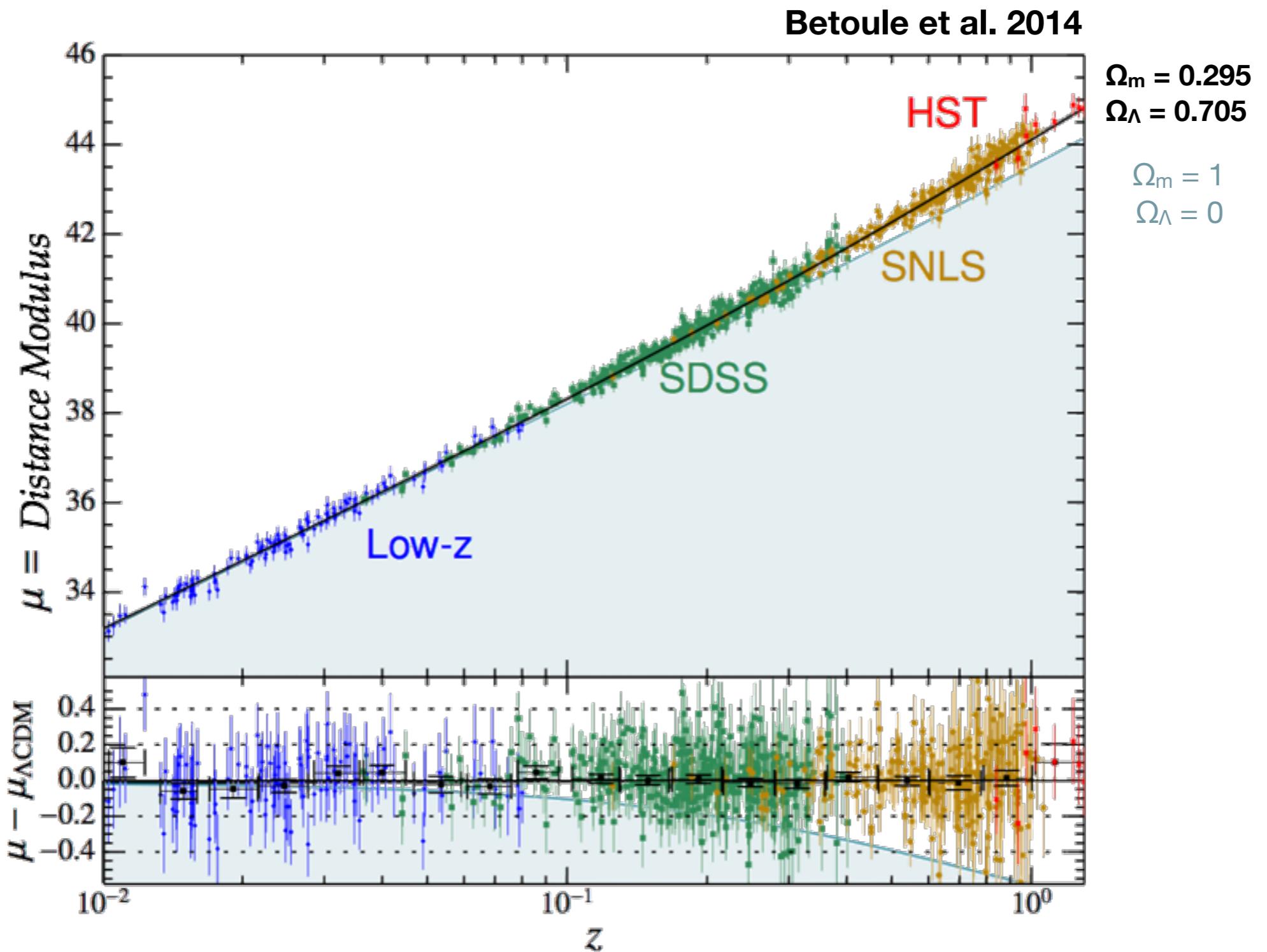


Accuracy of environmental tracer and consequence for determining the SN magnitude step

Martin BRIDAY - m.briday@ipnl.in2p3.fr

This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n°759194 - USNAC)

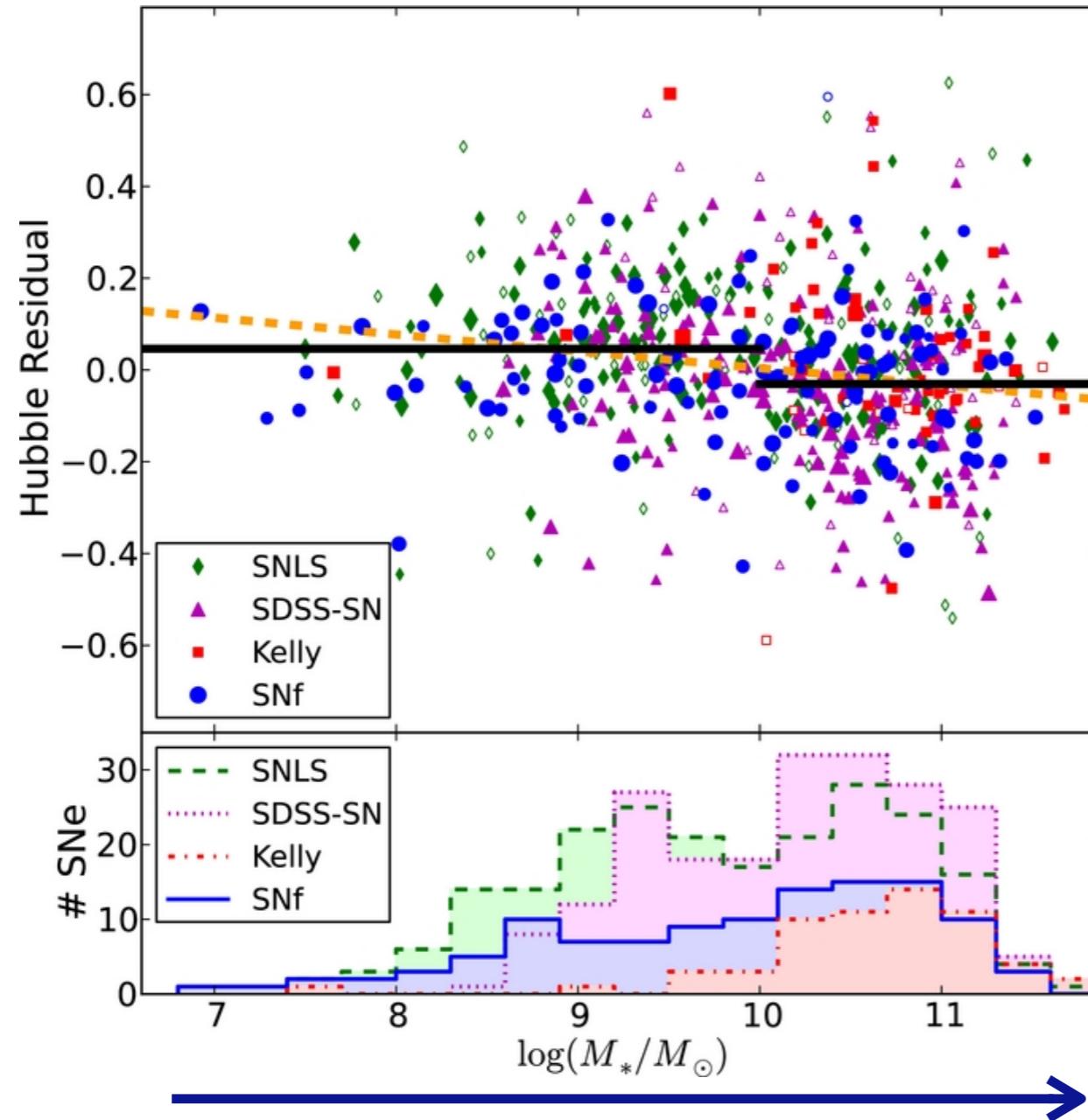
Hubble residuals



Mass step

Fainter

Childress et al. 2013



Global stellar mass:

$$\Delta HR = 0.077 \pm 0.014 \text{ mag}$$

Lighter

Heavier

Age step

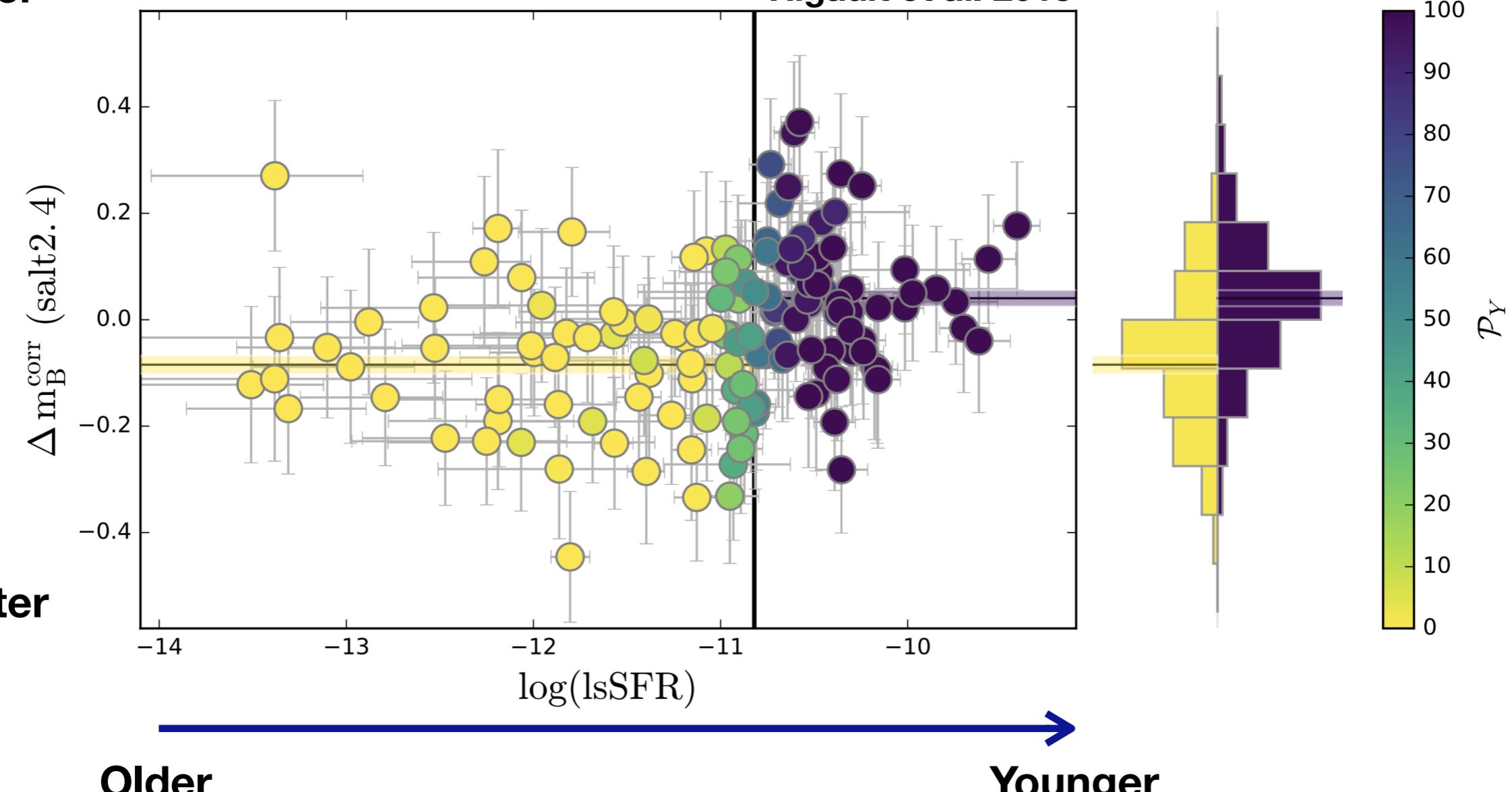
Fainter

Rigault et al. 2018

Brighter

Older

Younger

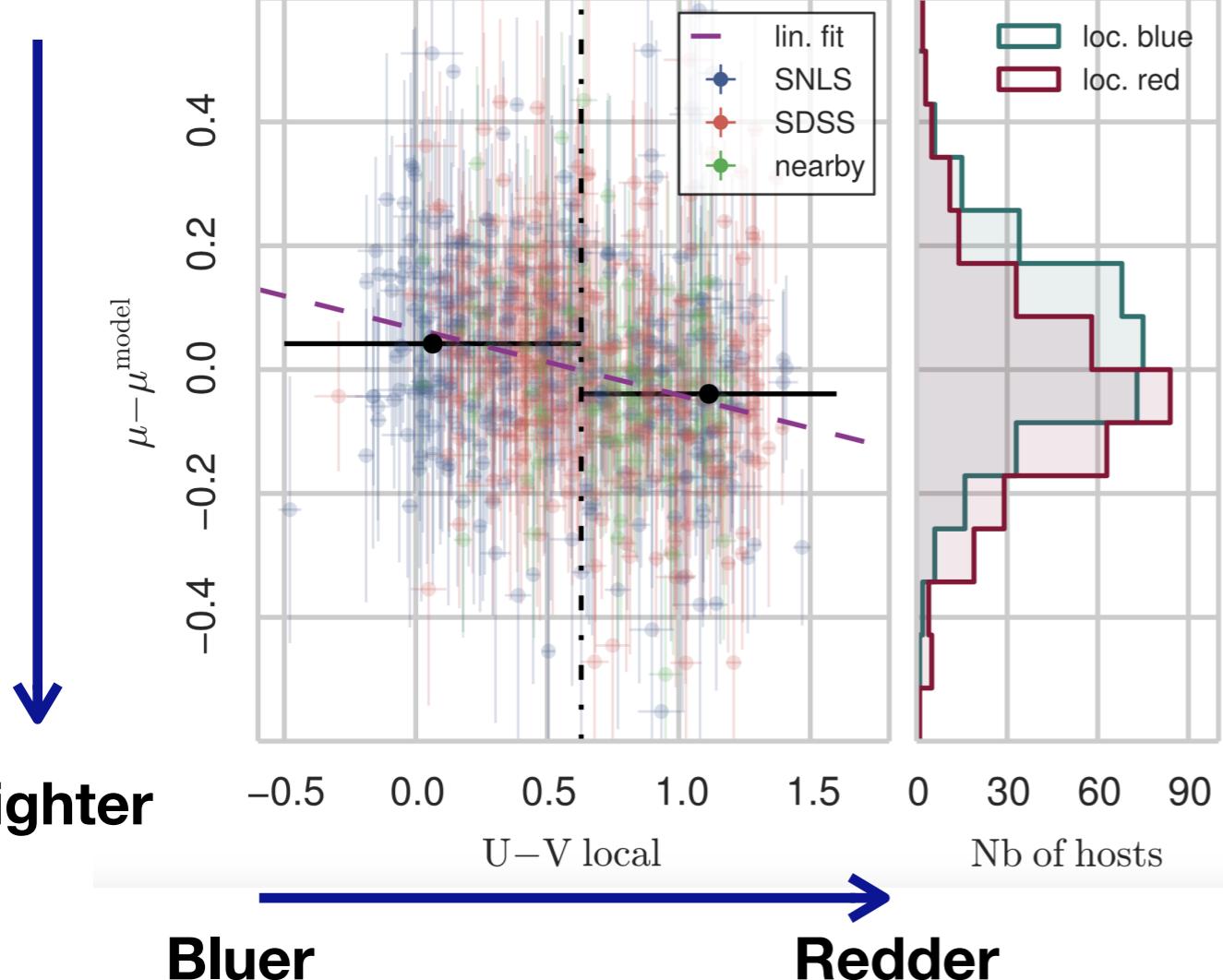


Local specific star formation rate:

$$\Delta \text{HR} = 0.163 \pm 0.029 \text{ mag}$$

Age steps

Fainter



Brighter

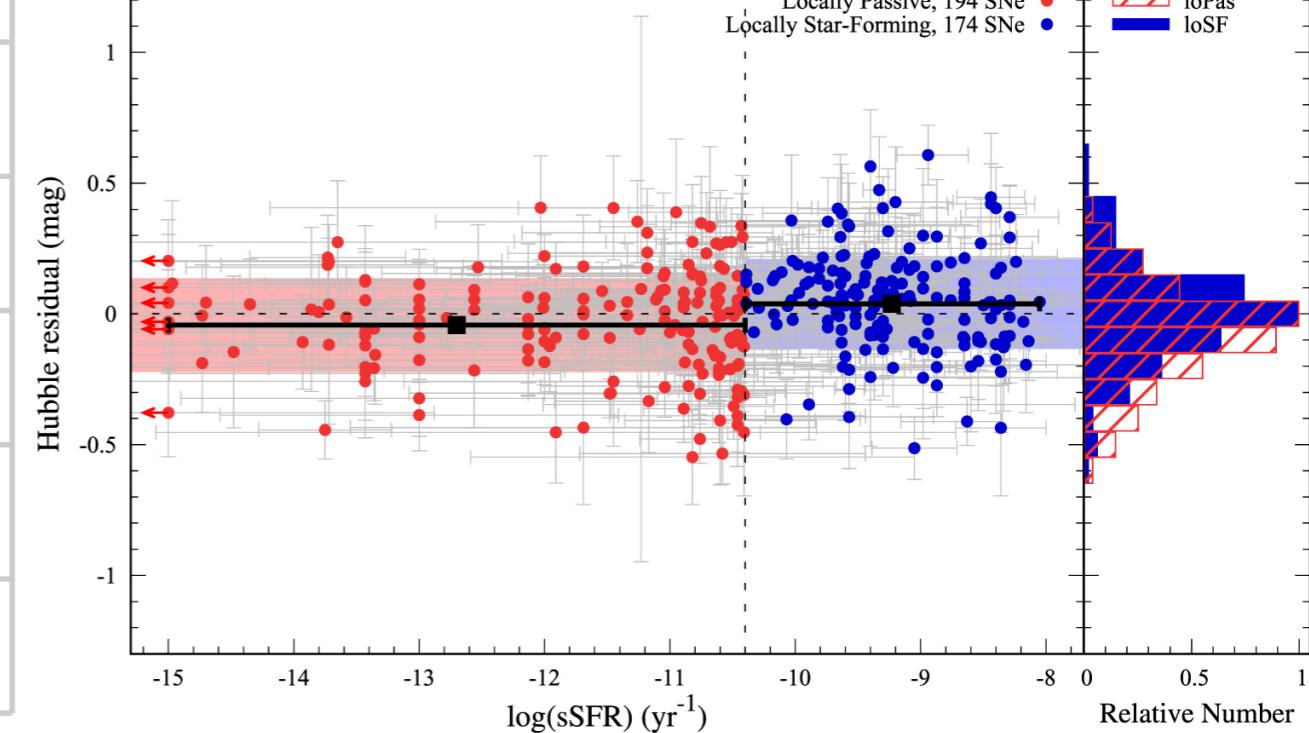
Bluer Redder

U-V color within a 3 kpc radius:

