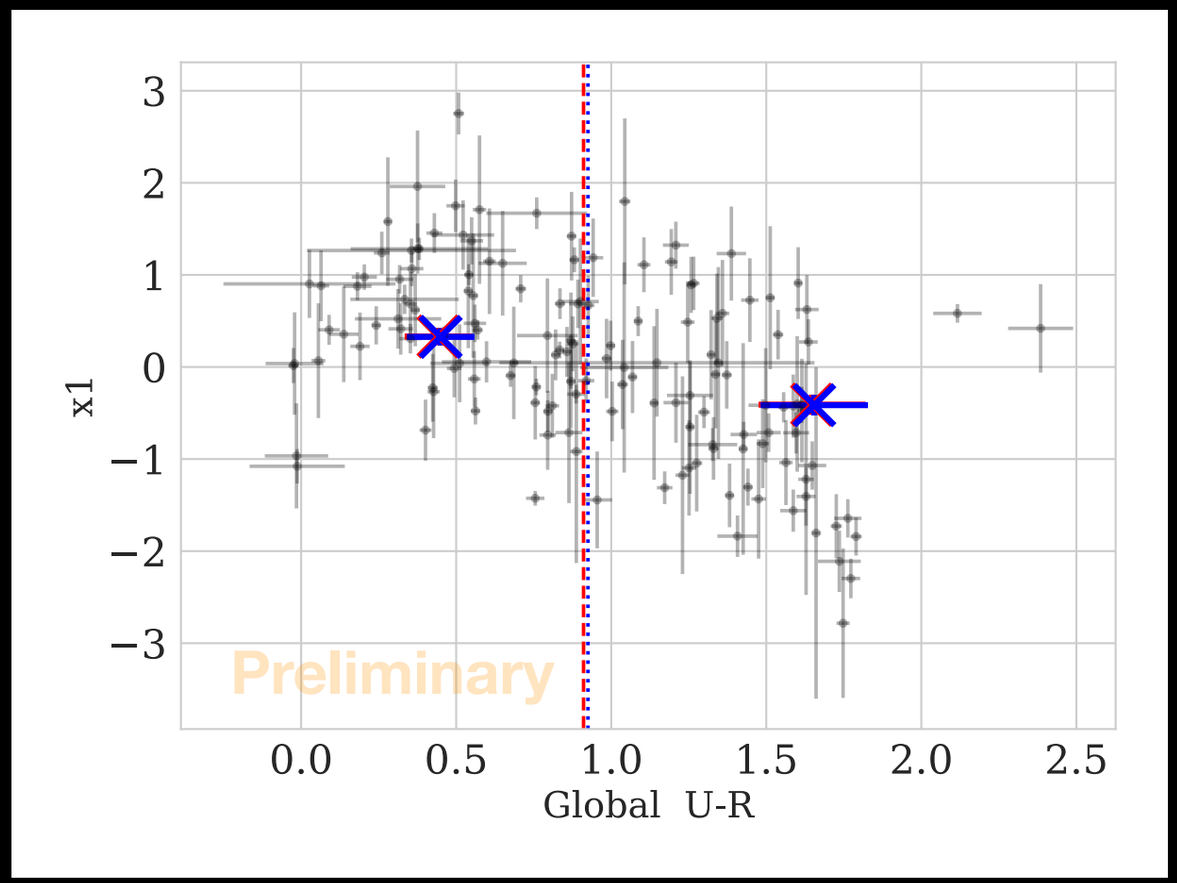
Median

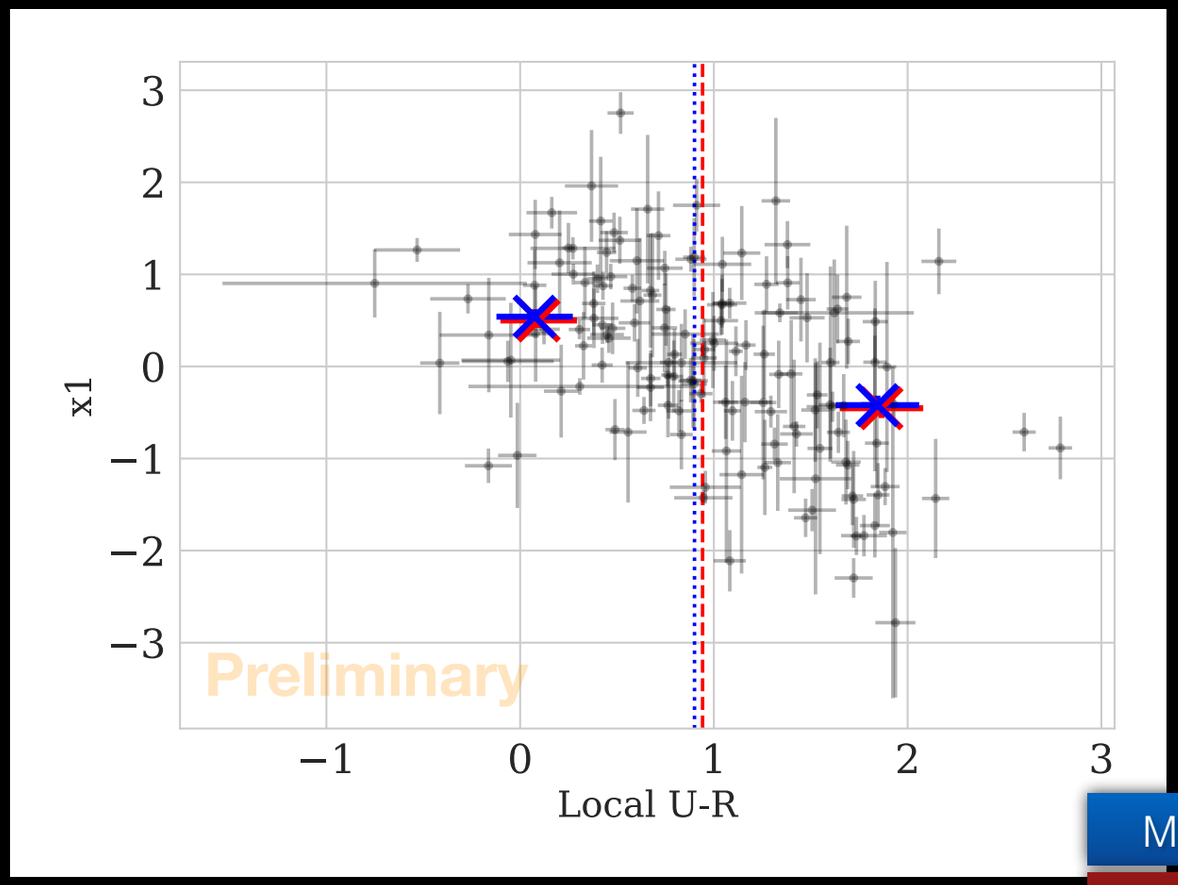


