

ULTRAVIOLET ASTRONOMY IN THE XXI CENTURY



e-Workshop 2020 – October 27-29

Clues on the afterlife galaxies from SDSS spectra and GALEX photometry

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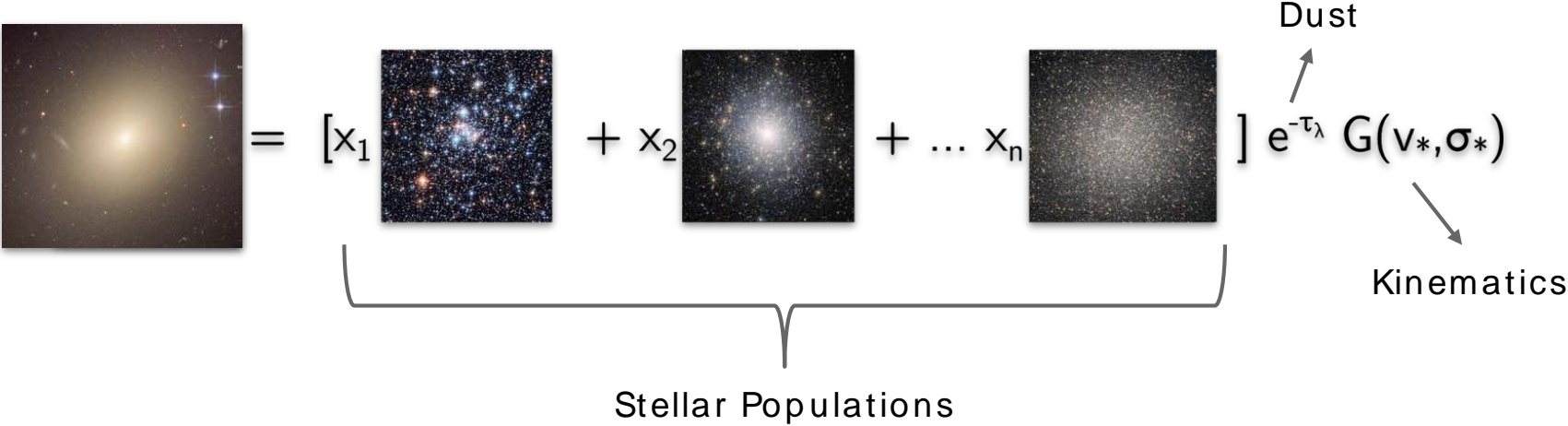


OSSERVATORIO
ASTRONOMICO DI PADOVA

A deep space photograph of a starry night sky. The background is a dark, dense field of stars of various colors, including white, yellow, and blue. A prominent feature is a large, diffuse nebula or galaxy structure that spans across the middle of the frame. This structure has a mix of colors, including dark blue, purple, and brownish-orange, suggesting different chemical compositions and temperatures. The text 'Spectral synthesis: STARLIGHT' is overlaid in the center-left area in a clean, white, sans-serif font. The word 'Spectral synthesis:' is in a larger font size than 'STARLIGHT', which is in all caps.

Spectral synthesis:
STARLIGHT

Spectral synthesis

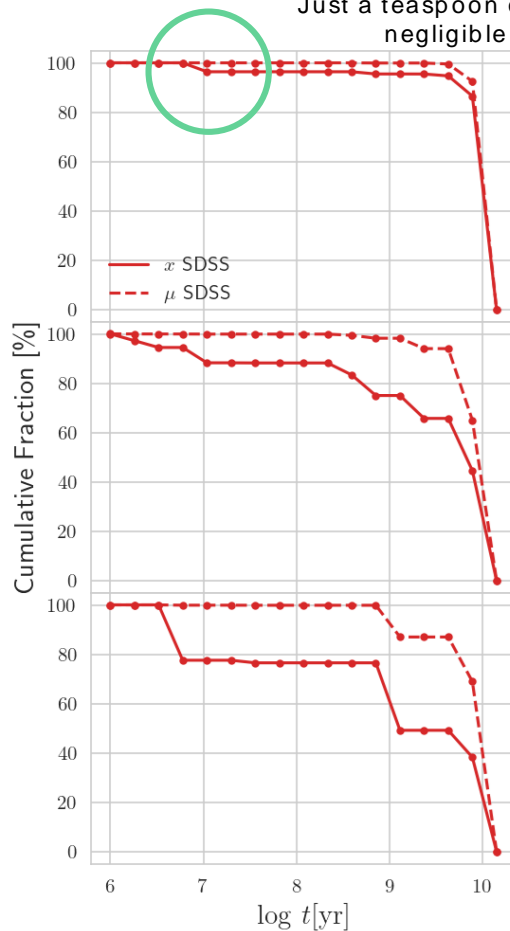
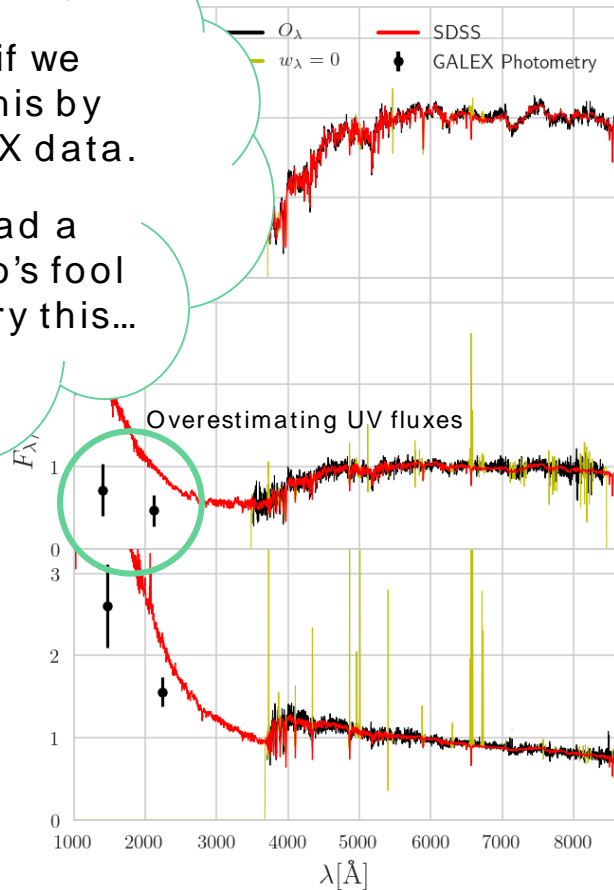