$$\Delta \text{HR} = 0.091 \pm 0.013 \text{ mag}$$

Roman et al. 2017

Kim et al. 2018

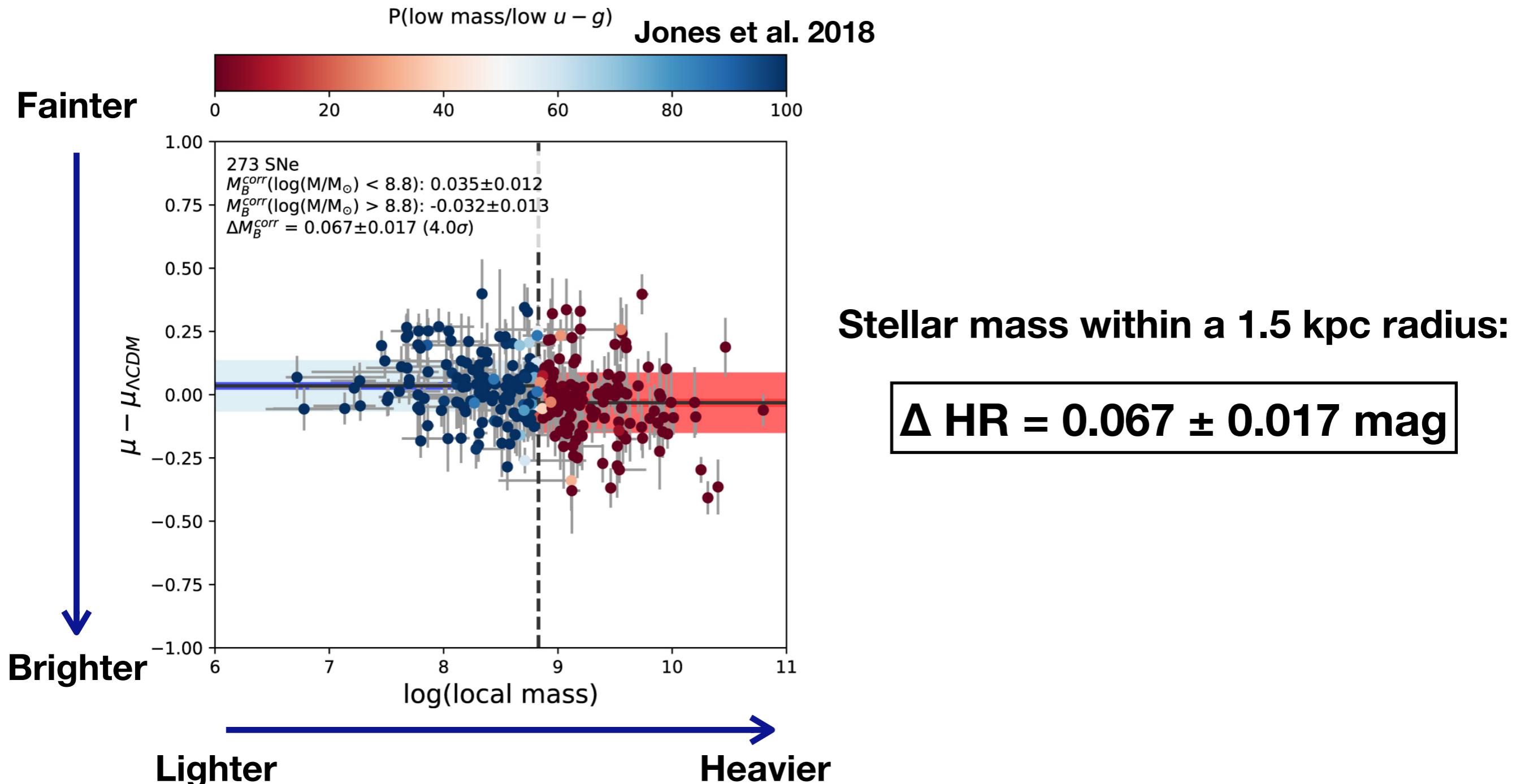


Older Younger

Global specific star formation rate:

$$\Delta \text{HR} = 0.081 \pm 0.018 \text{ mag}$$

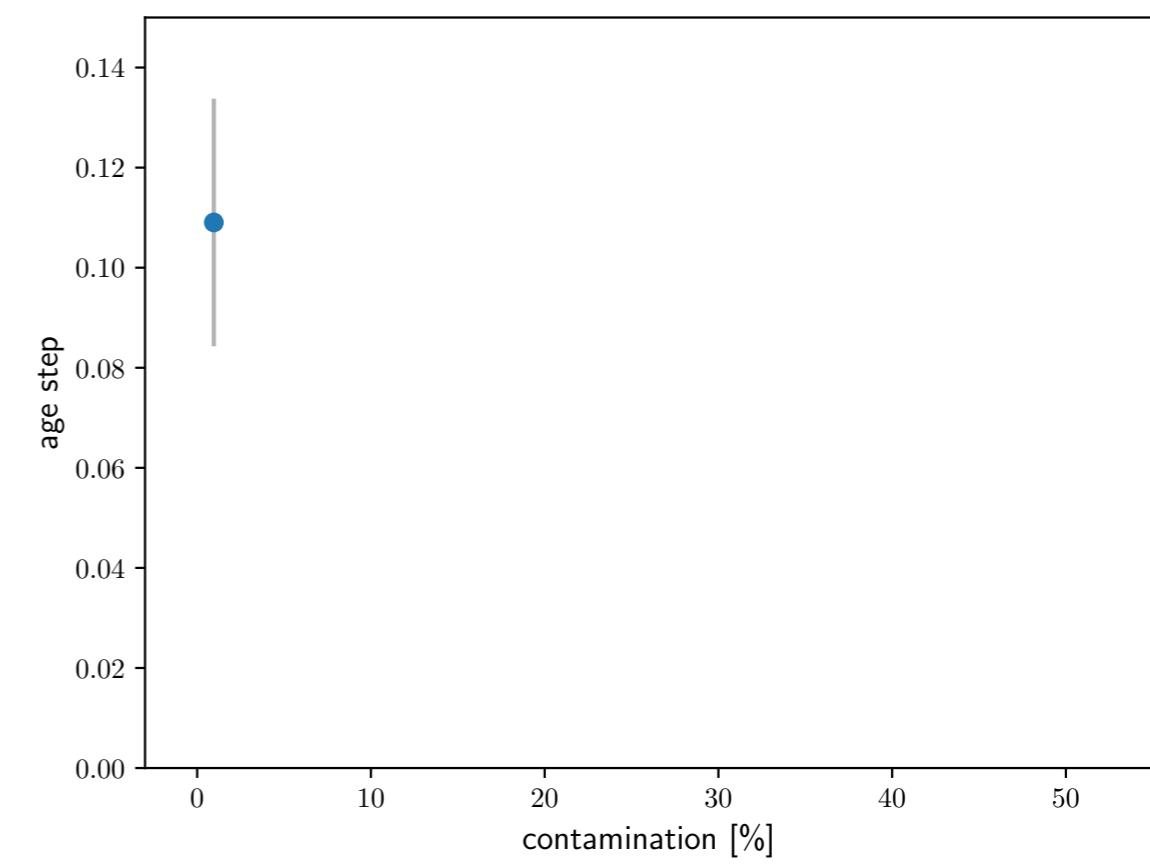
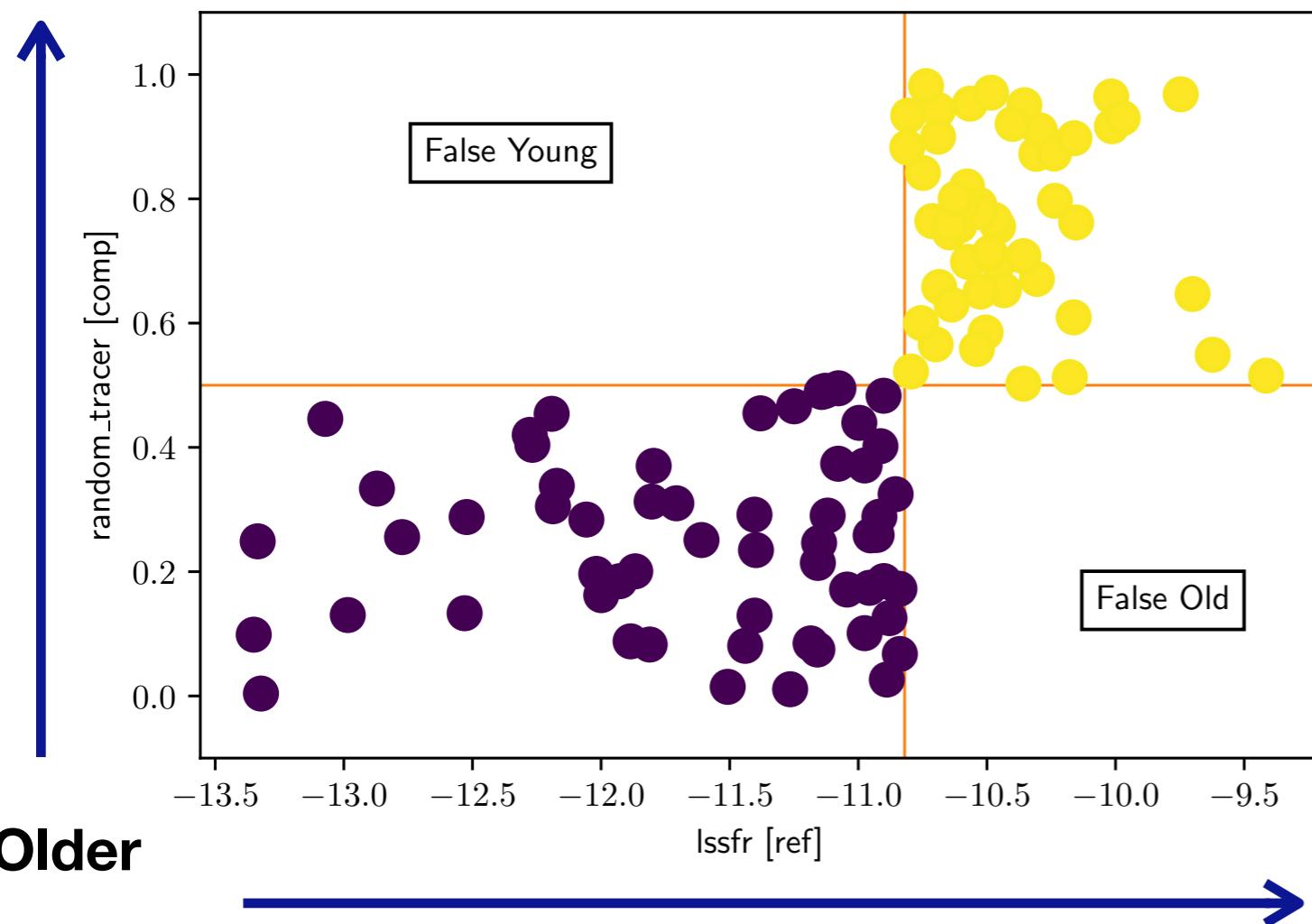
Age steps



Contamination

→ False-negative and false-positive fractions

Younger



Older

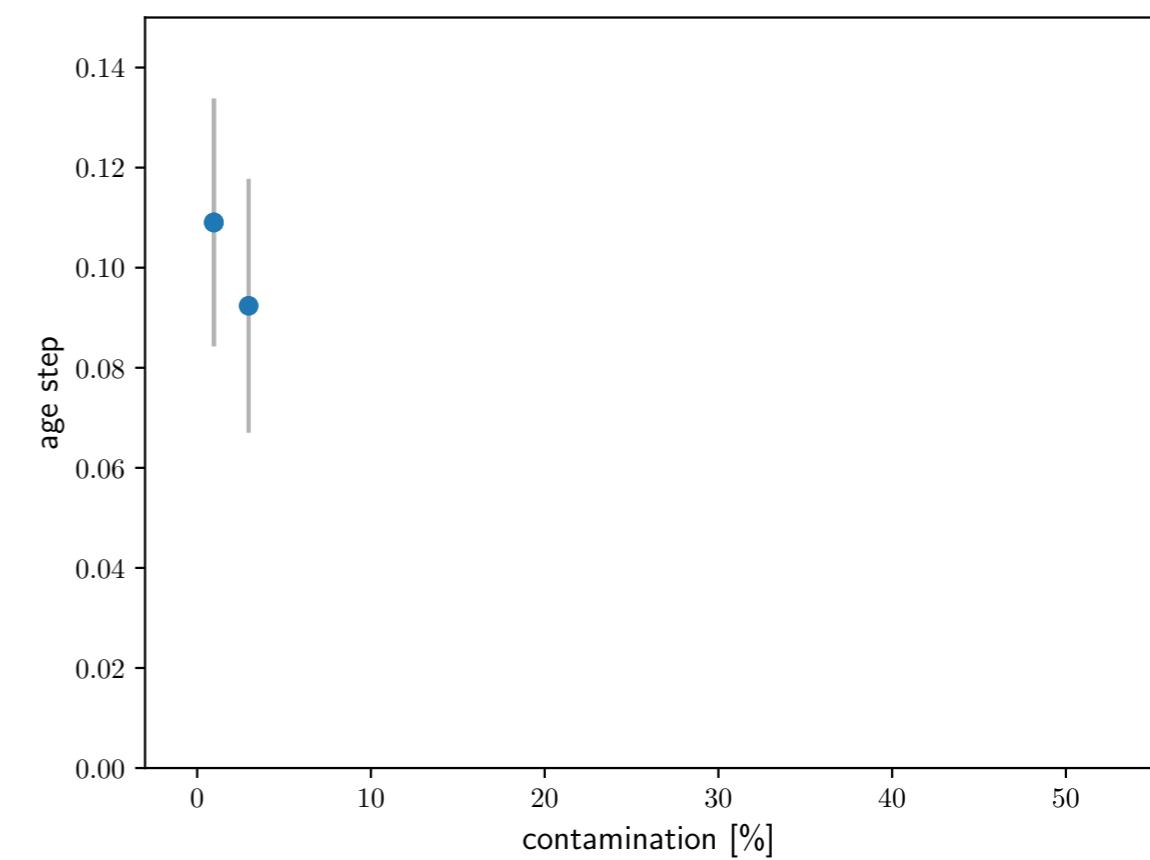
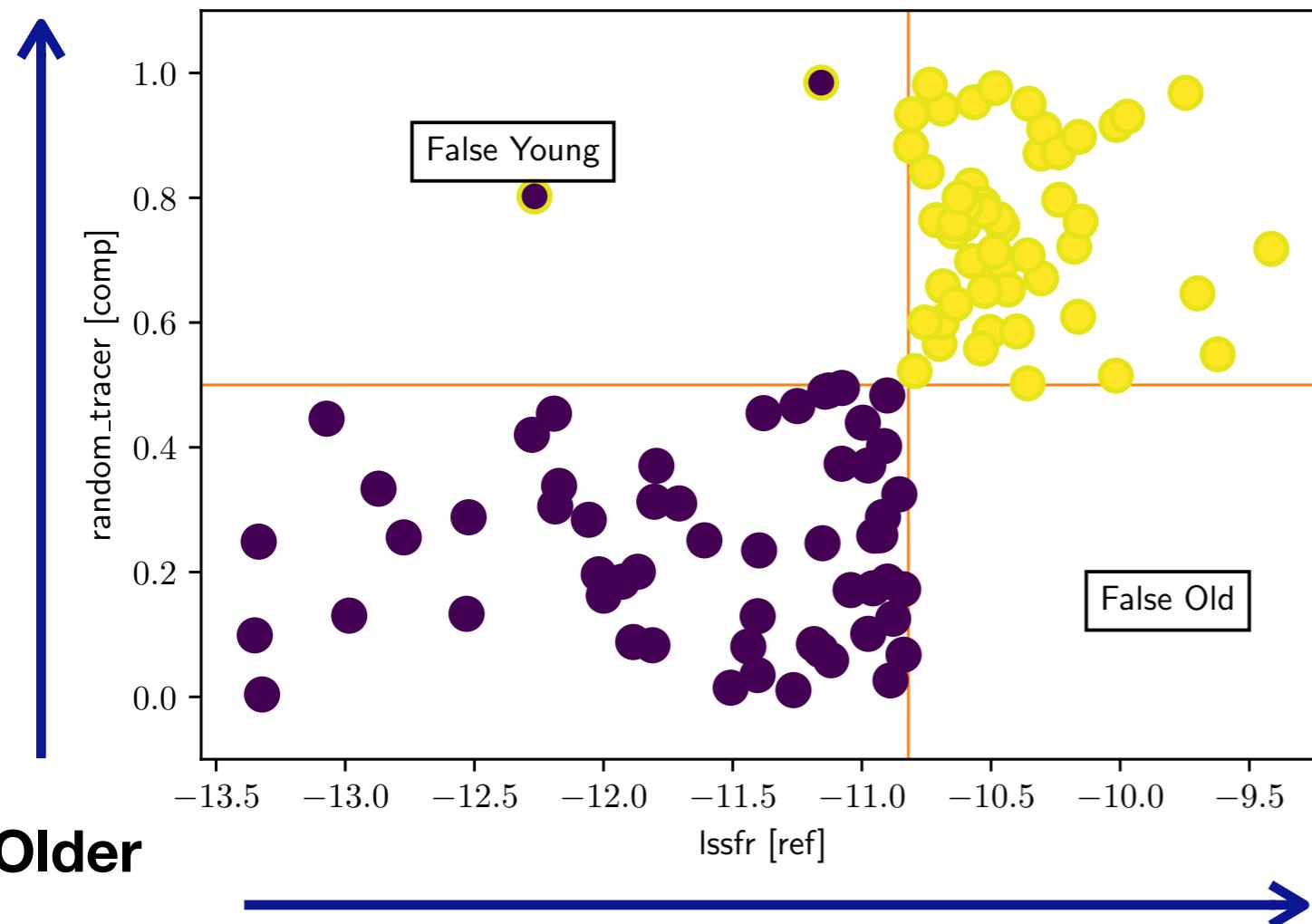
Older