Local Mass = -0.068±0.018 (3.8σ)



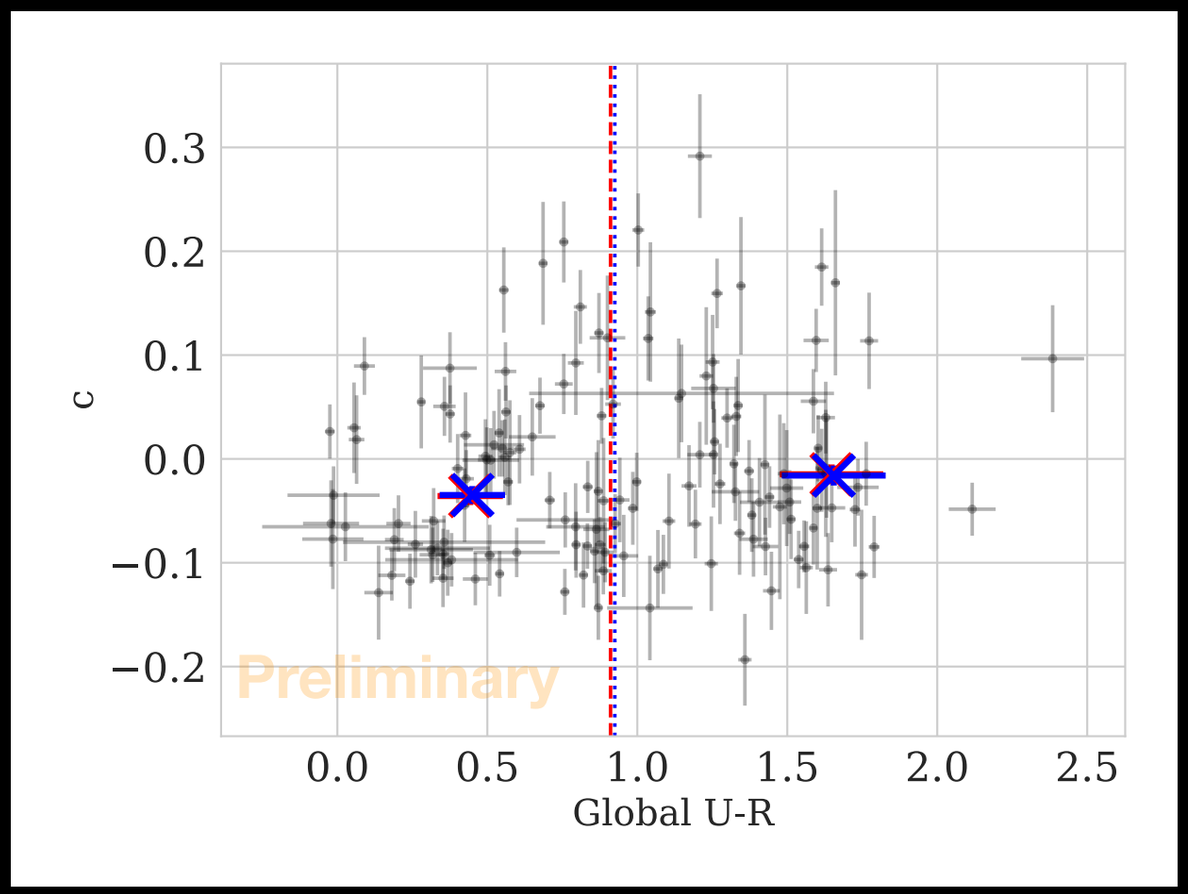
Local U-R = -0.081±0.017 (4.7σ)