An old known issue

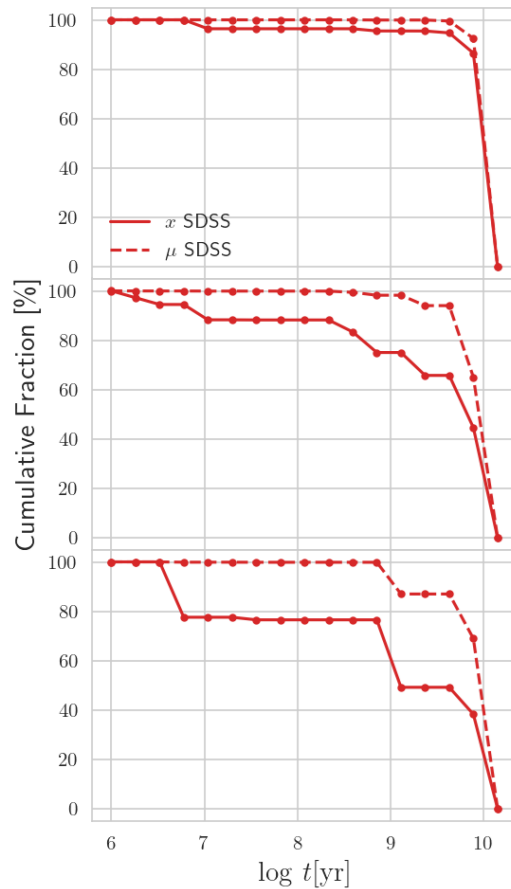
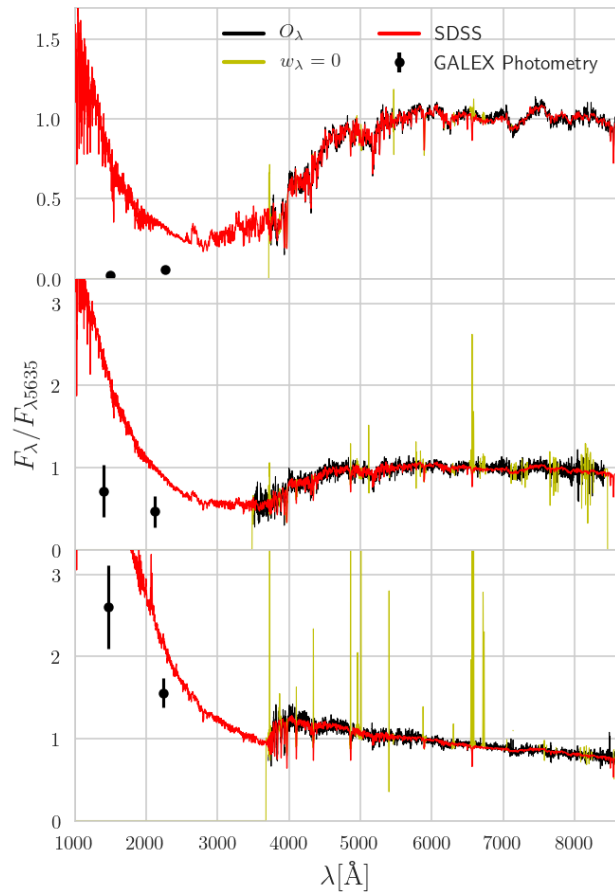
Just a teaspoon of optical light,
negligible in mass

I wonder if we
could fix this by
fitting GALEX data.

If only I had a
student who's fool
enough to try this...