Younger

Contamination

→ False-negative and false-positive fractions

Younger



Older

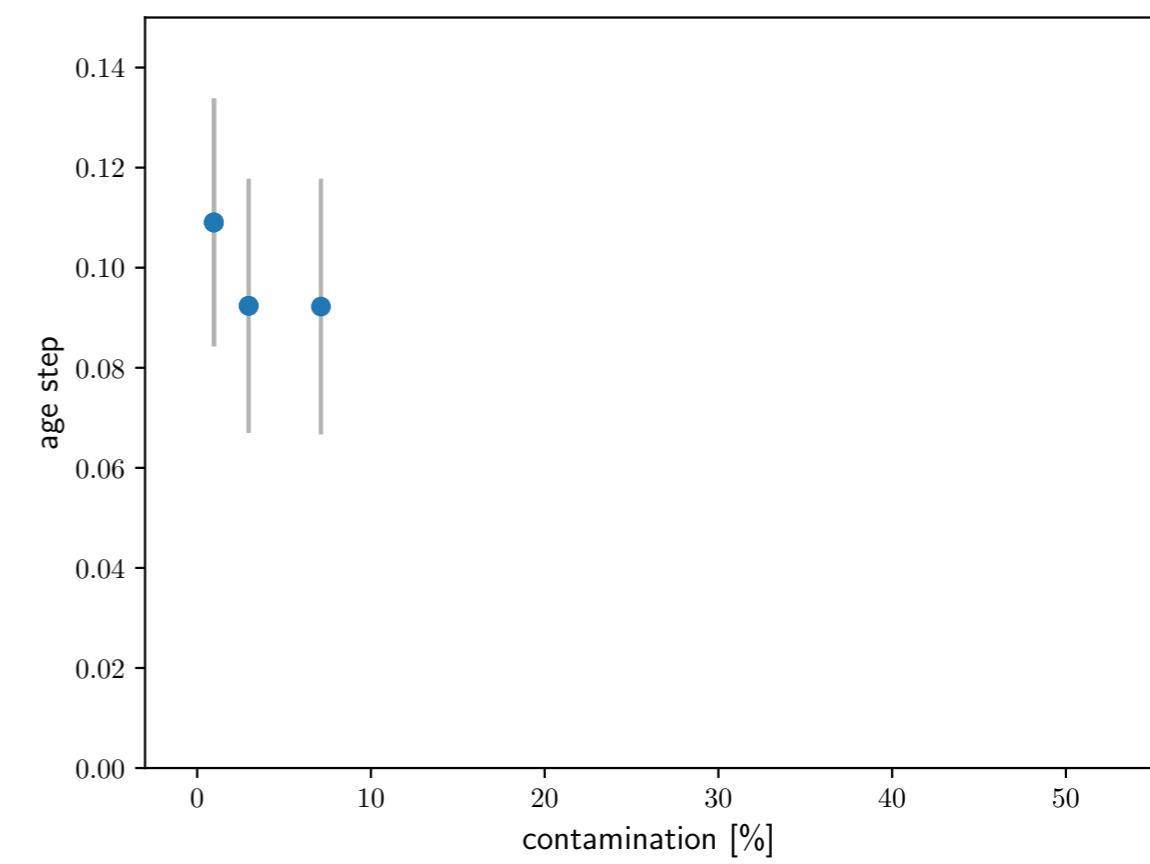
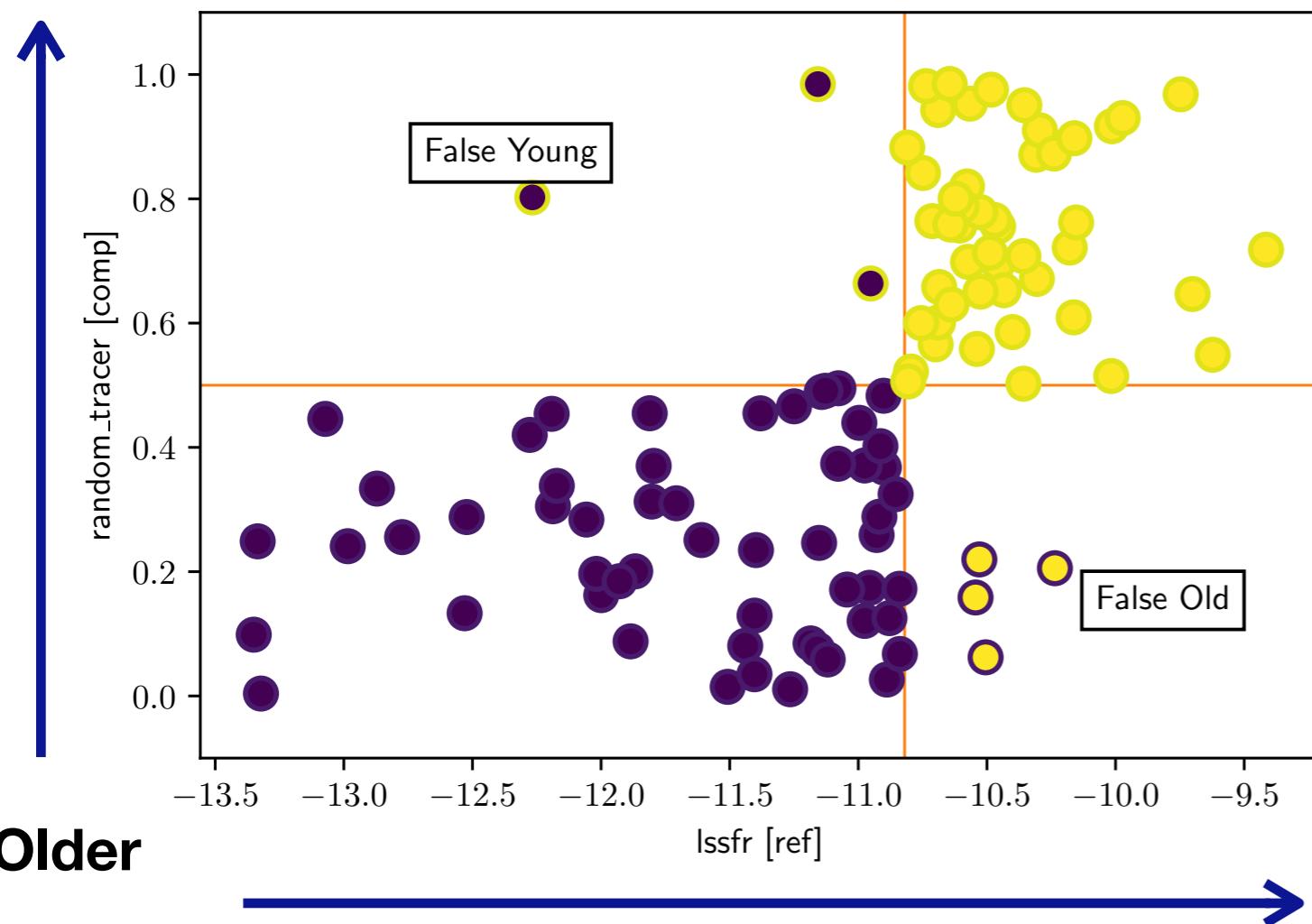
Older

Younger

Contamination

→ False-negative and false-positive fractions

Younger



Older

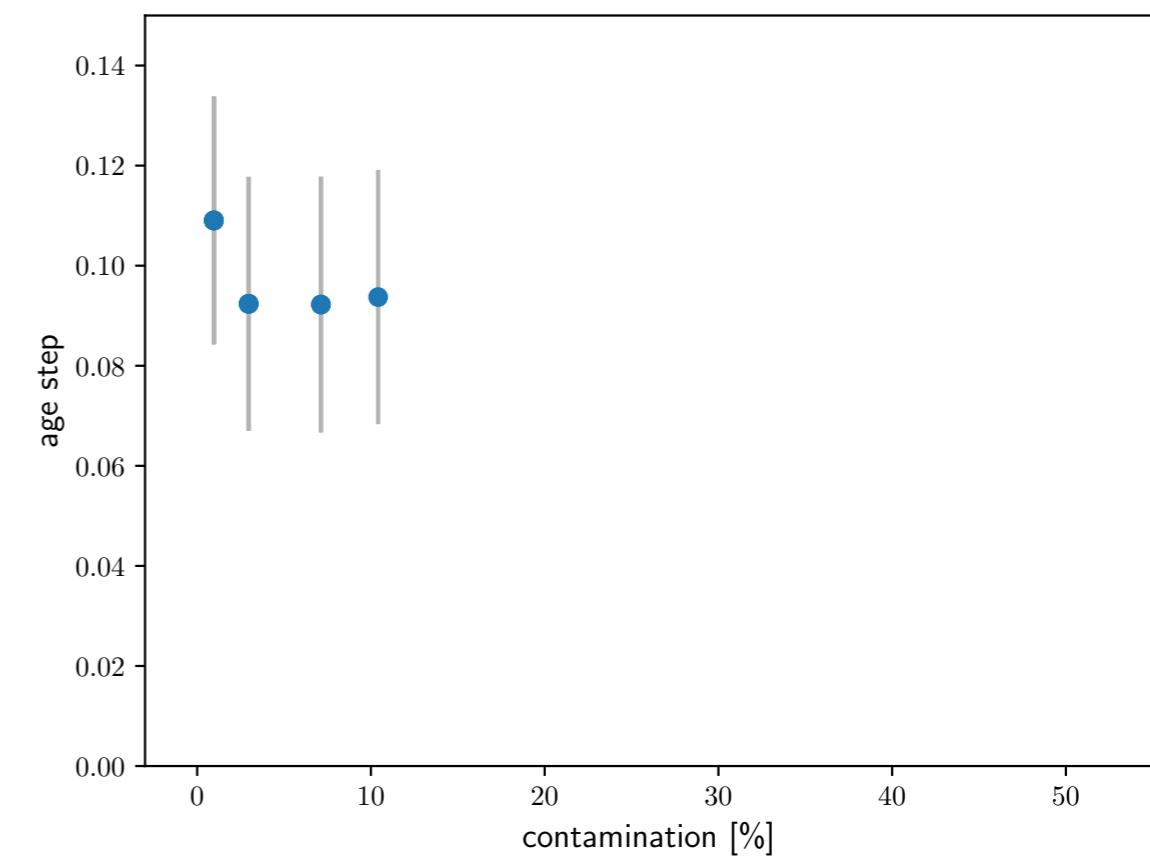
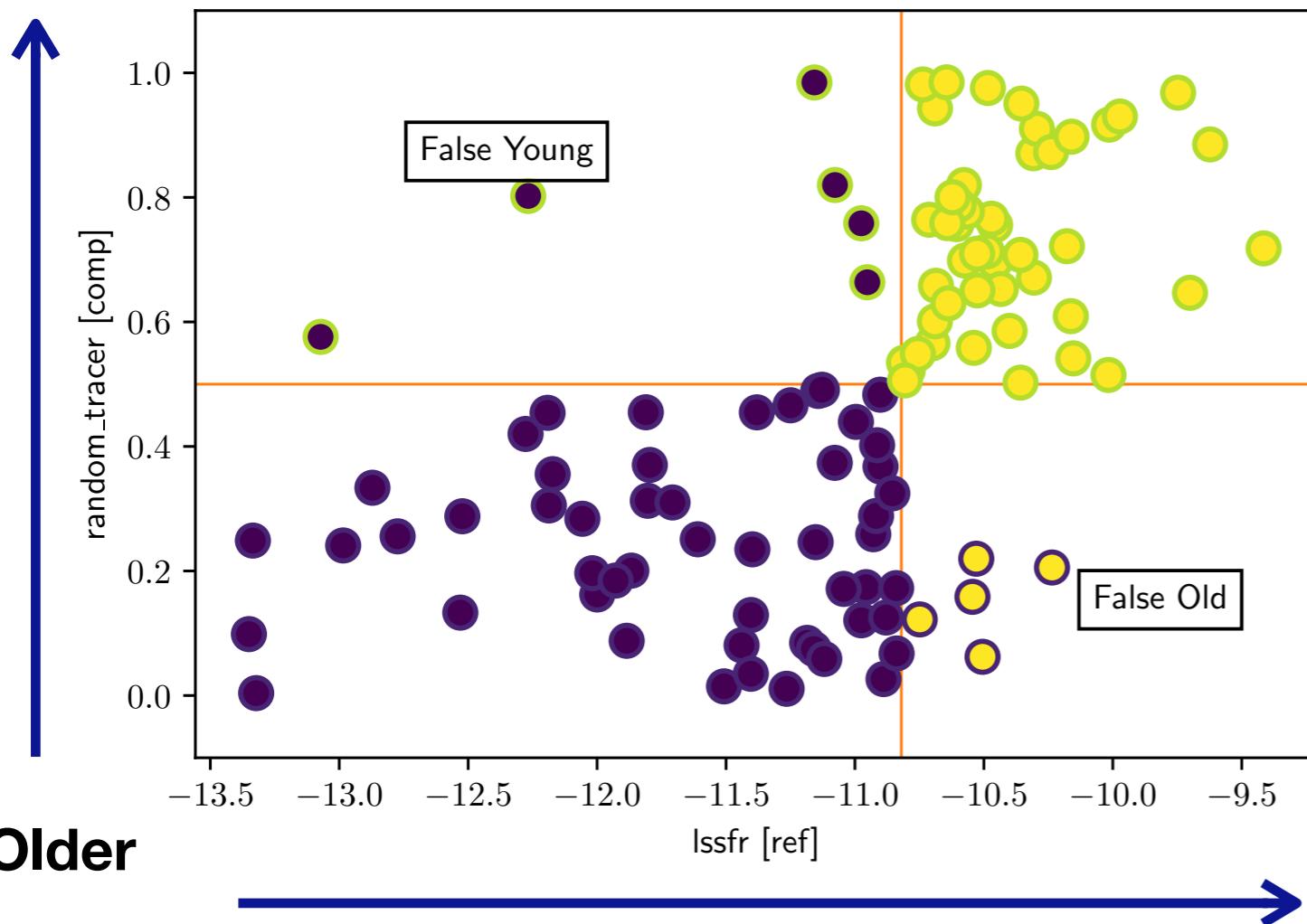
Older