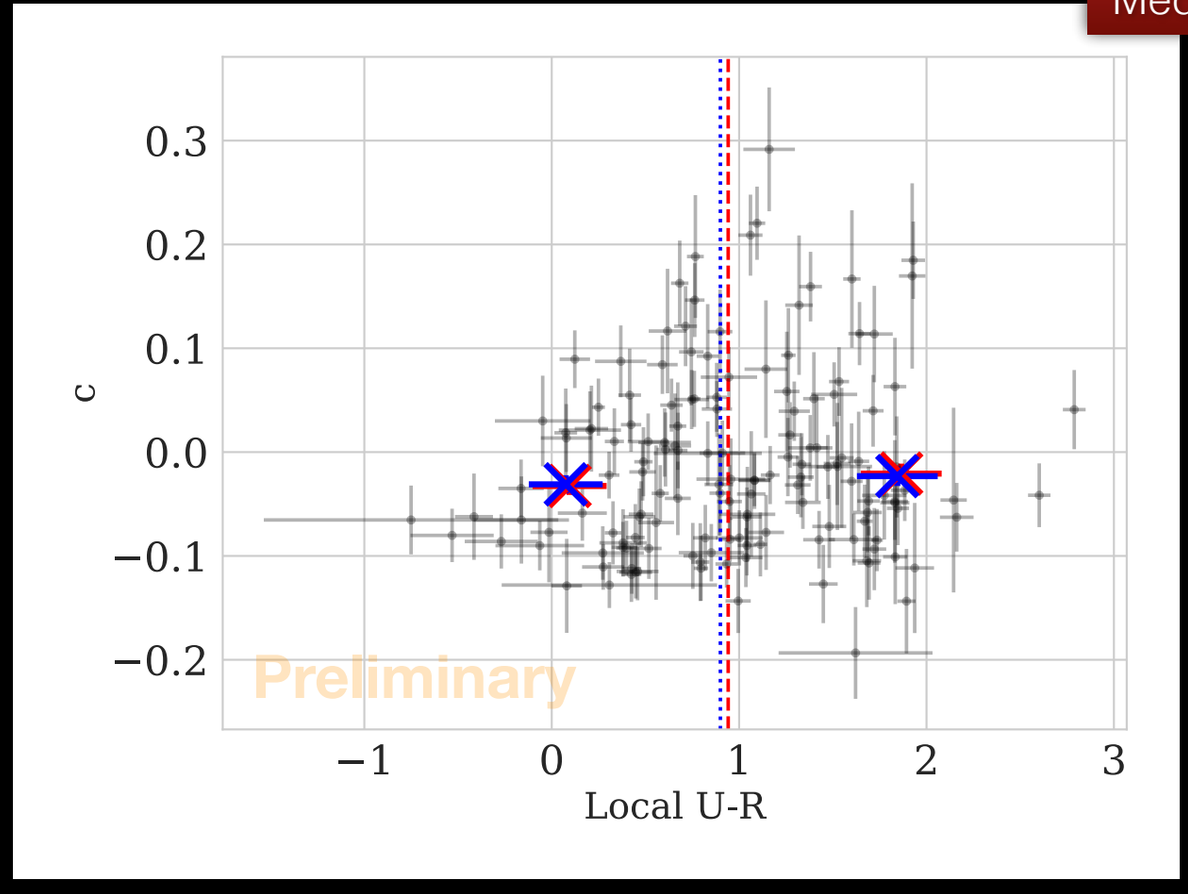

x1
Global U-R
Preliminary


x1
Local U-R
Preliminary

Max

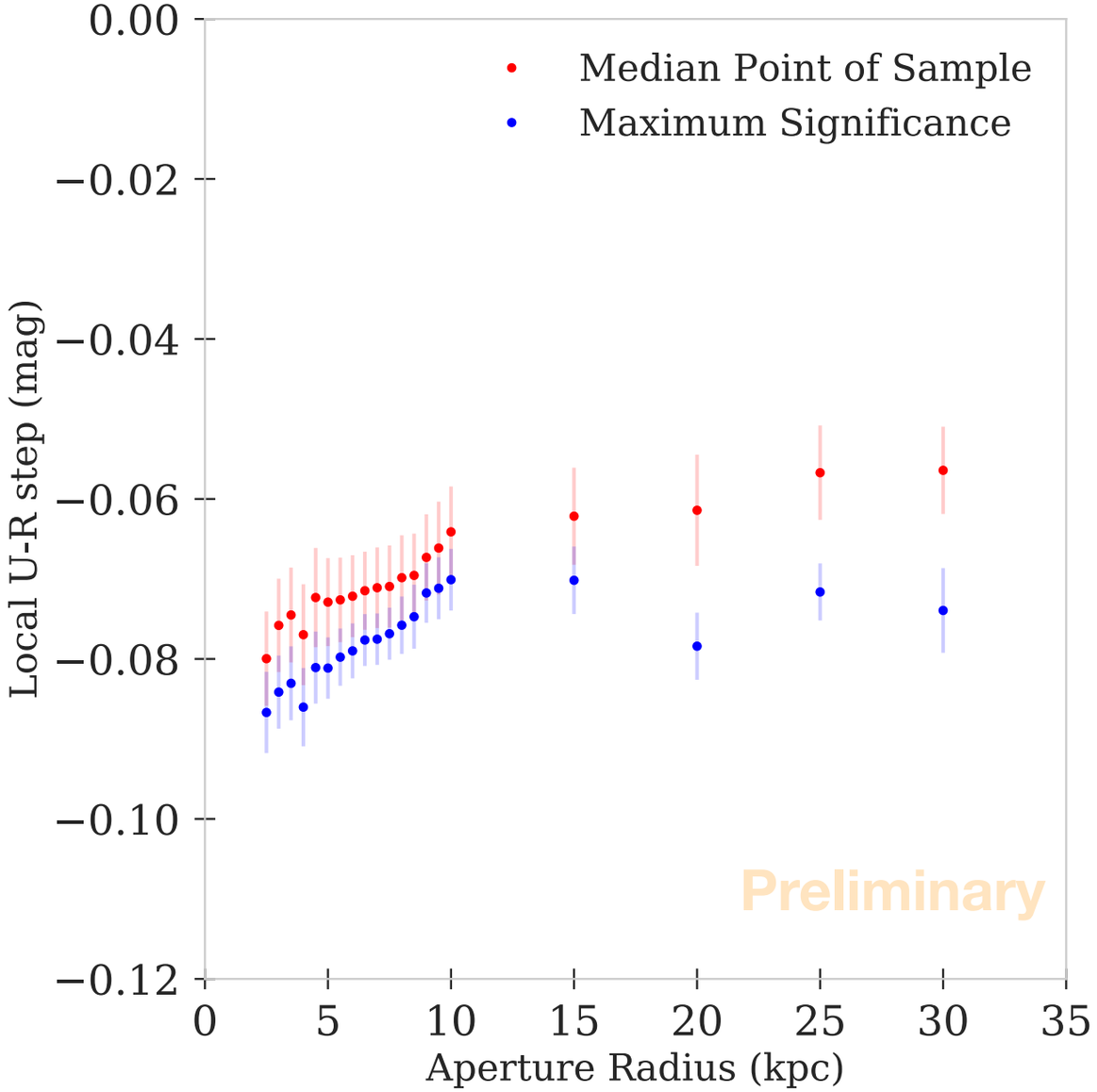
Median