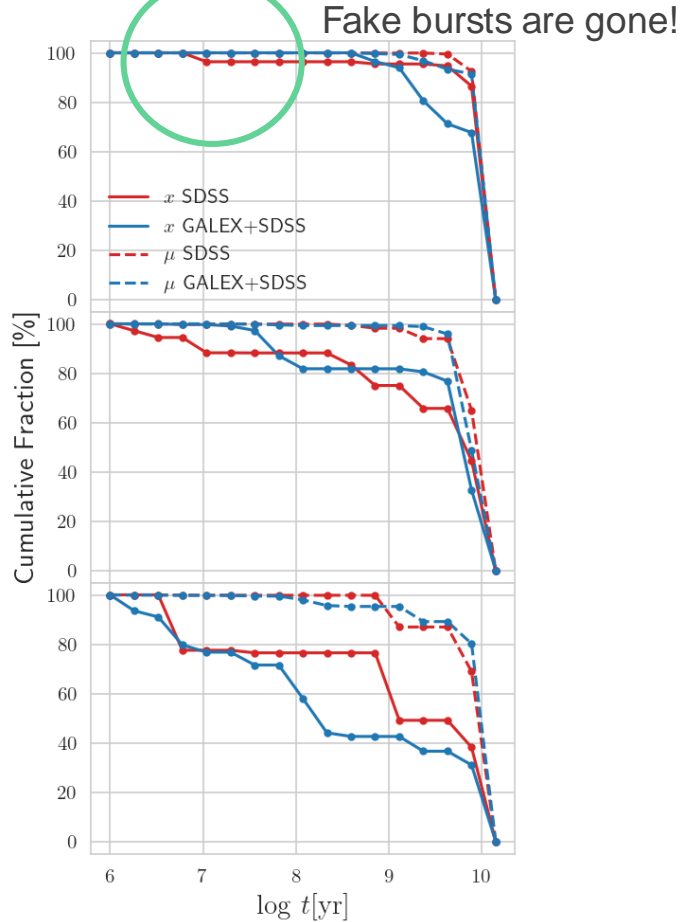
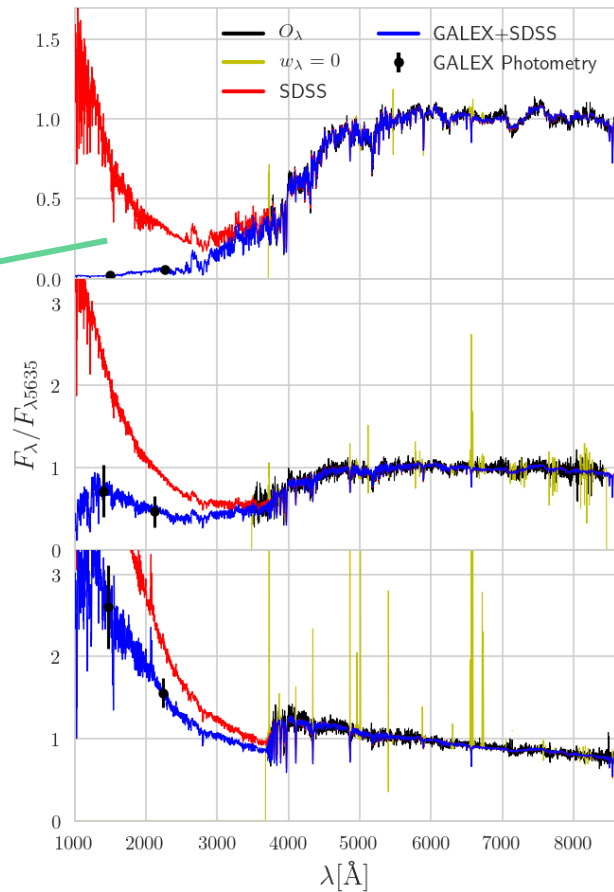


GALEX+SDSS synthesis



GALEX+SDSS synthesis

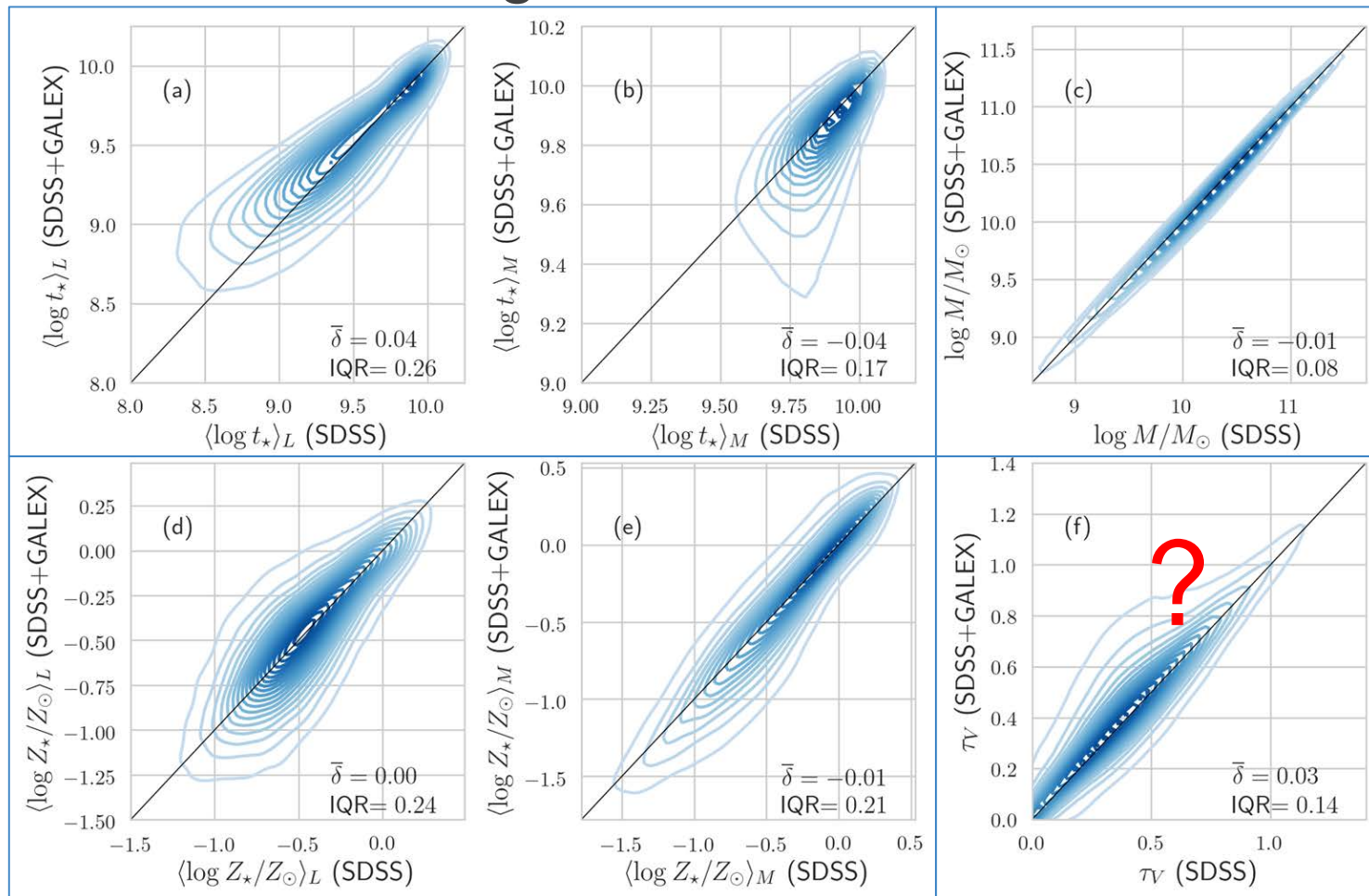
GALEX data prevents the overshooting of UV fluxes!