Younger

Contamination

→ False-negative and false-positive fractions

Younger



Older

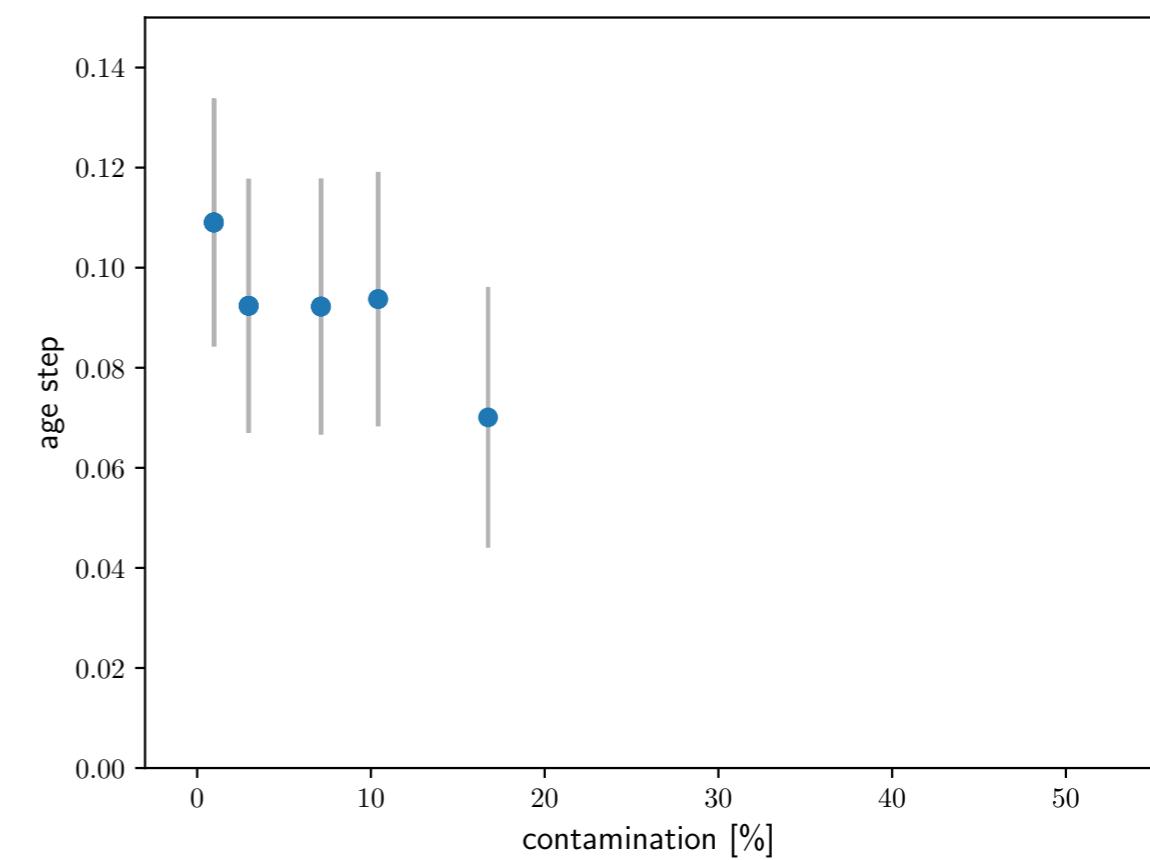
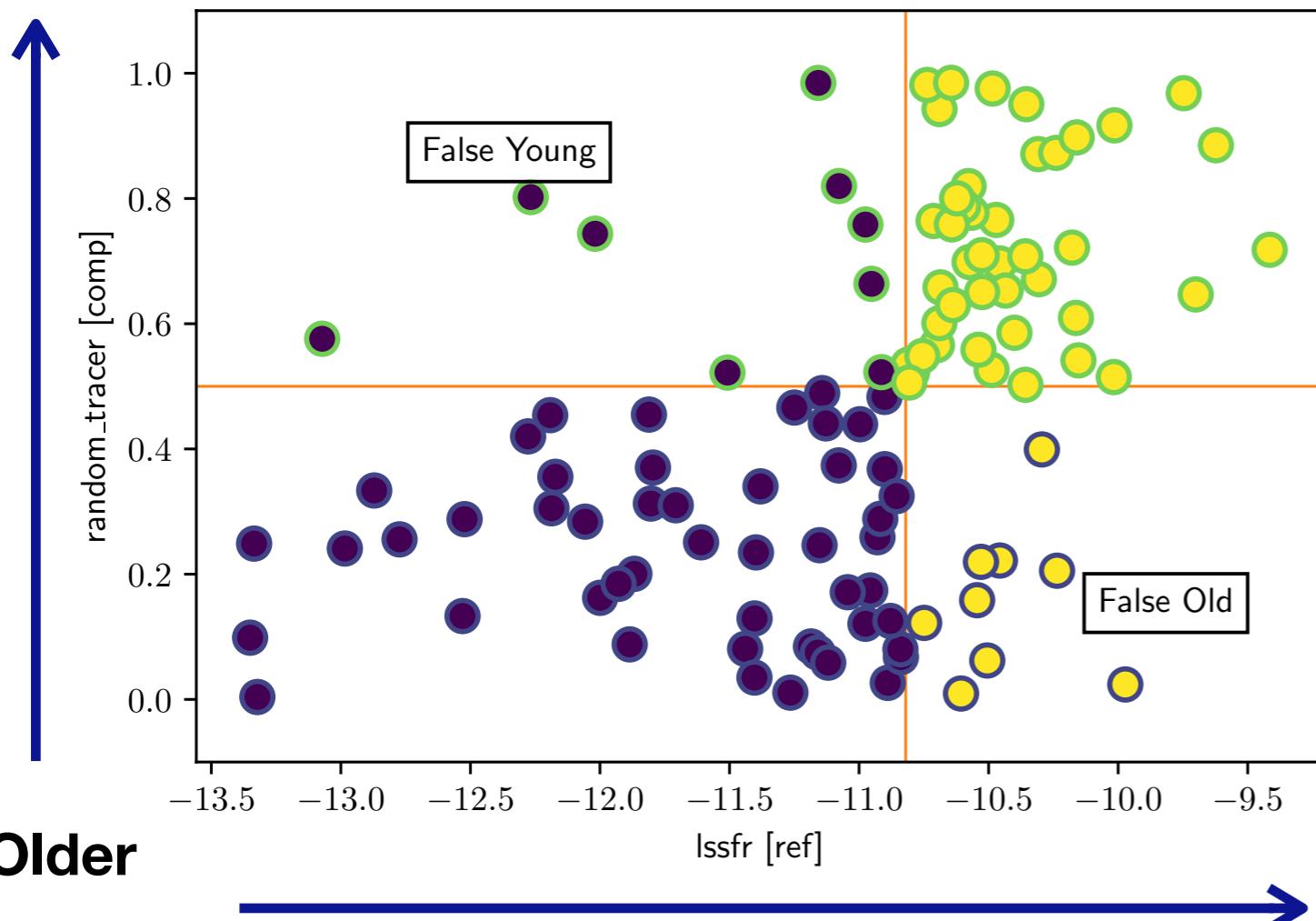
Older

Younger

Contamination

→ False-negative and false-positive fractions

Younger



Older

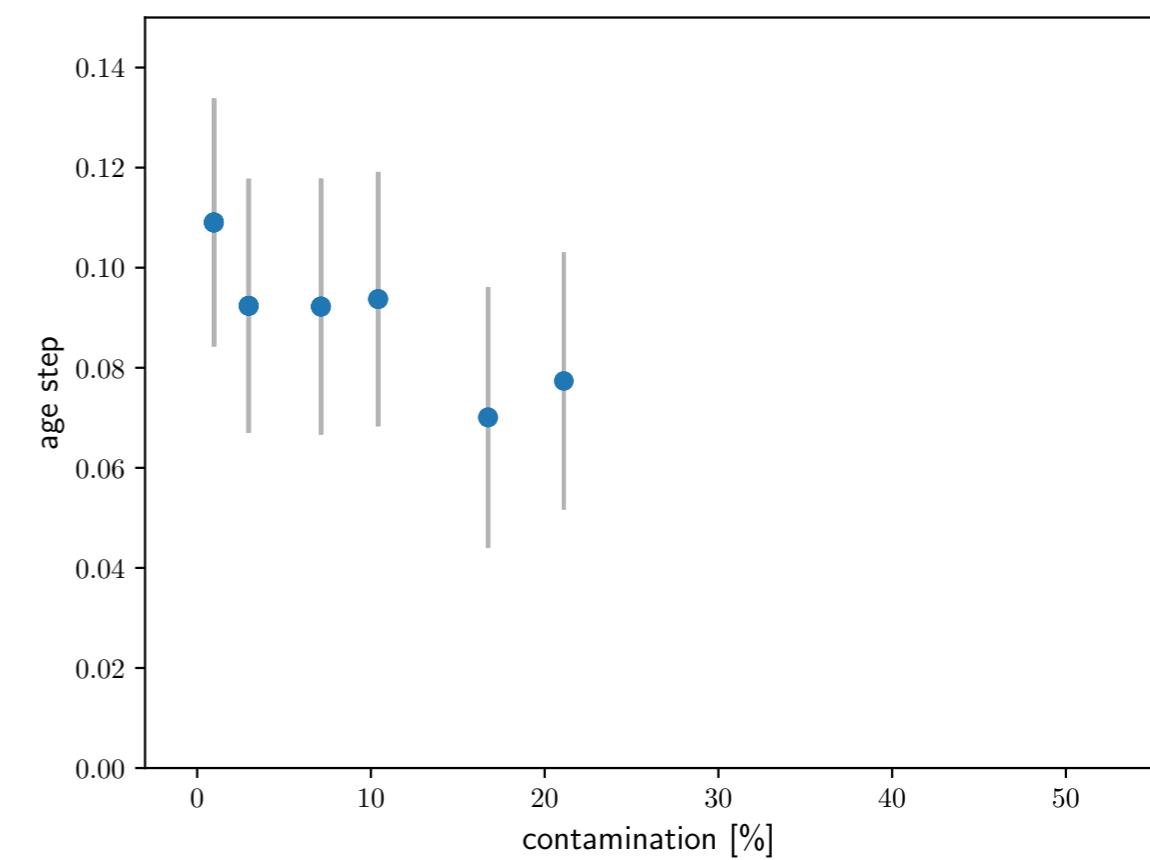
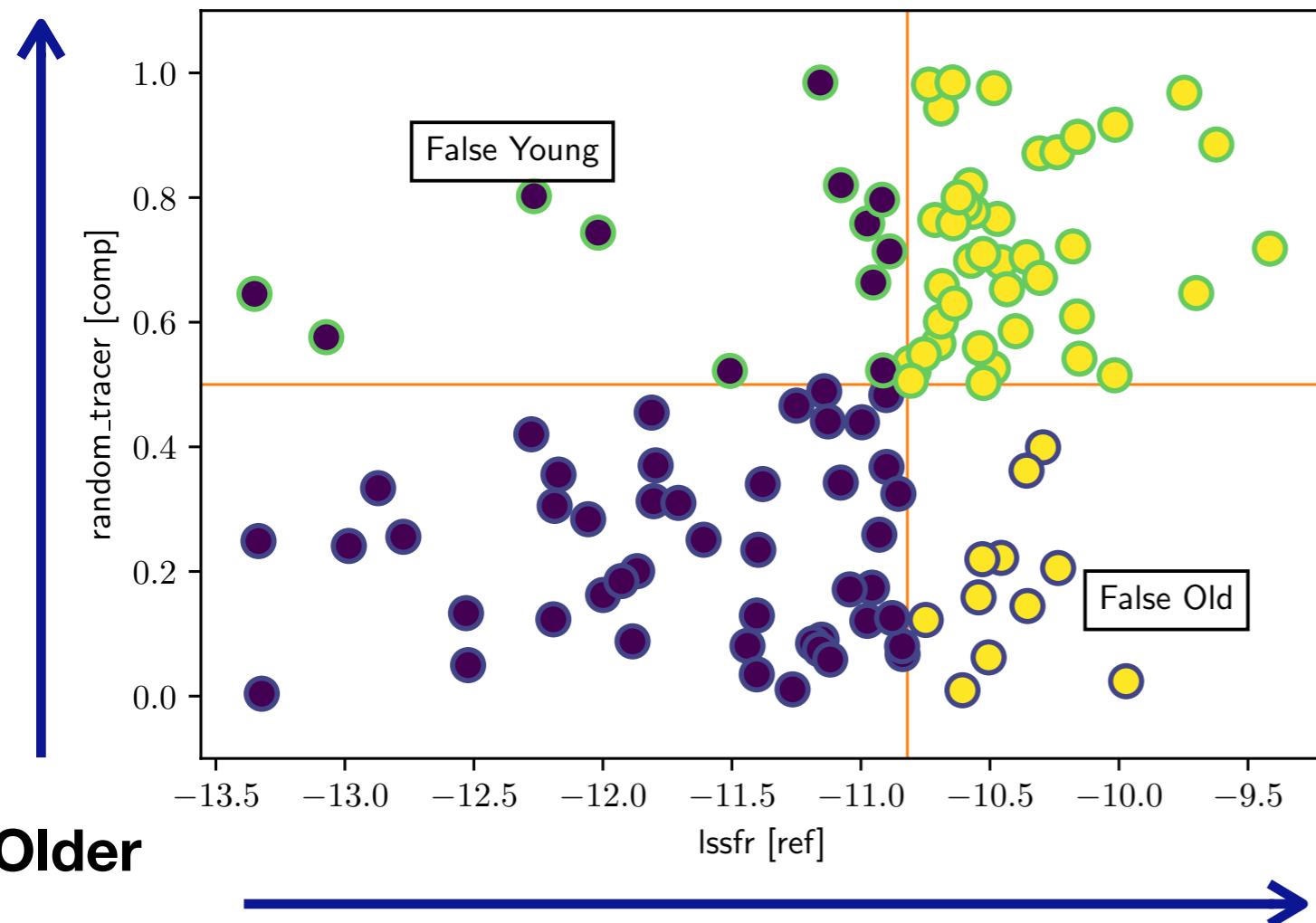
Older

Younger

Contamination

→ False-negative and false-positive fractions

Younger



Older

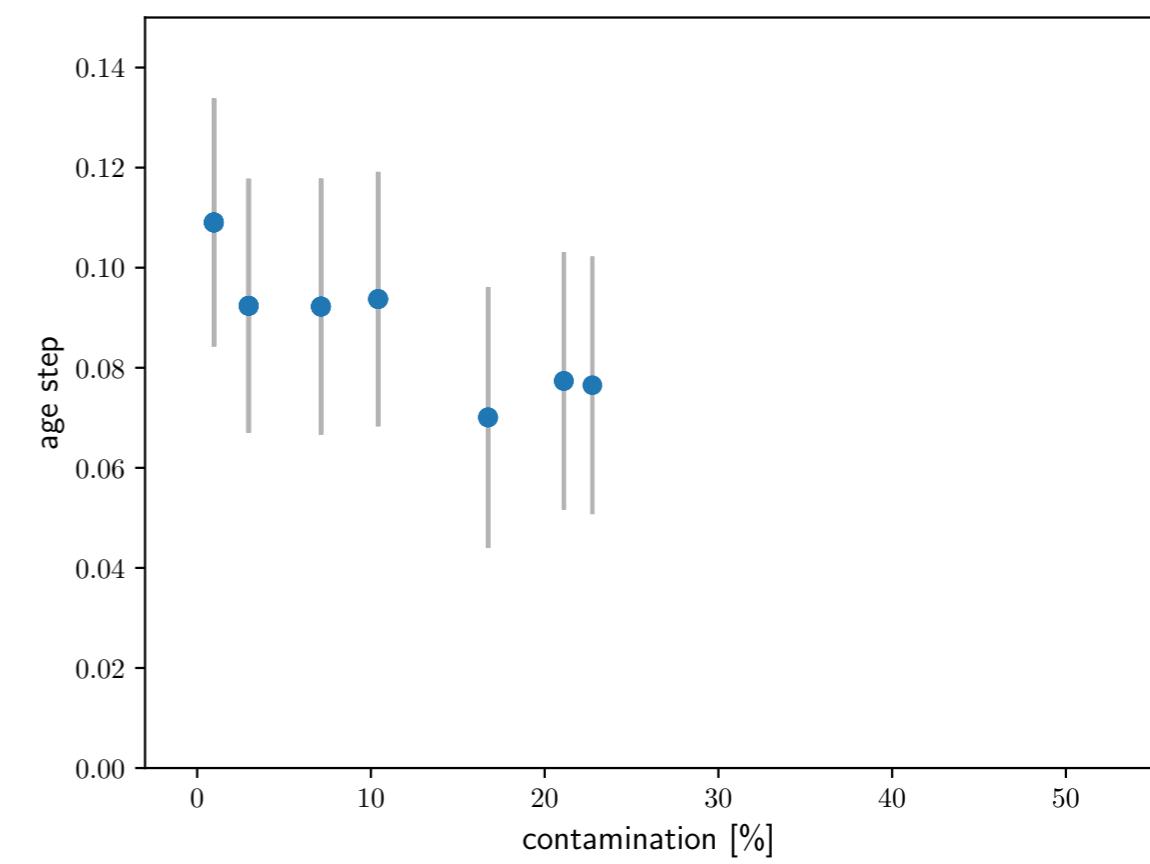
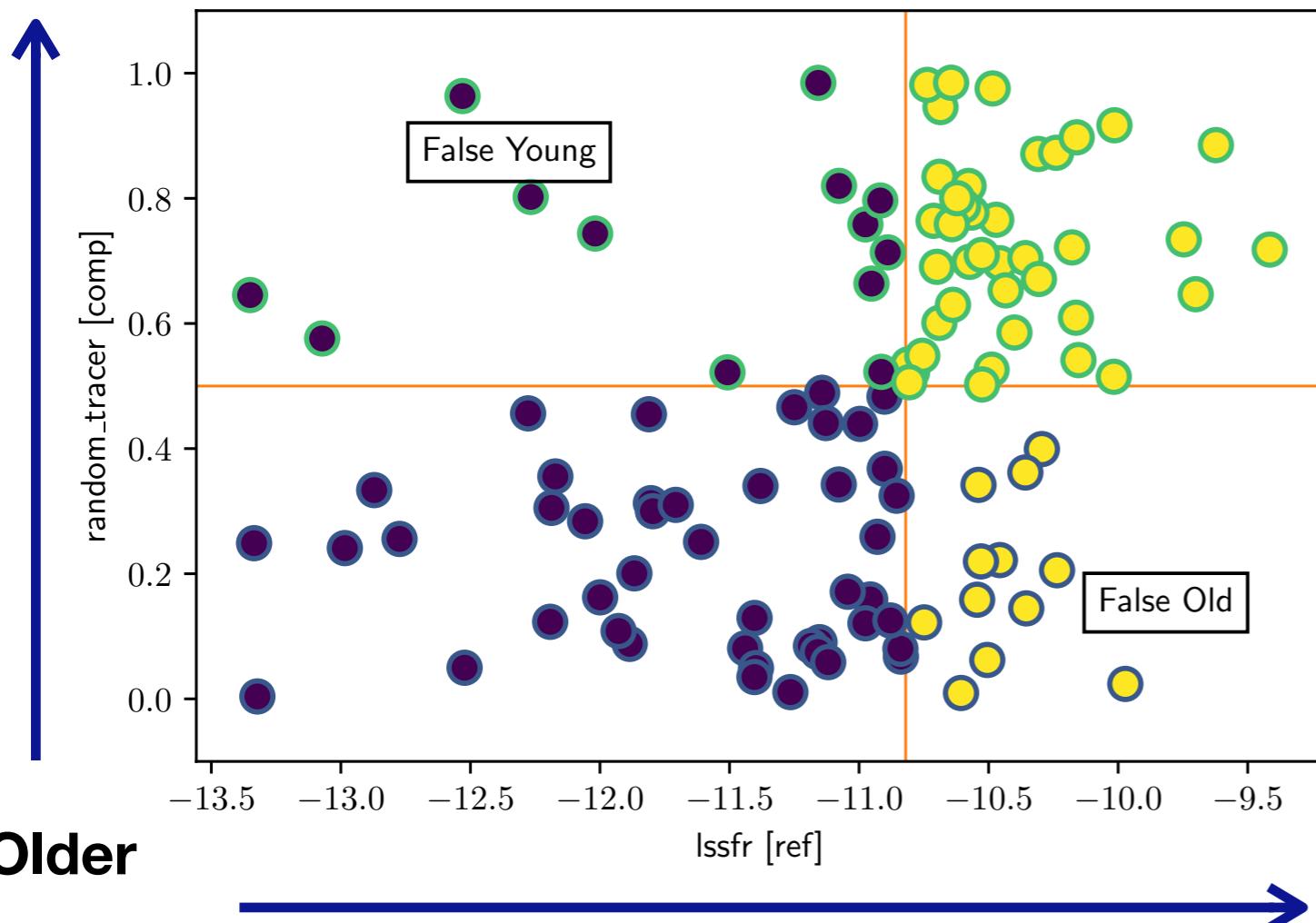
Younger