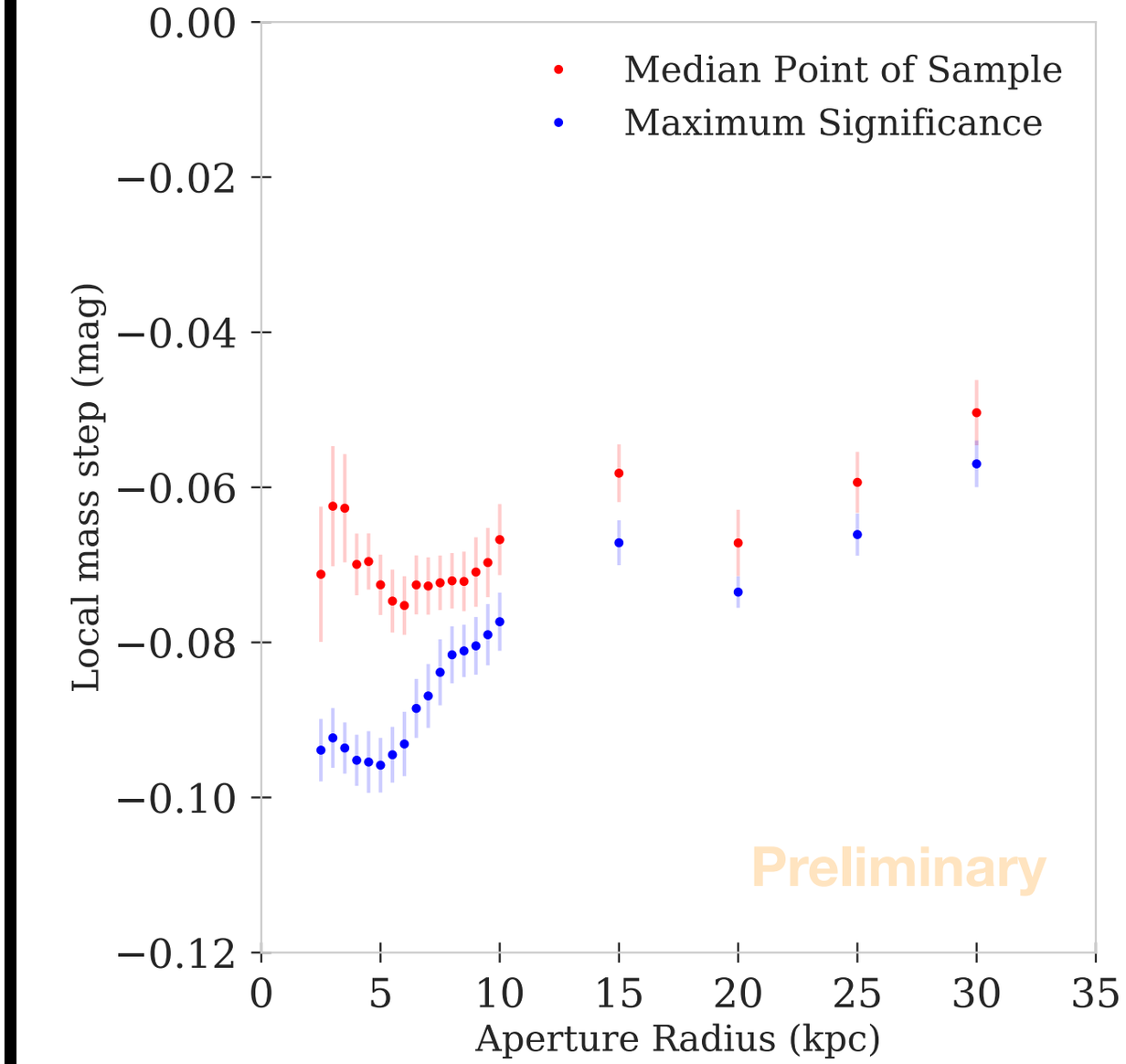

c
Global U-R
Preliminary

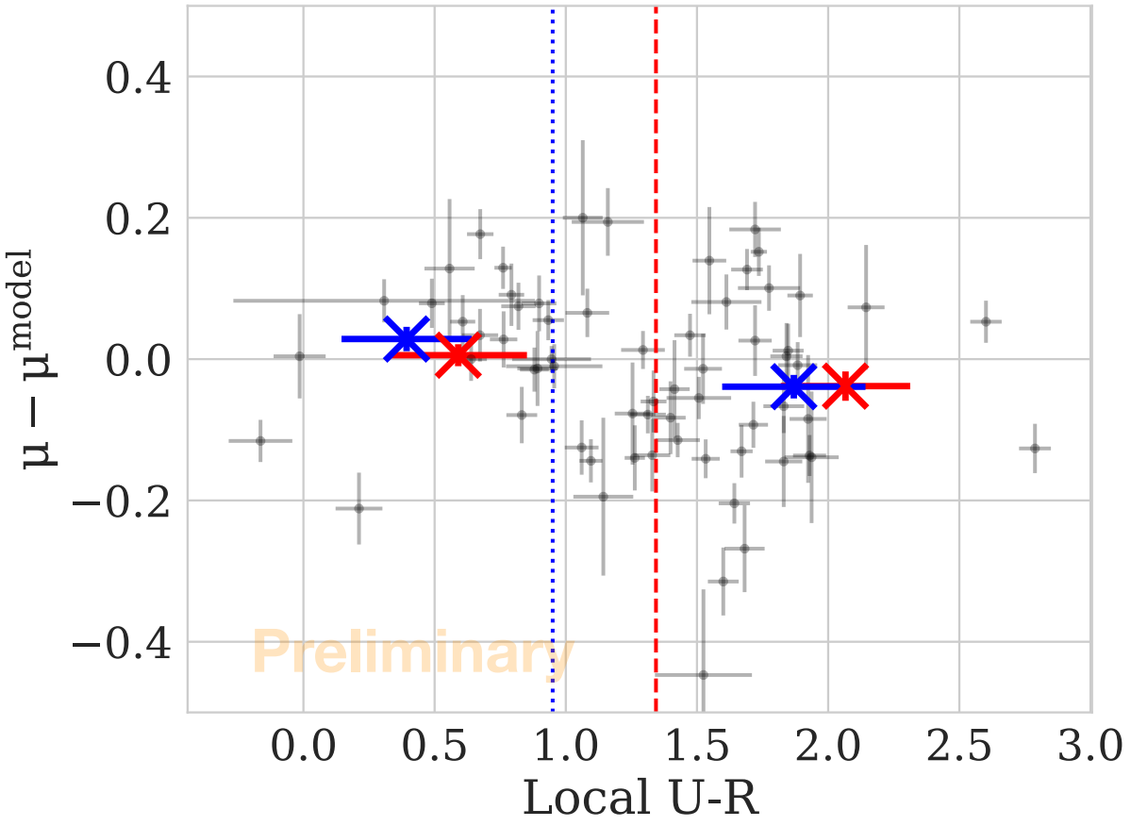

c
Local U-R
Preliminary

Results