What changes
with UV data?

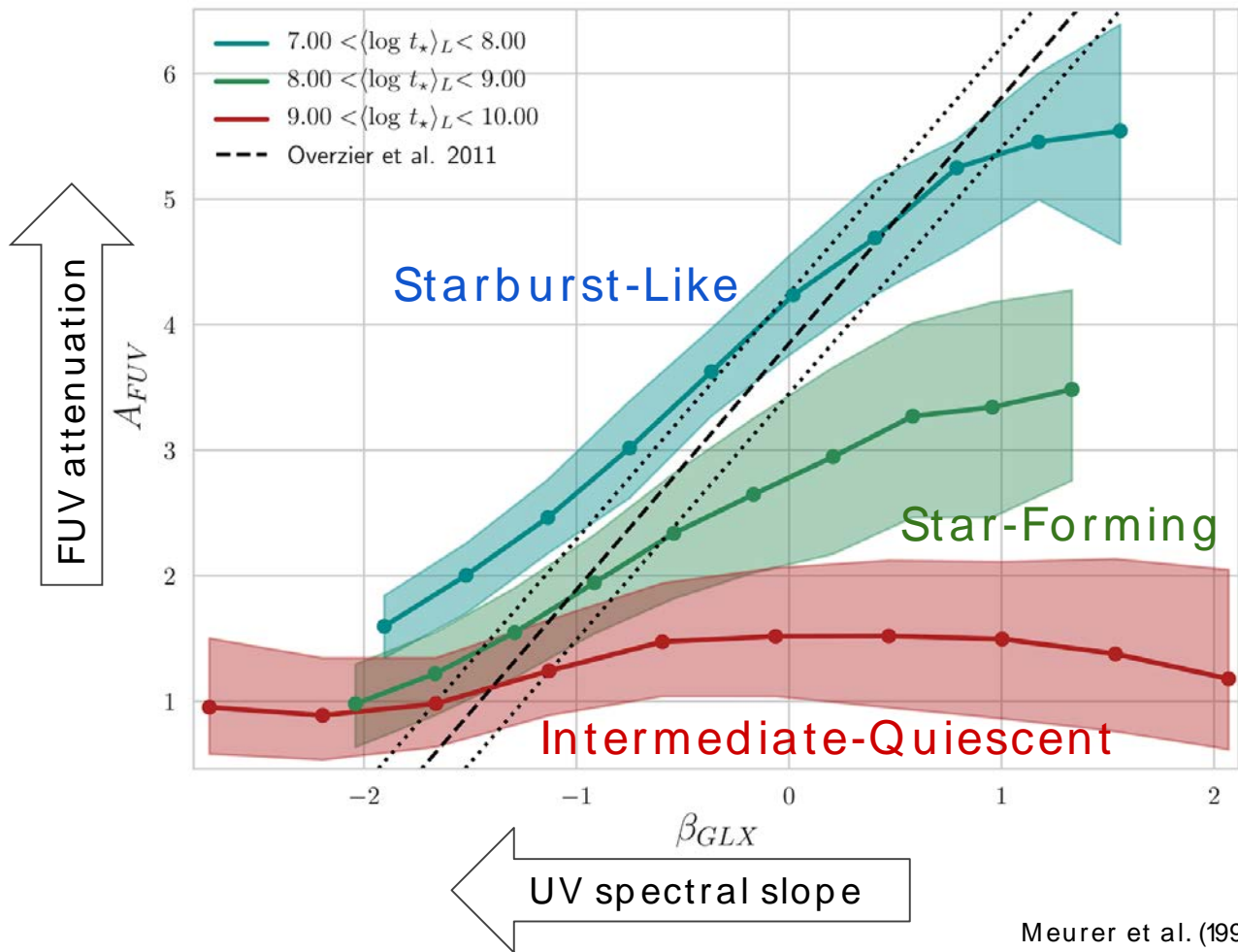
What changes with GALEX data?