Older

Contamination

→ False-negative and false-positive fractions

Younger



Older

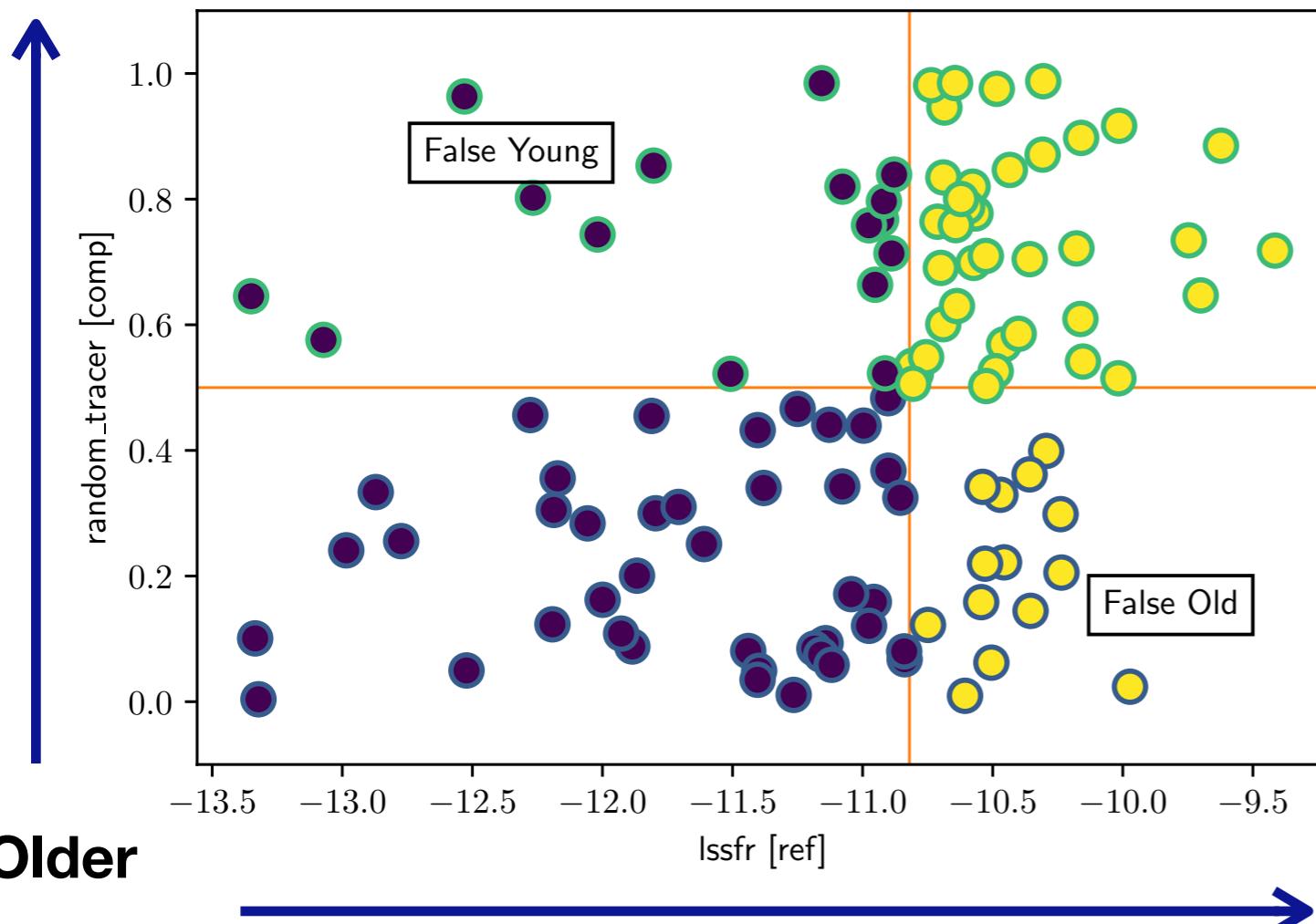
Older

Younger

Contamination

→ False-negative and false-positive fractions

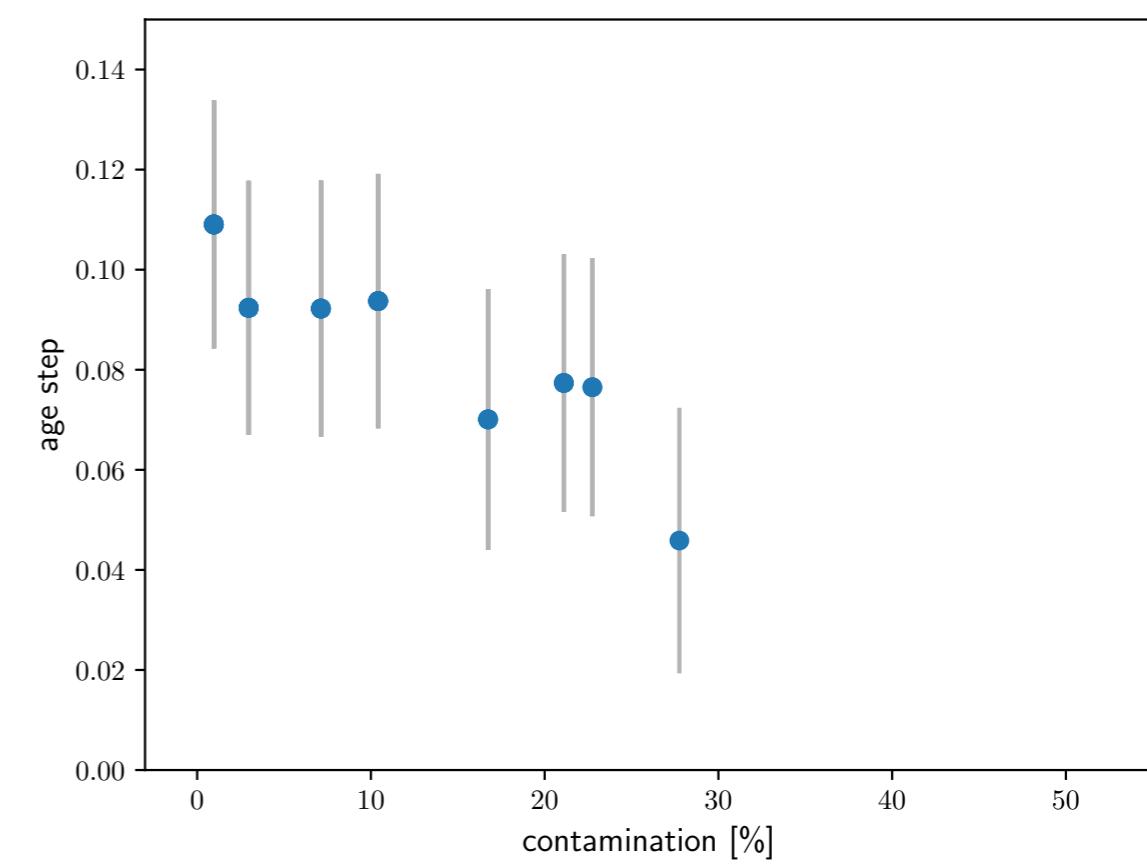
Younger



Older

Older

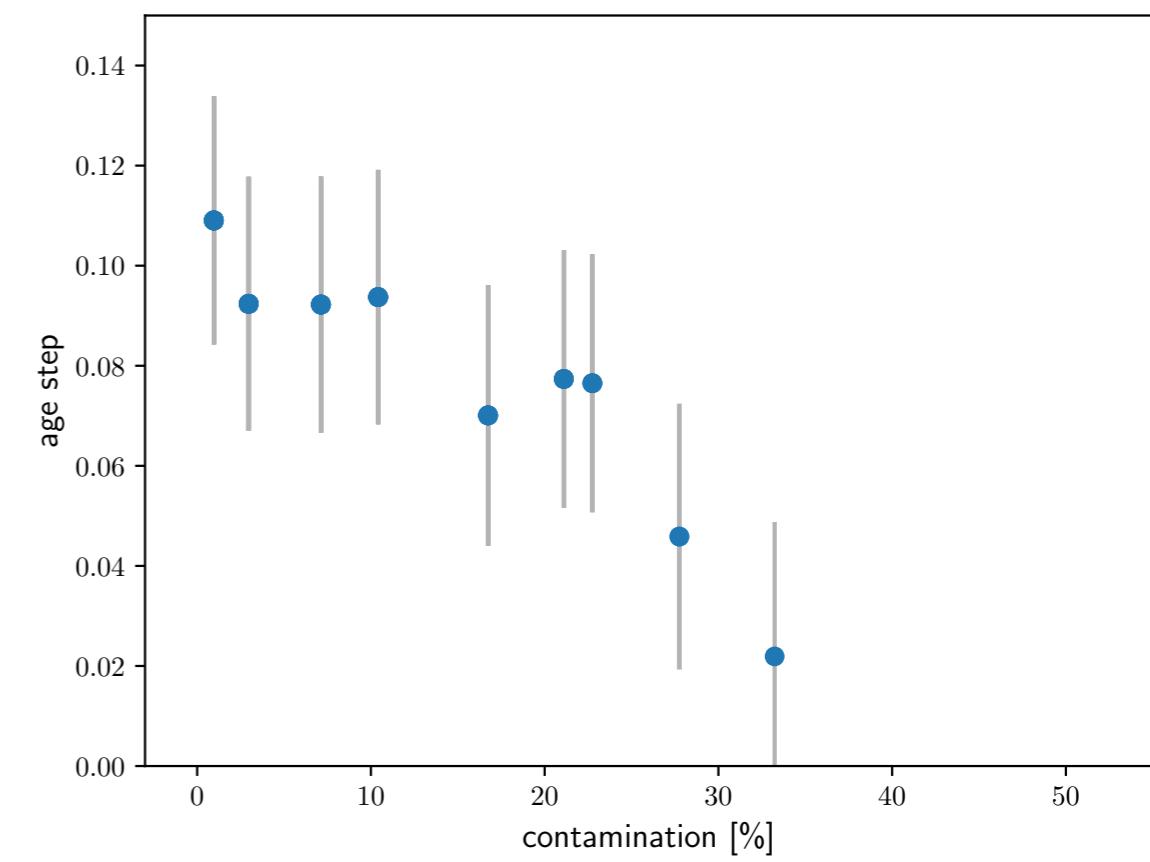
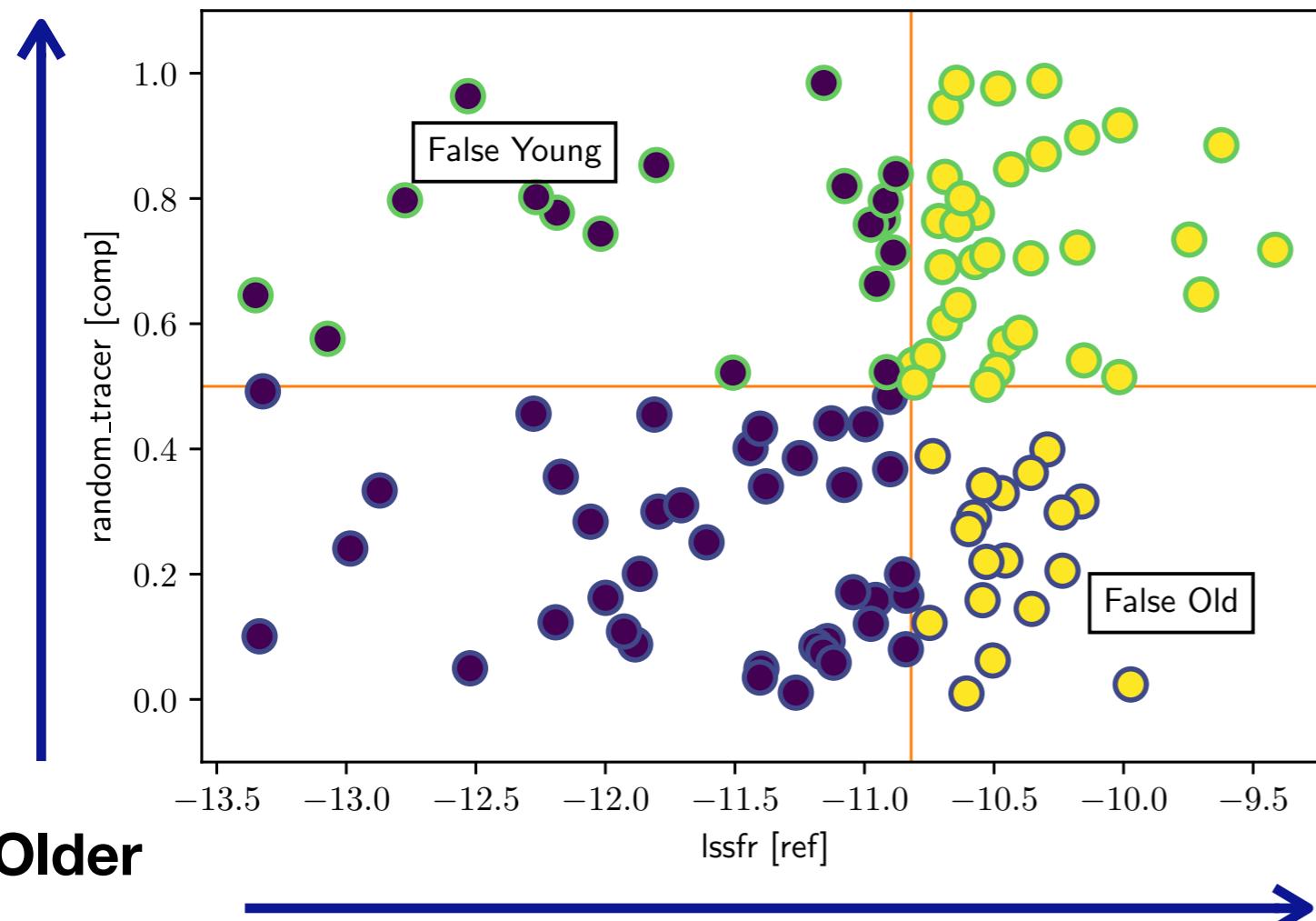
Younger