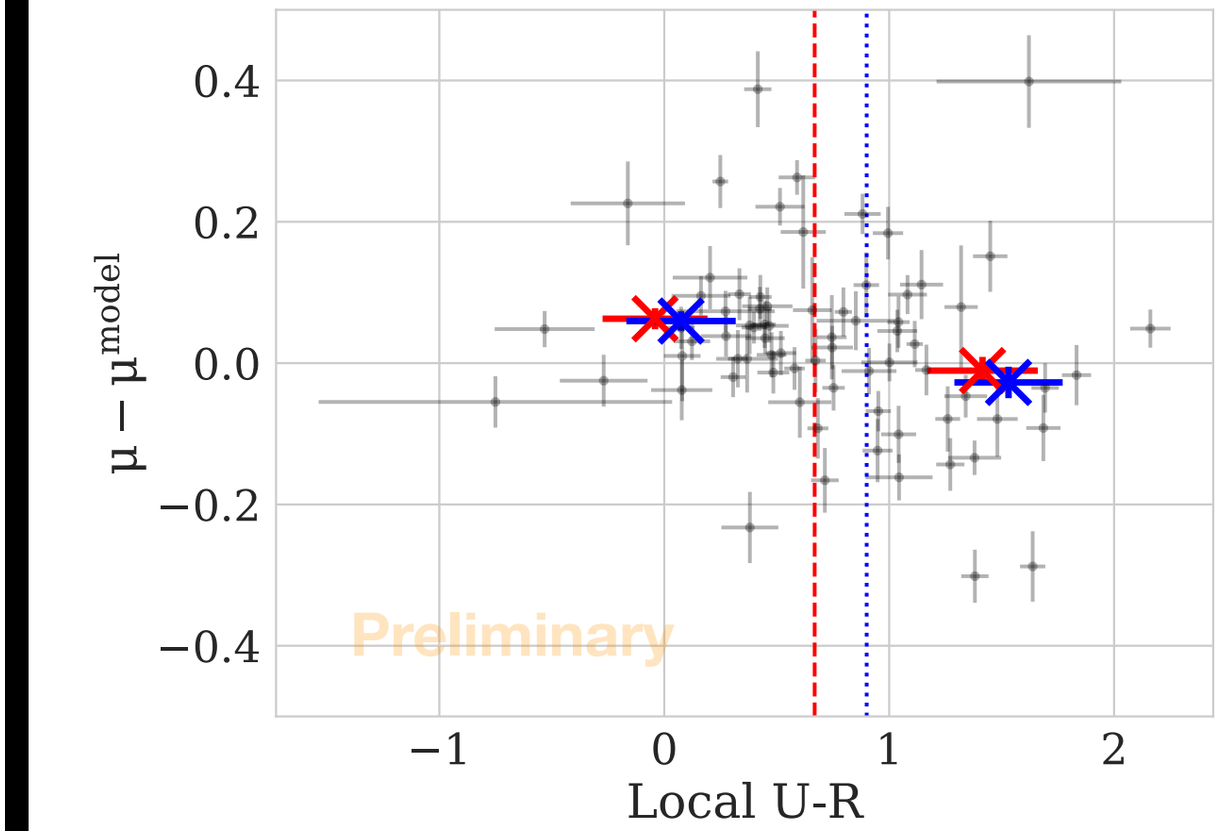
As a function of aperture size





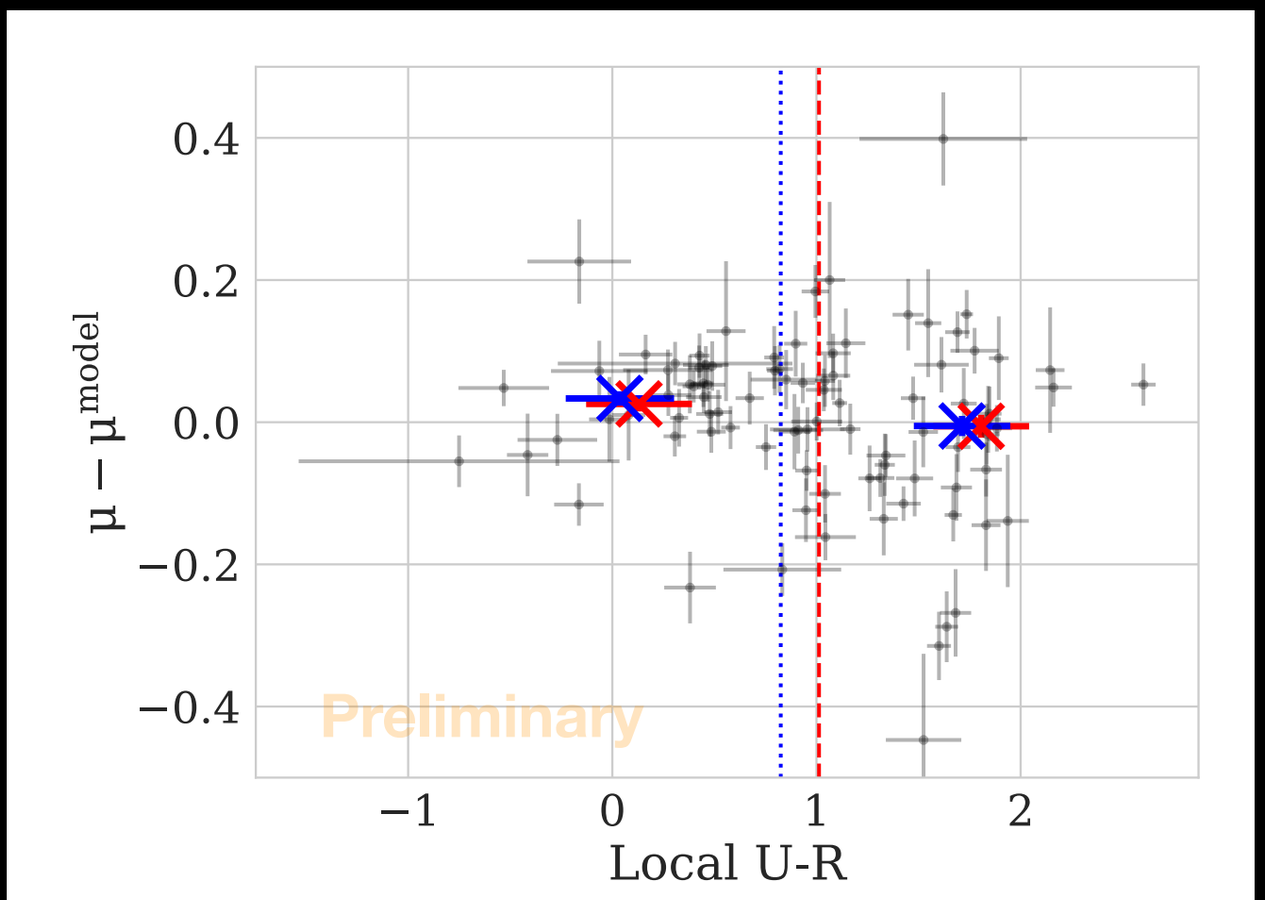


$x_1 < 0$: -0.044±0.026