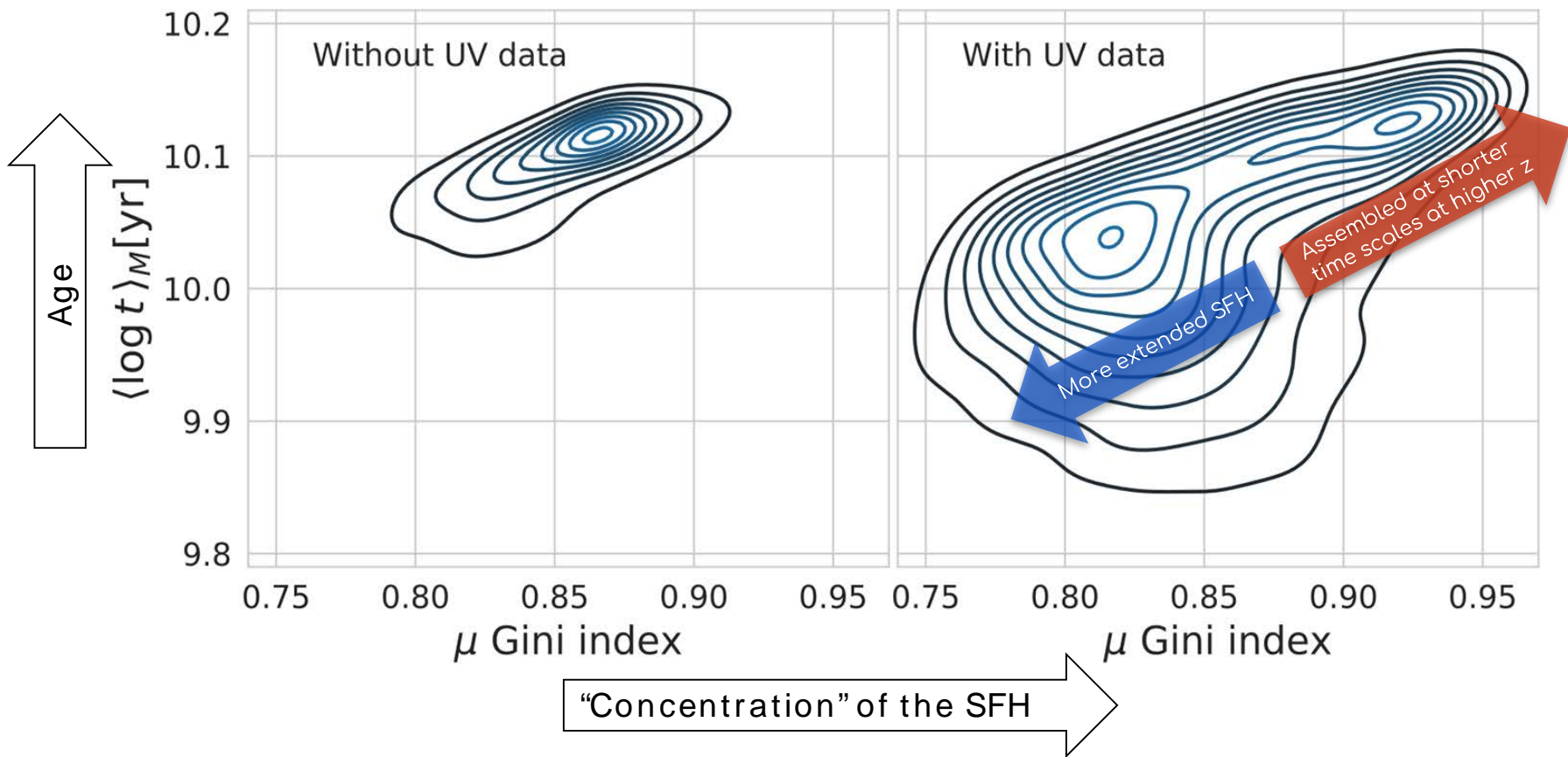
$\beta - A_{FUV}$ relation

β is the UV power-law slope obtained by fitting the UV spectrum with:

$$F_{\lambda} = \lambda^{\beta}$$



A bimodality in the red sequence





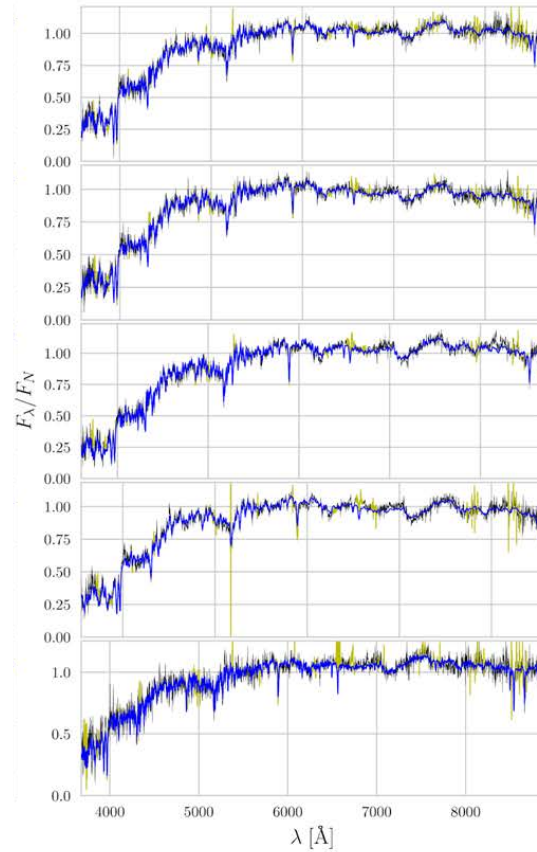
Unveiling the
afterlife of
galaxies

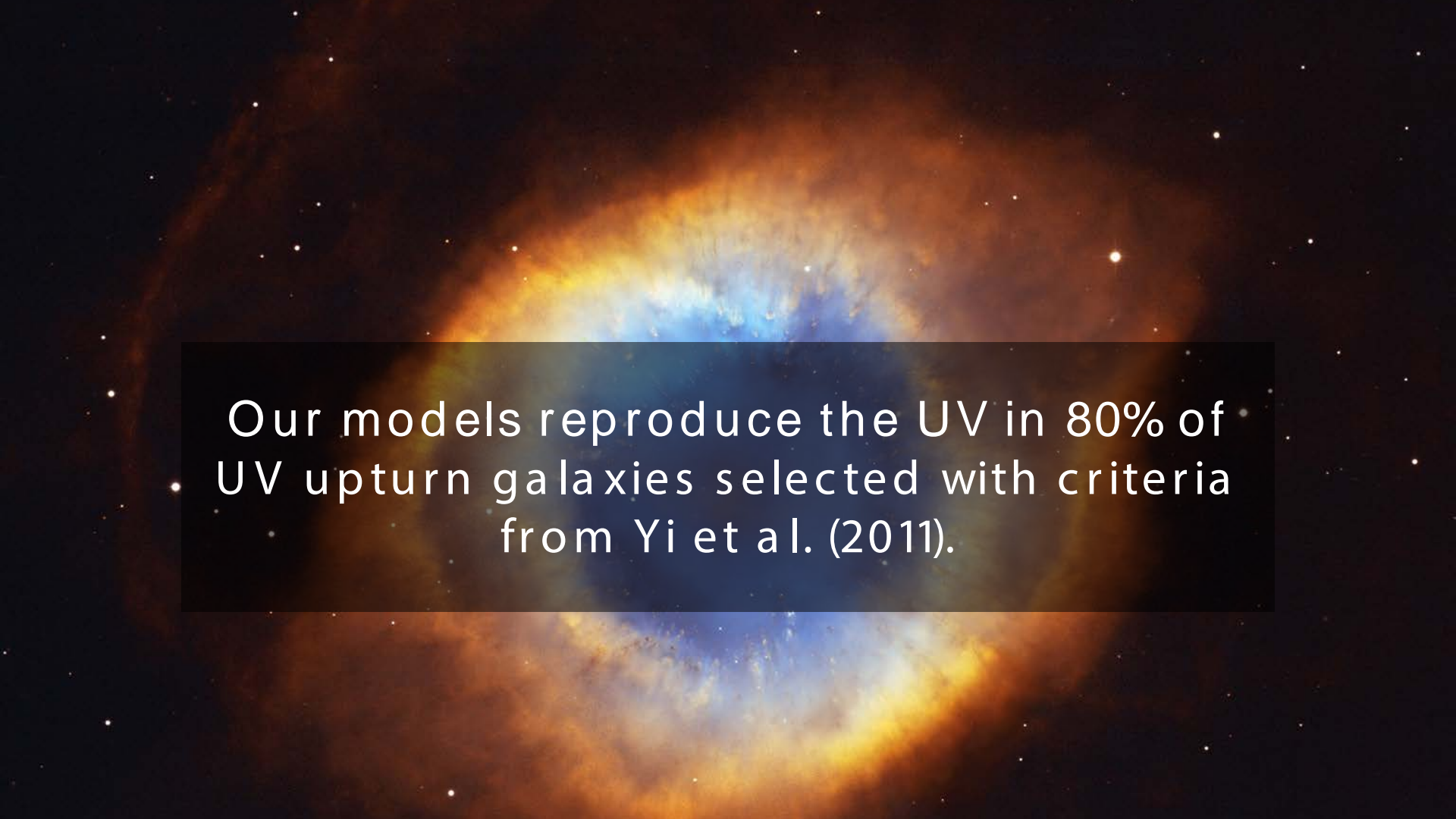
What will you be looking at?