Contamination

→ False-negative and false-positive fractions

Younger



Older

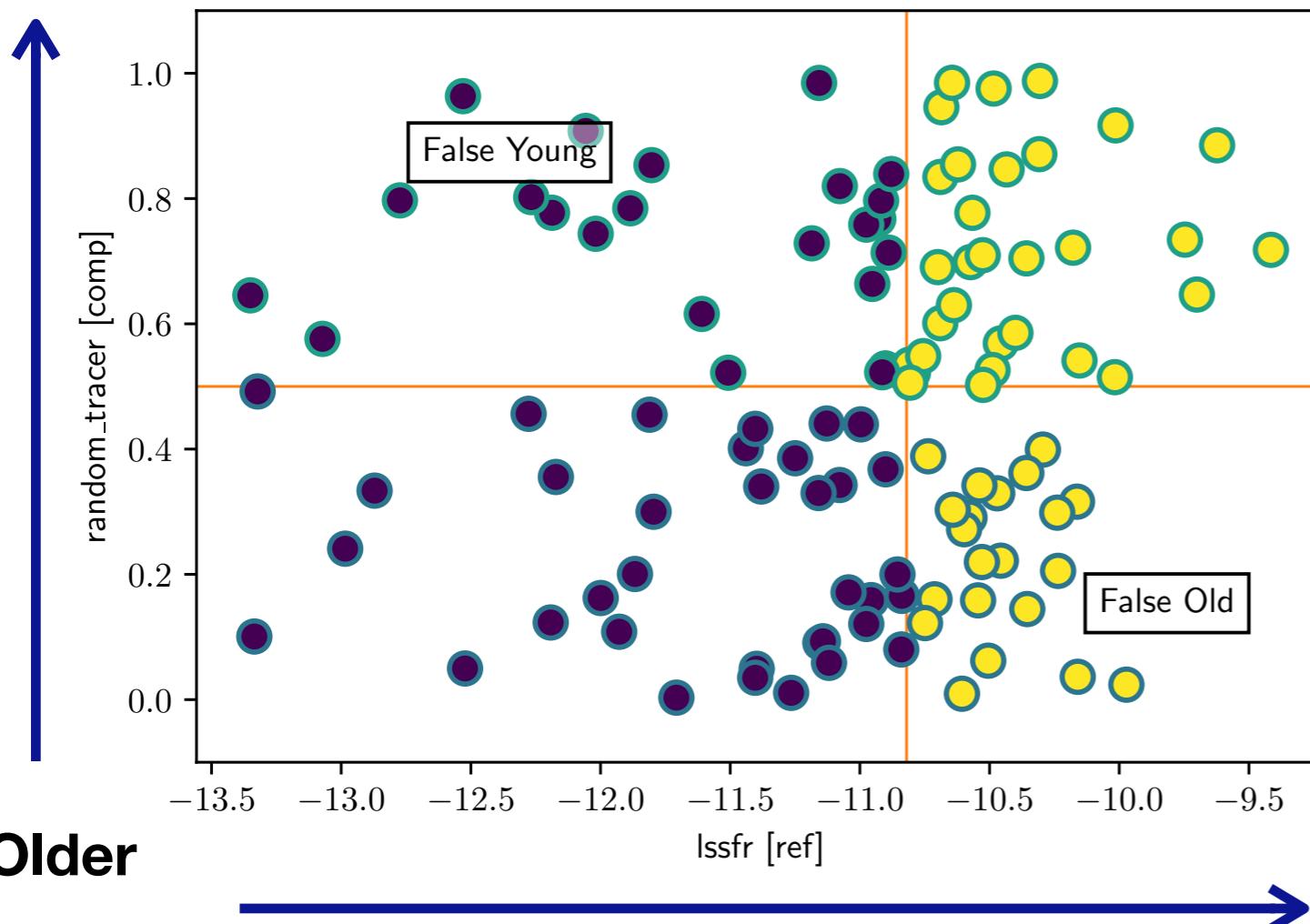
Older

Younger

Contamination

→ False-negative and false-positive fractions

Younger

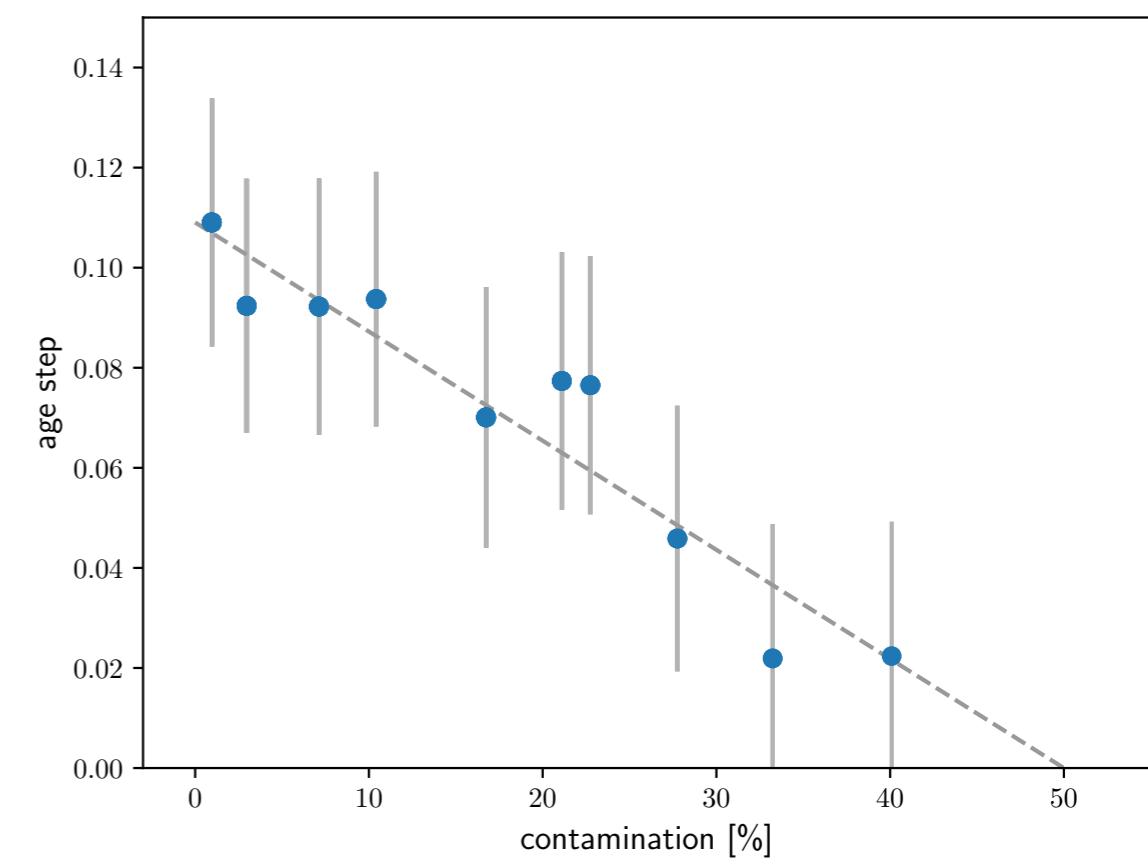


Older

Older

Younger

7



Age tracers

- Local Specific Star Formation Rate (LsSFR)
 - Stellar mass
 - Colors
 - Morphology
-
- The diagram illustrates the age tracers listed above. A brace on the right side groups the first two items (LsSFR and Stellar mass) under the label 'SNf'. Another brace further down groups the last two items (Colors and Morphology) under the label 'SDSS'.

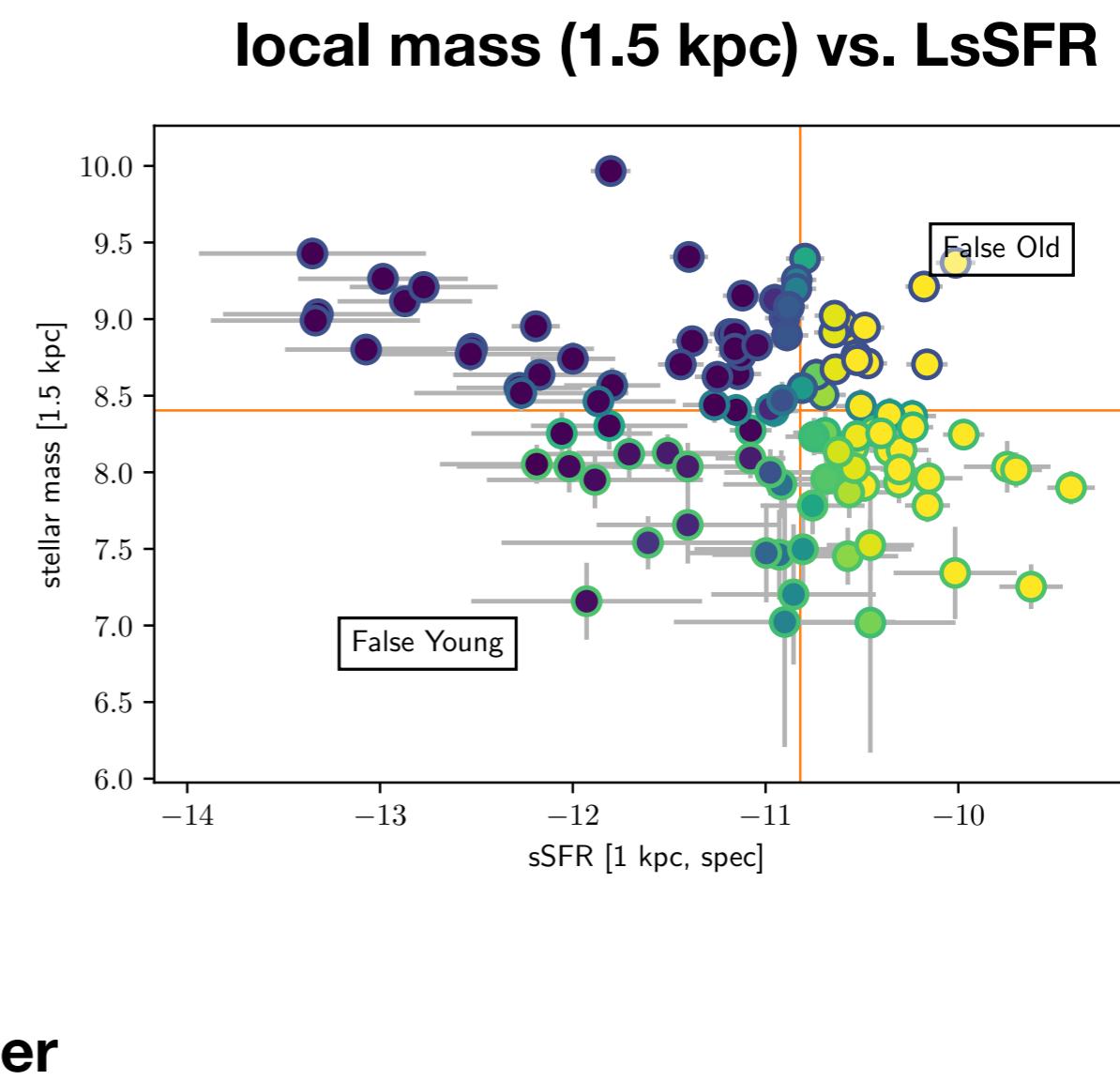
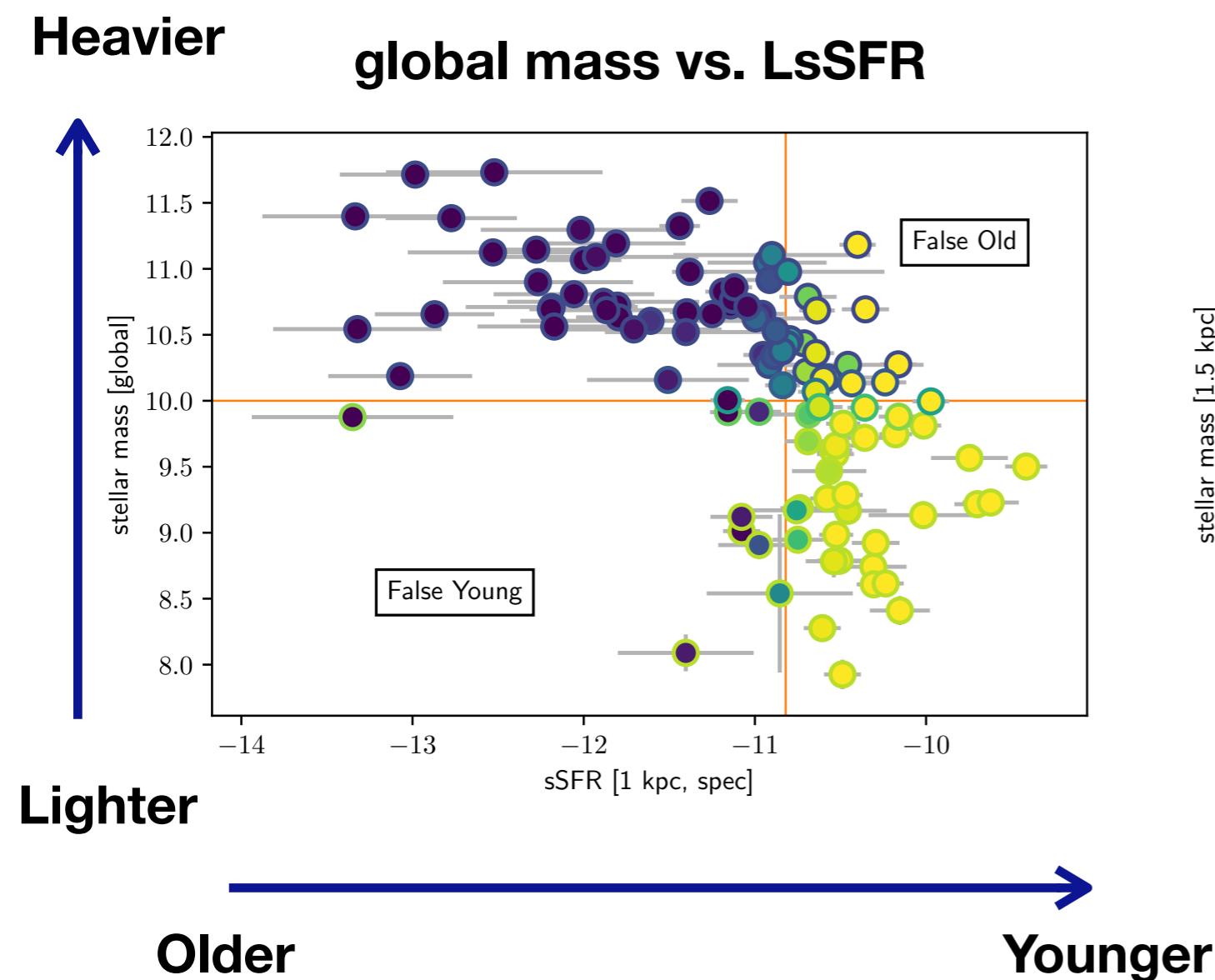
SNela sample : The Nearby Supernova factory (SNf)

Age tracers

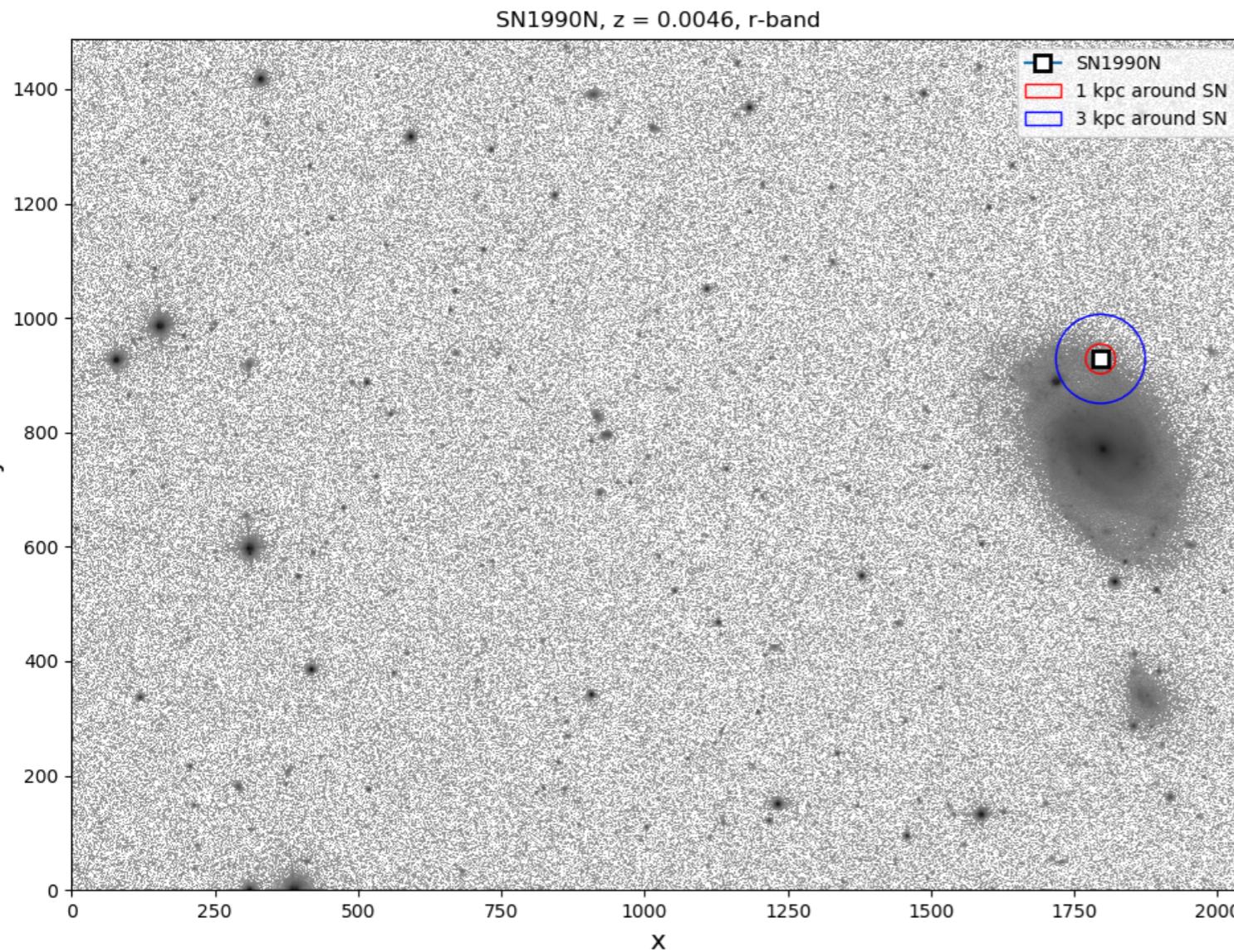
-
- The diagram illustrates the various age tracers used in the SNela sample. A red box highlights 'Local Specific Star Formation Rate (LsSFR)'. A red arrow points from this box to the word 'Reference' at the top right. To the right of the list, two black curly braces group the tracers: one brace groups 'LsSFR', 'Stellar mass', and 'Colors' under the label 'SNf'; another brace groups 'Morphology' under the label 'SDSS'.
- Local Specific Star Formation Rate (LsSFR)
 - Stellar mass
 - Colors
 - Morphology
- } SNf } SDSS