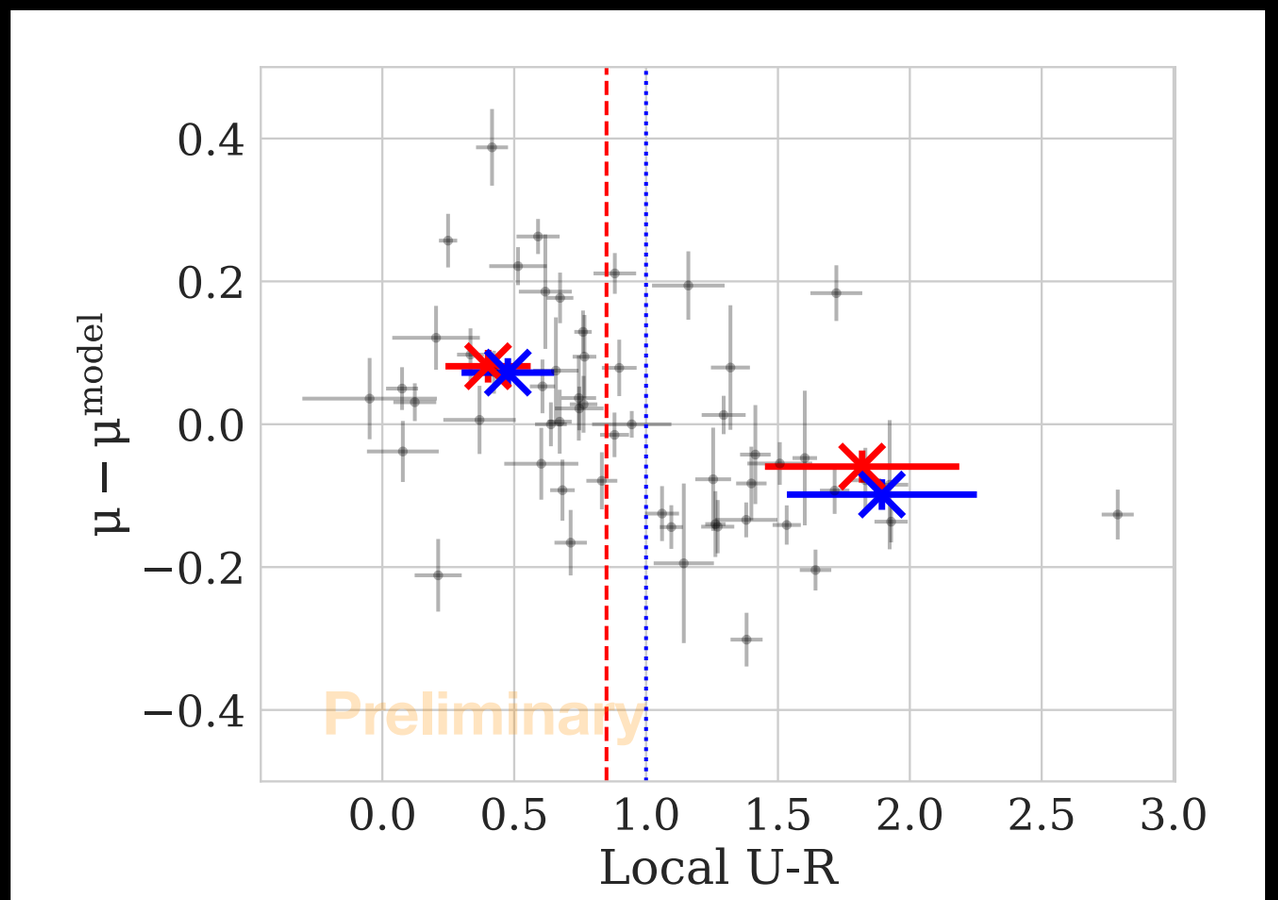


$x_1 > 0$: -0.078±0.023

1.0σ



c < 0 : -0.031±0.019



c > 0 : -0.140±0.032

2.9σ

What does this mean?

- What is the underlying physical quantity or mechanism causing these steps?
- Local or global?
- Which parameter should we correct for?

Expanding this analysis to the ~3000 objects in the full 5-year DES sample will help provide more answers to these questions.

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