3453 galaxies:

- With SDSS spectra
- Detected in both GALEX bands (NUV and FUV)
- Classified as elliptical by galaxy zoo
- In the **red sequence** ($NUV-r > 5$)

Spectral synthesis of ETGs



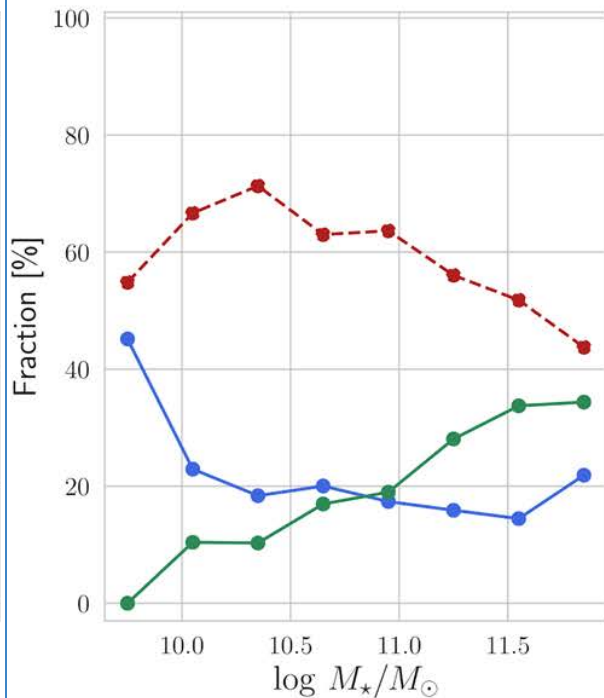
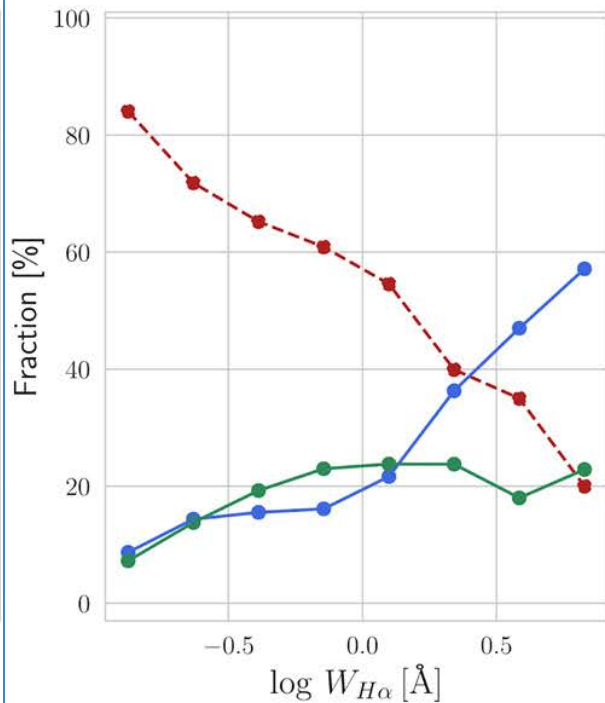
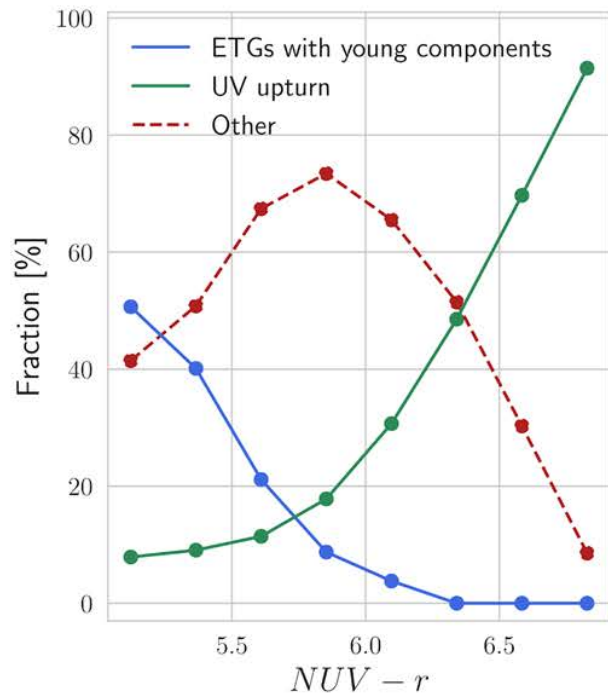


Our models reproduce the UV in 80% of
UV upturn galaxies selected with criteria
from Yi et al. (2011).