SNela sample : The Nearby Supernova factory (SNf)

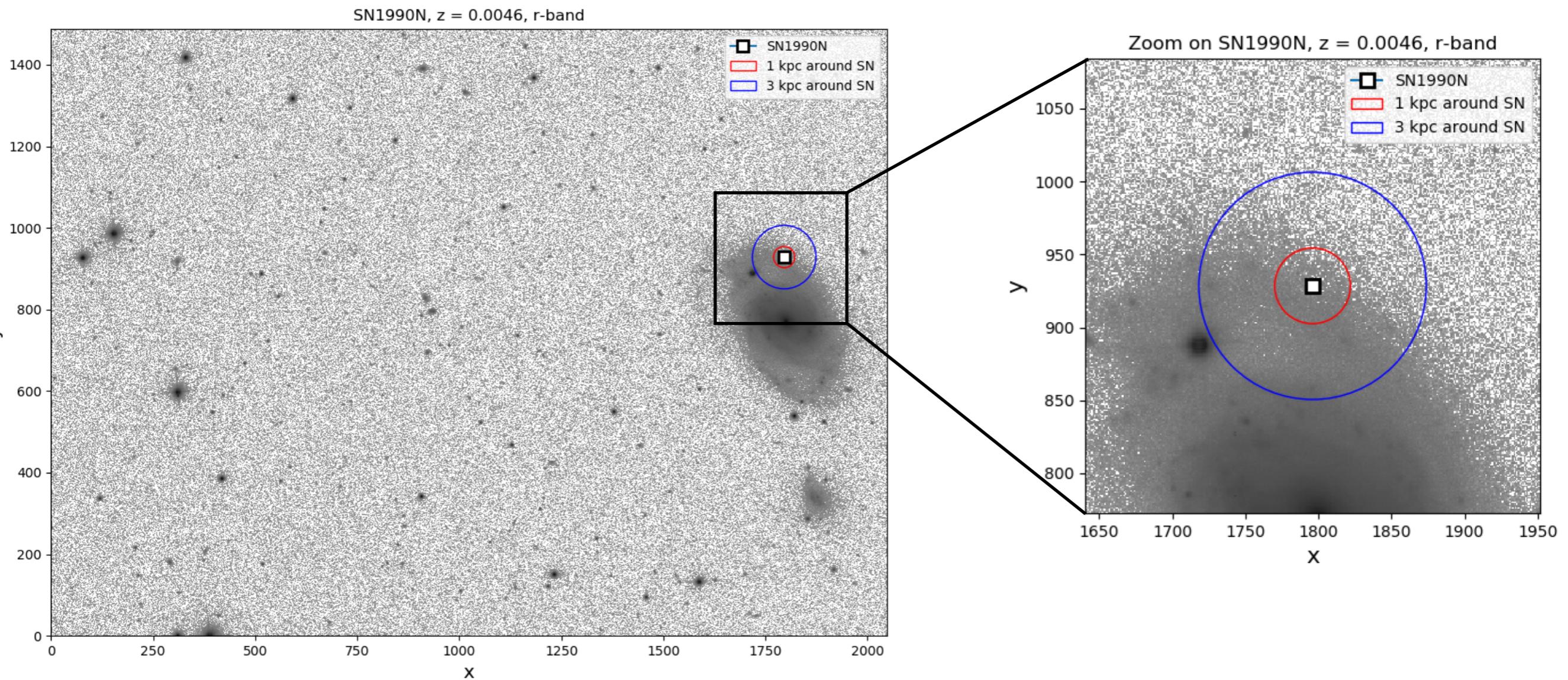
Age tracer : stellar mass



Age tracer : colors

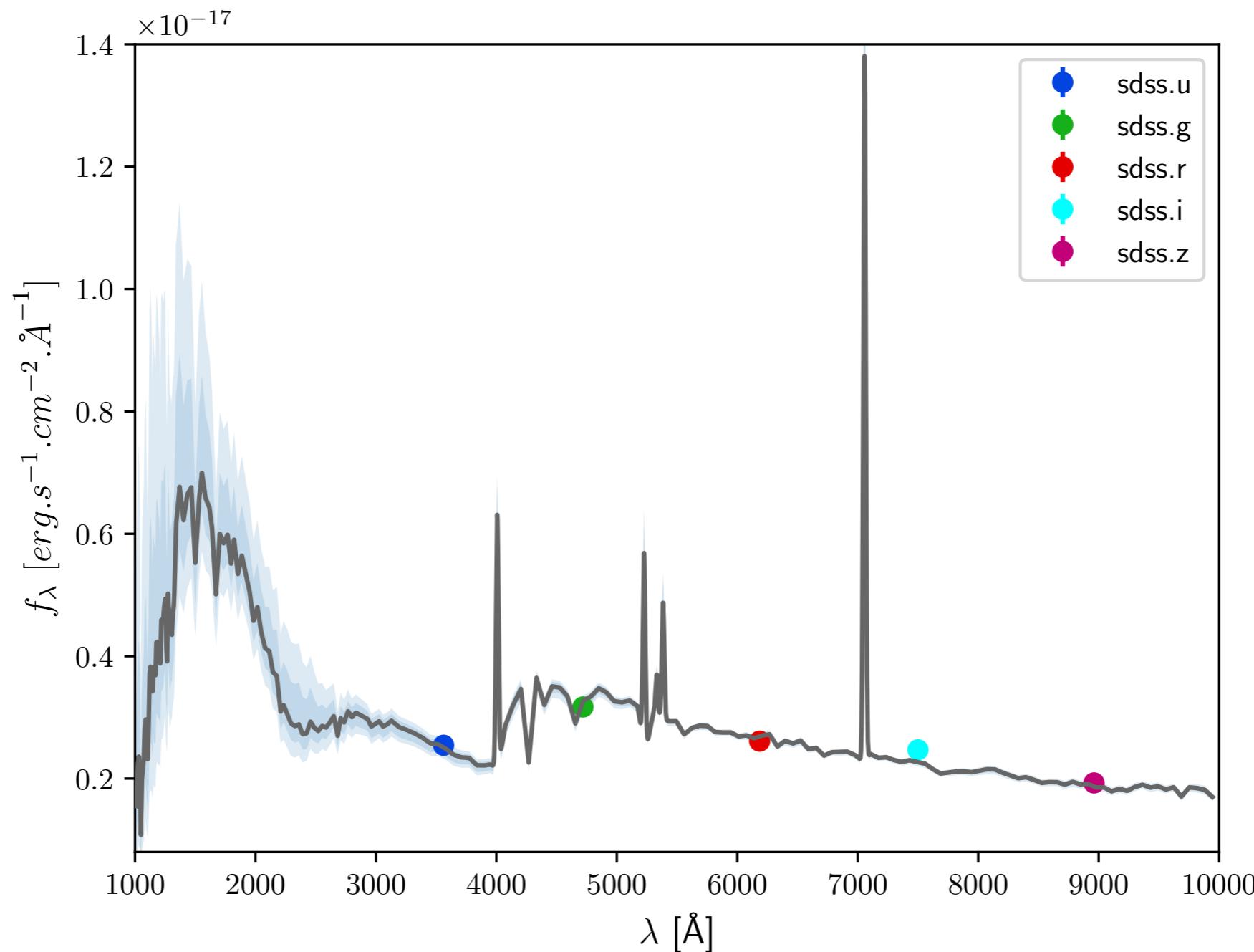


Age tracer : colors



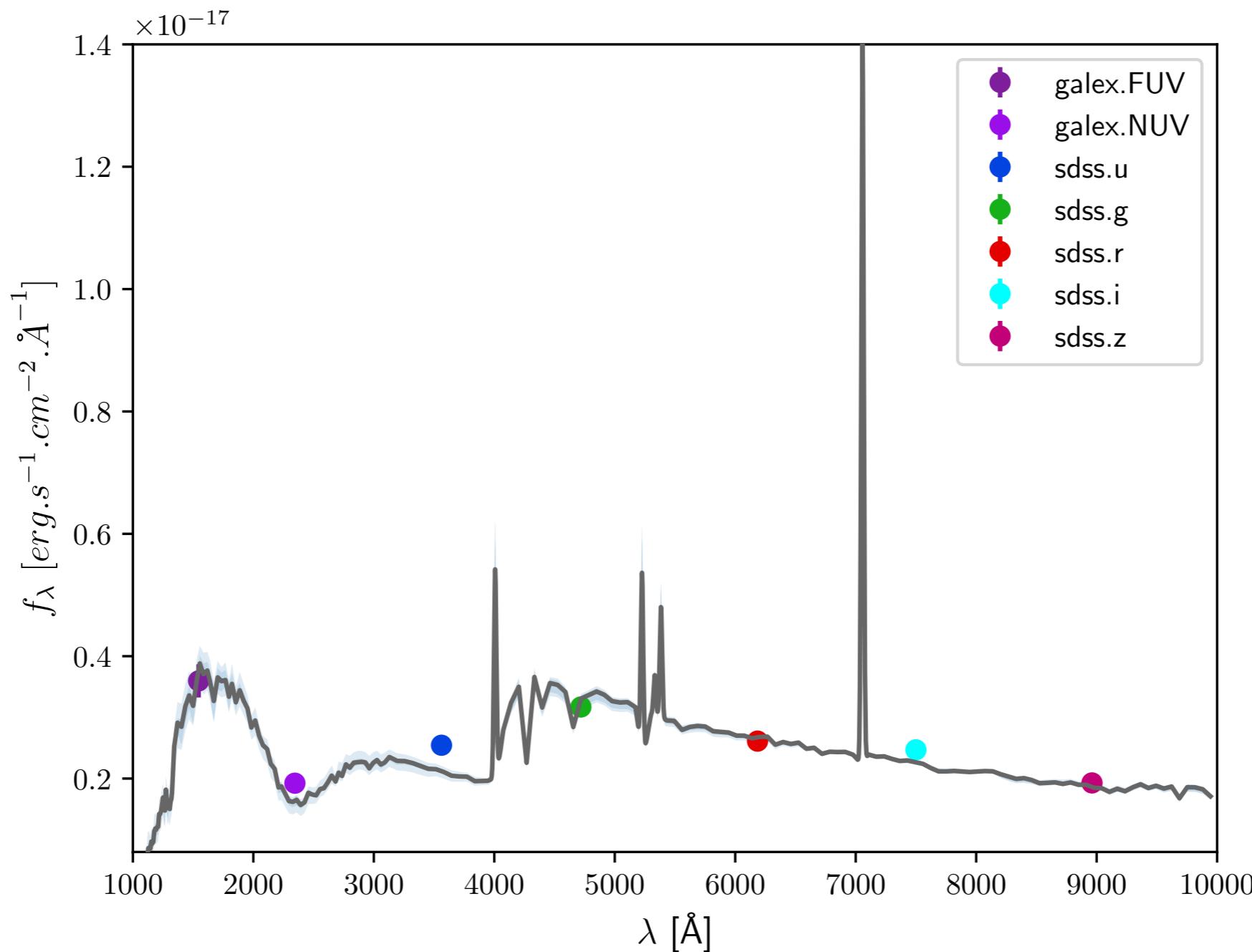
Age tracer : colors

SED fitting using LePhare



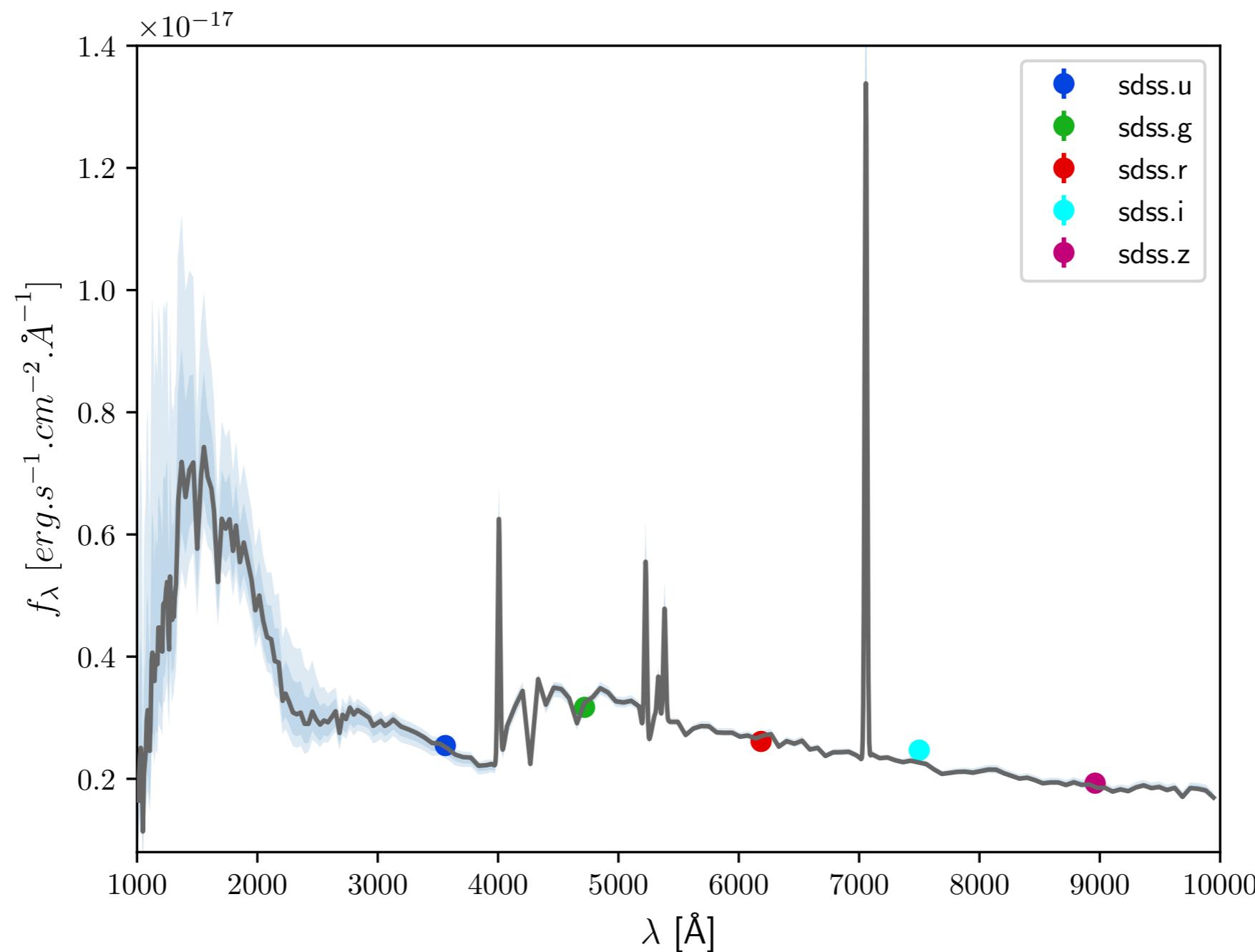
Age tracer : colors

SED fitting using LePhare



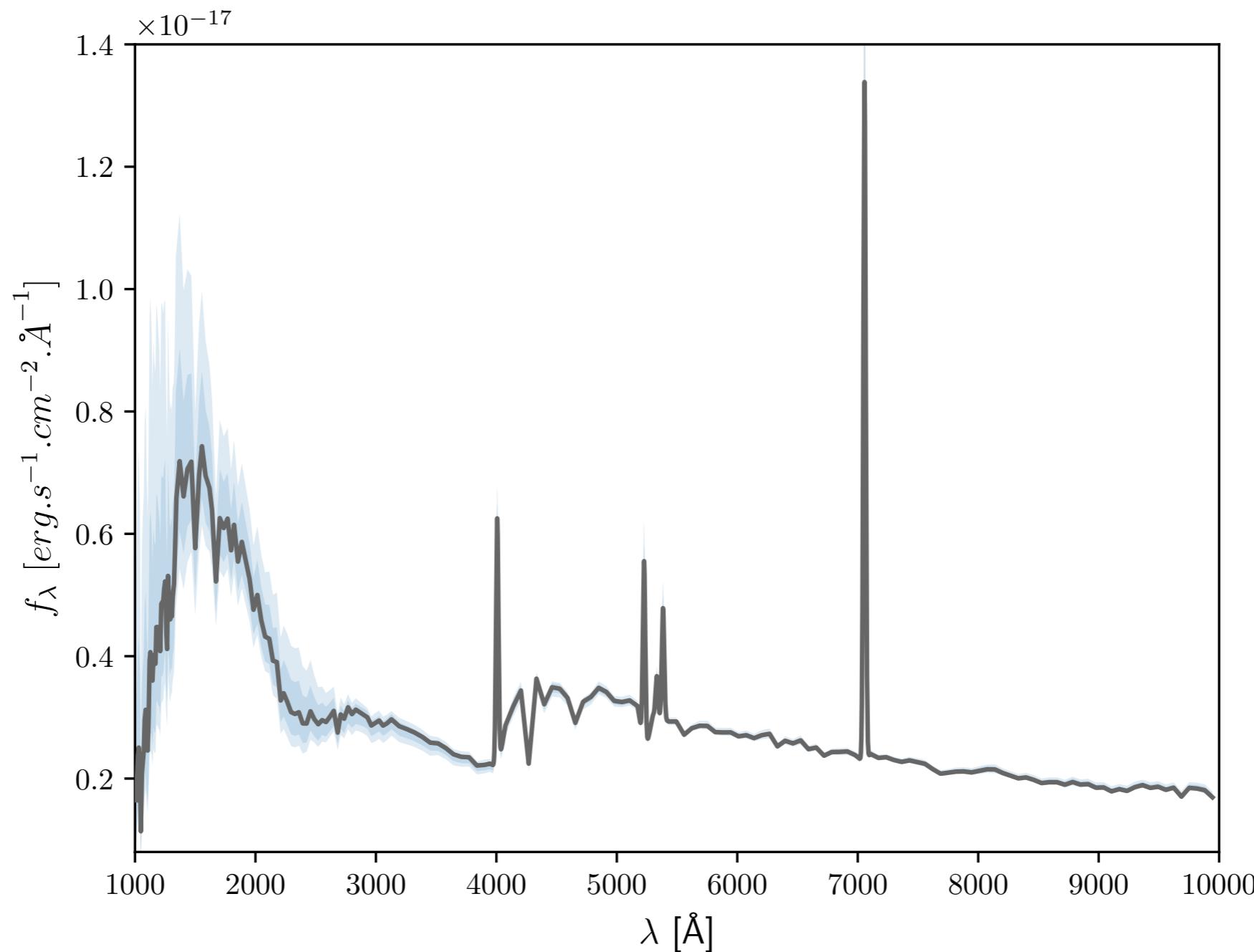