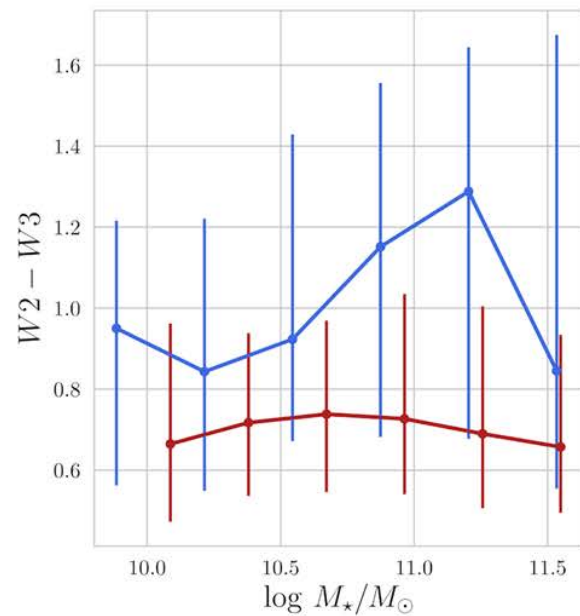
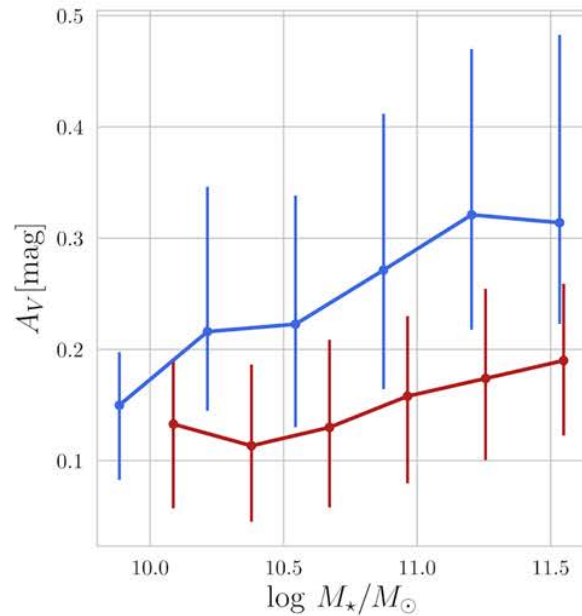
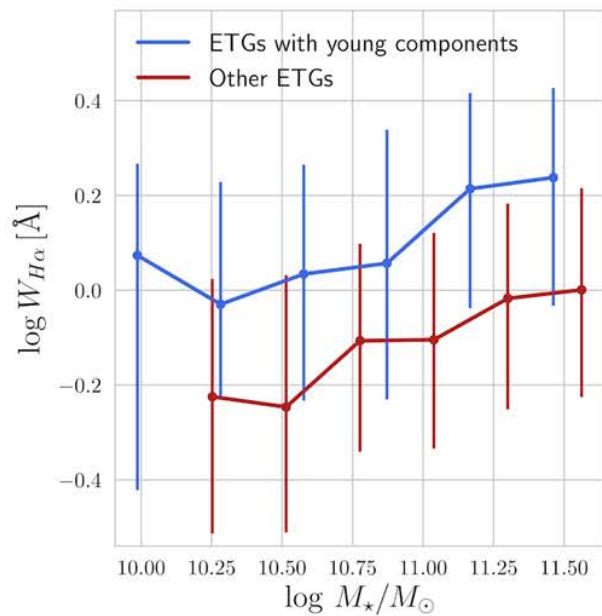
Sub-classes of ETGs

- ETGs with young components: At least 5% of FUV emission from stars younger than 1 Gyr (17.6%)
- UV upturn: No young components and $FUV-NUV < 0.9$ (21.6%)
- Other: None of the above (60.6%)

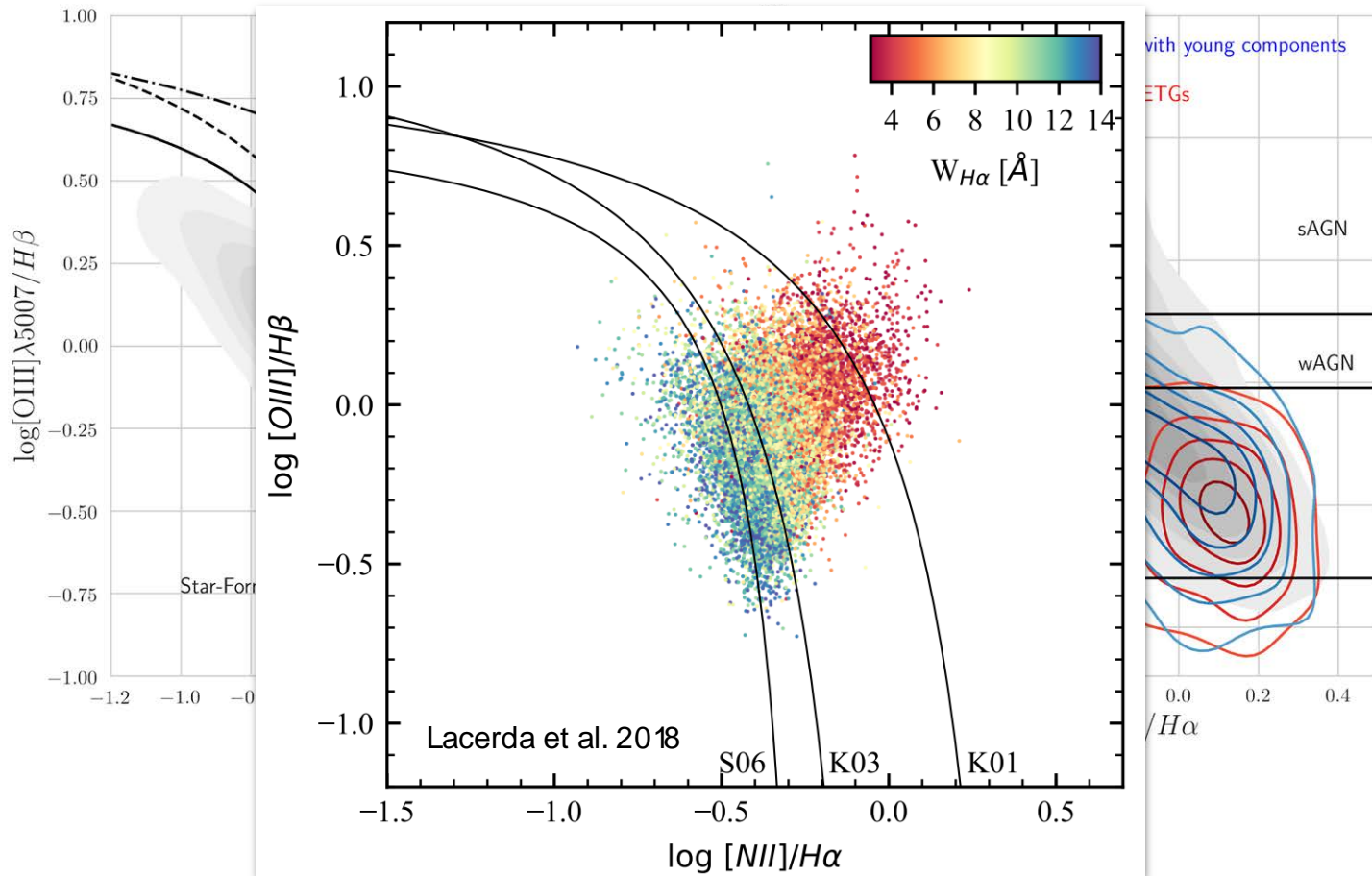
Distributions of the sub-classes



The ISM of ETGs with young components



Ionization sources: HOLMES or SF?

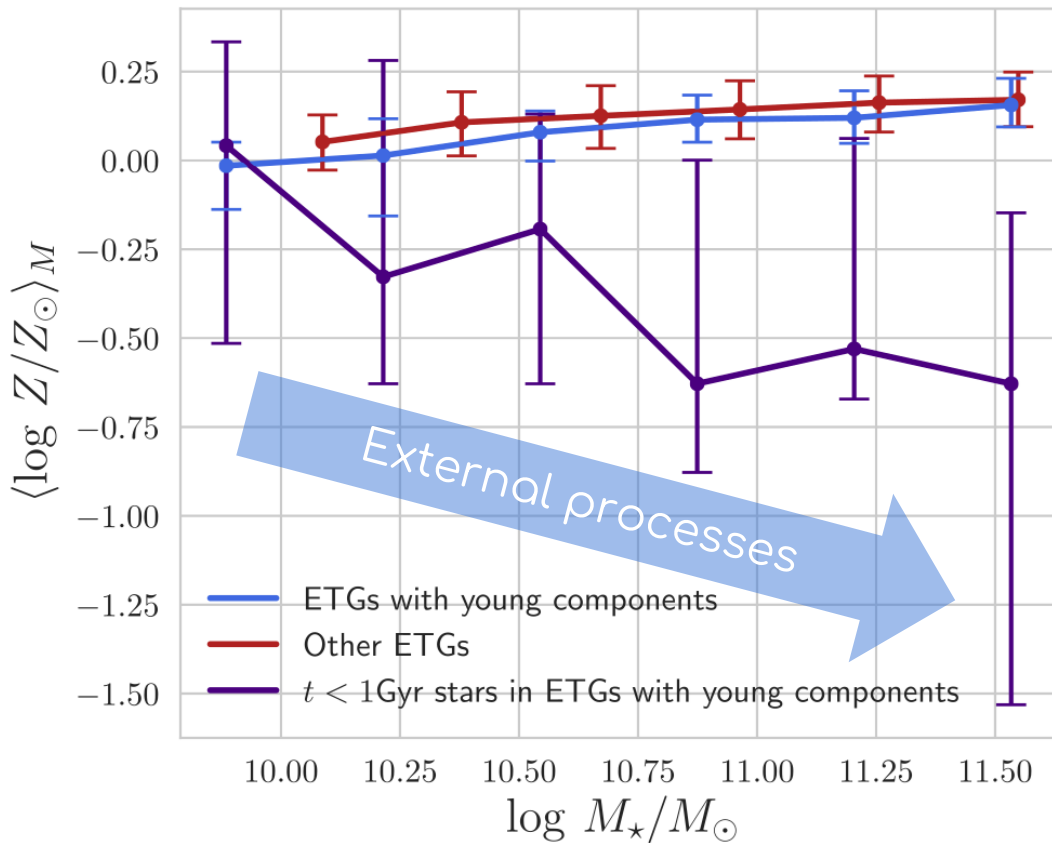




Beware! Convoluted
plot ahead.

How do young components form?

Downsizing
Internal processes
Moving up towards
the **red sequence**



Rejuvenation
External processes
Moving towards or
away from the **red
sequence**

A deep space photograph of a starry night sky. On the left side, there is a large, diffuse nebula with a mix of blue and white colors, appearing as a soft, glowing cloud. The rest of the image is filled with numerous individual stars of varying brightness and colors, including white, yellow, and blue. The background is a dark, deep blue-black, providing a high contrast for the celestial objects.

Thank you!