Age tracer : colors

SED fitting using LePhare



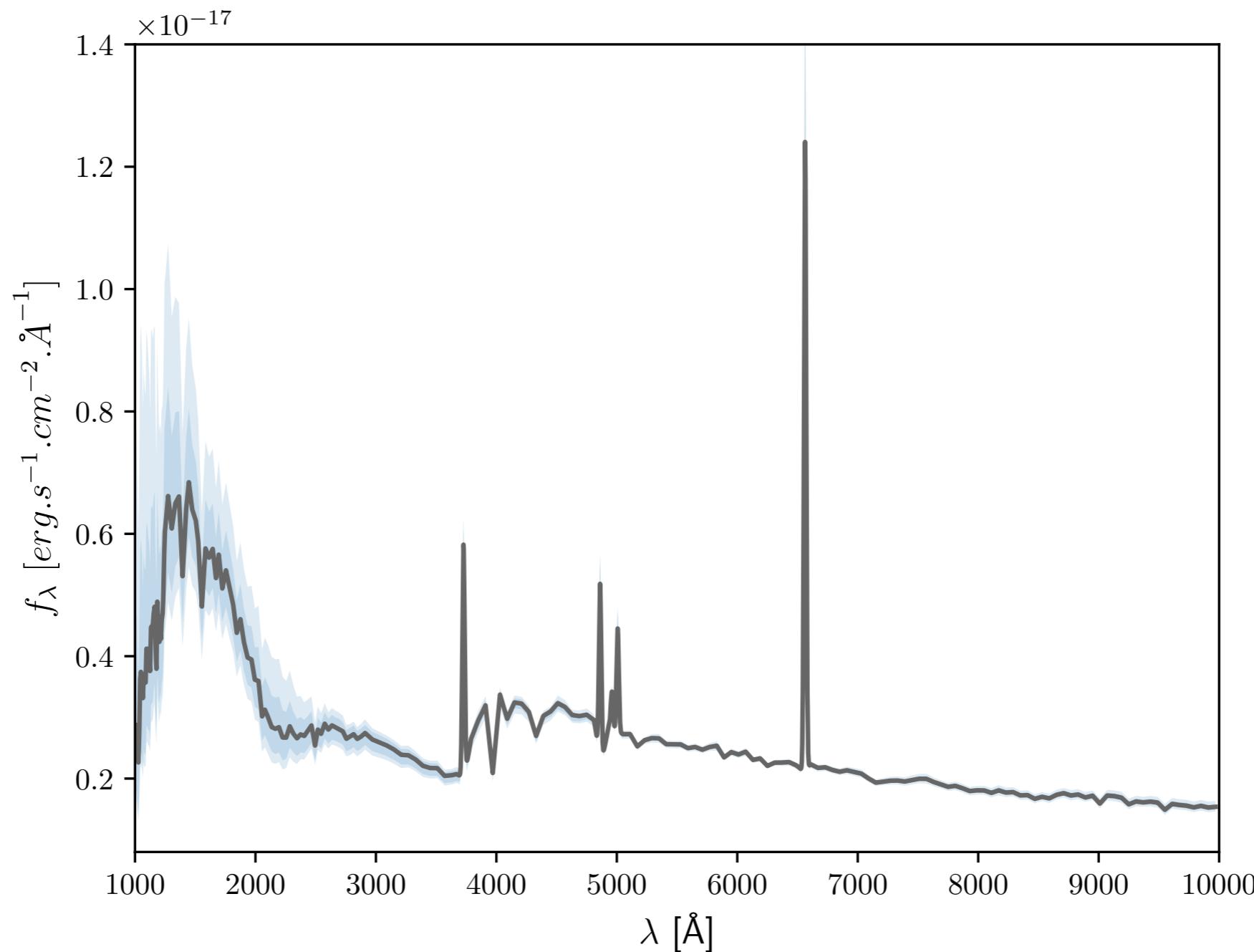
Age tracer : colors

SED fitting using LePhare



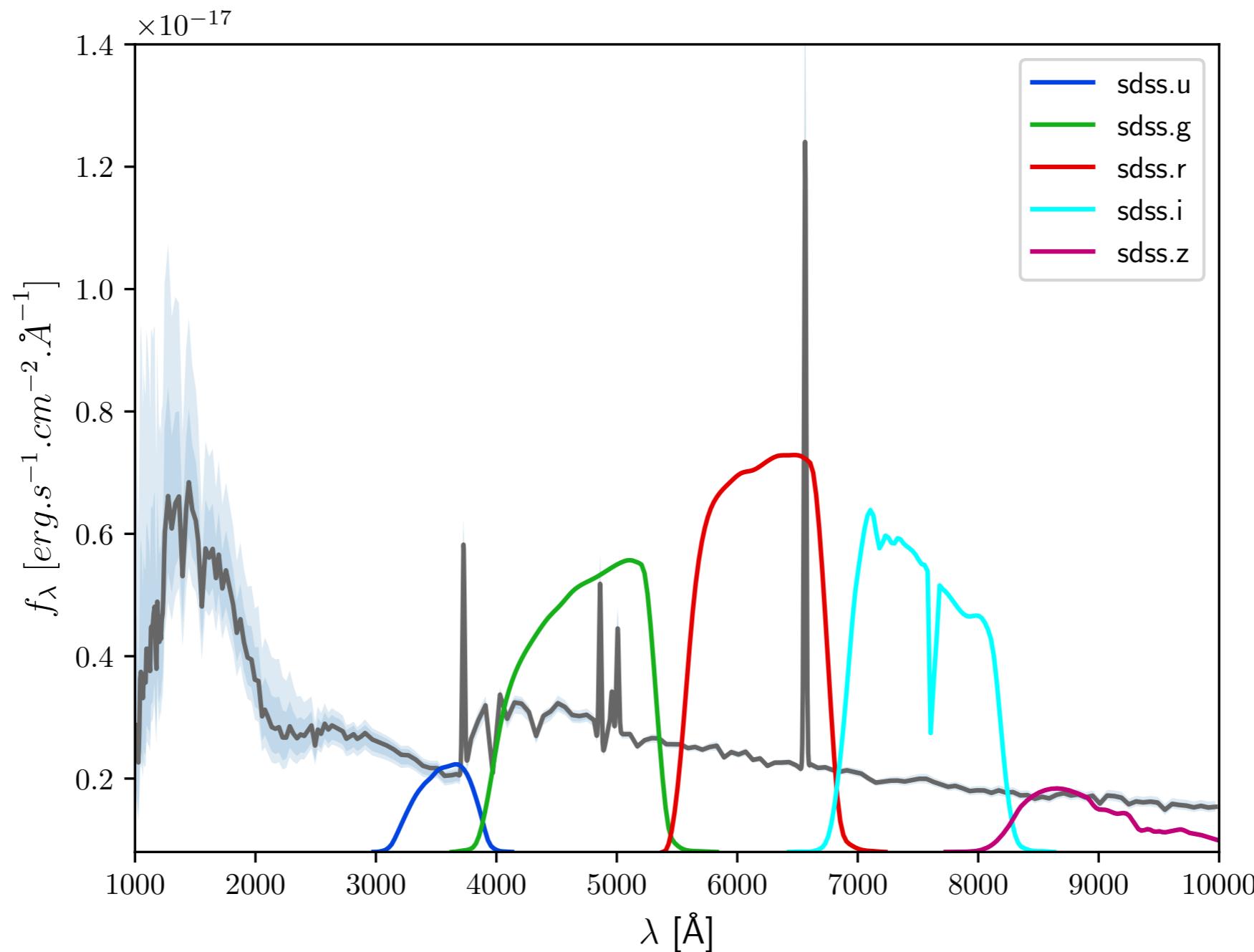
Age tracer : colors

SED fitting using LePhare



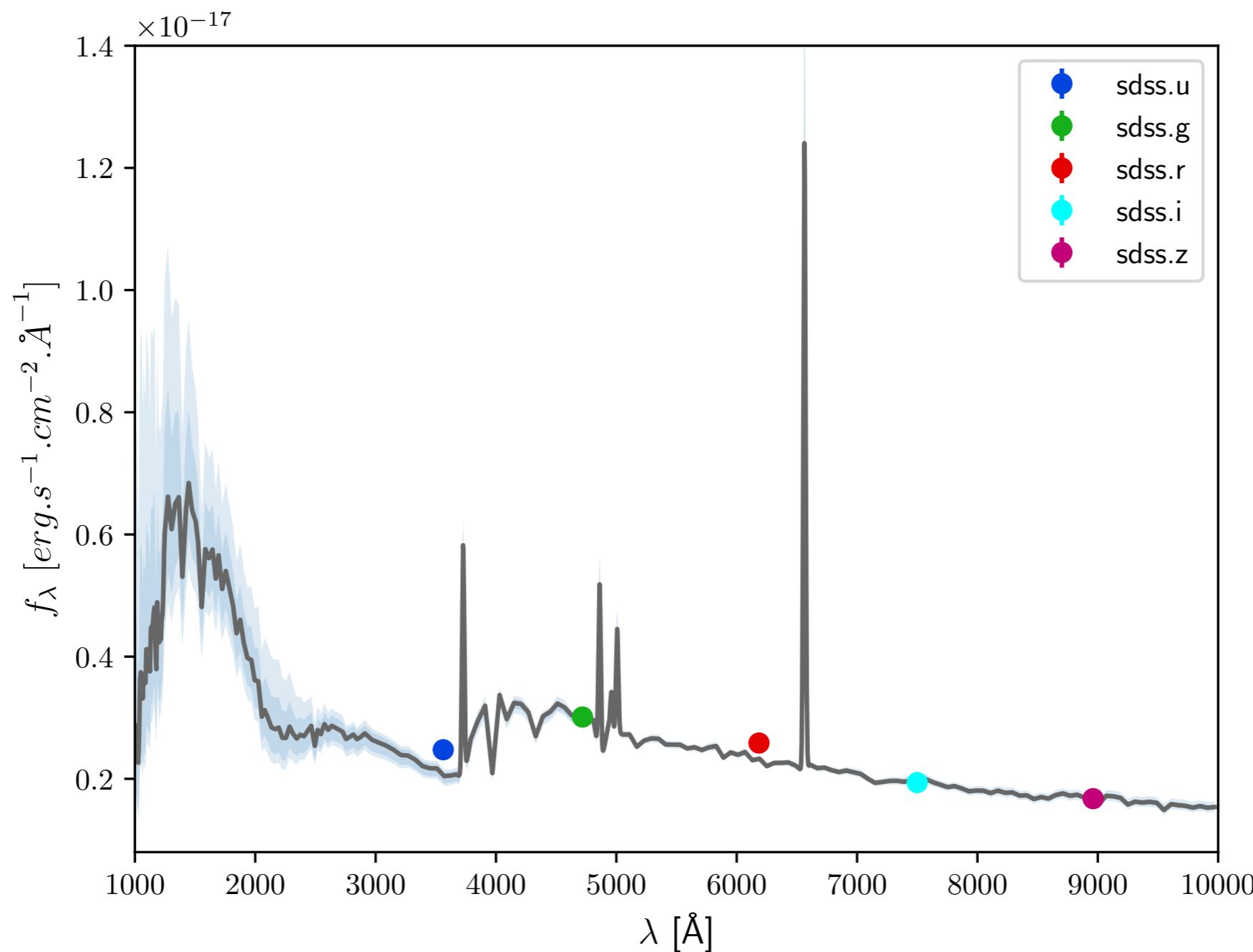
Age tracer : colors

SED fitting using LePhare

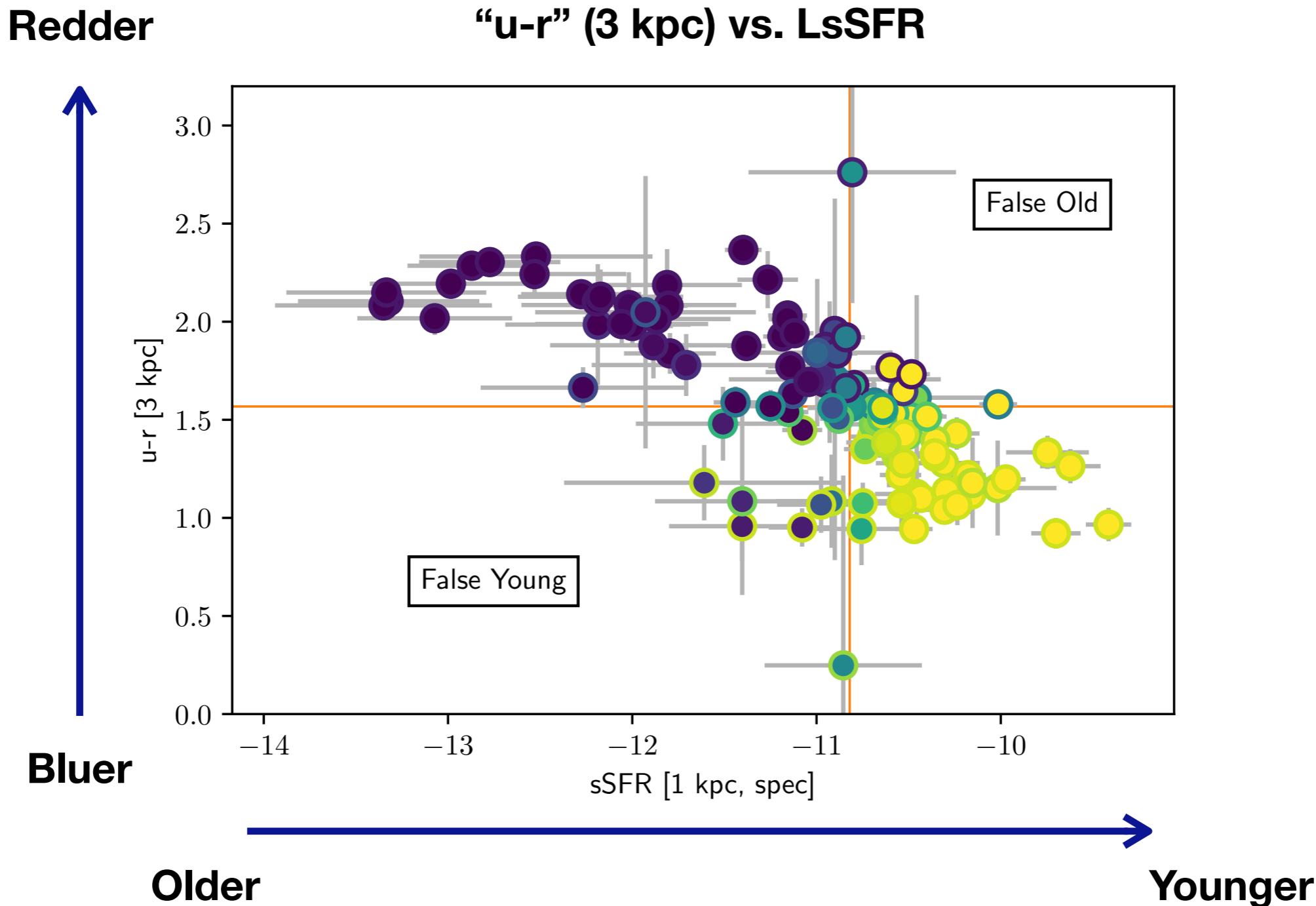


Age tracer : colors

SED fitting using LePhare



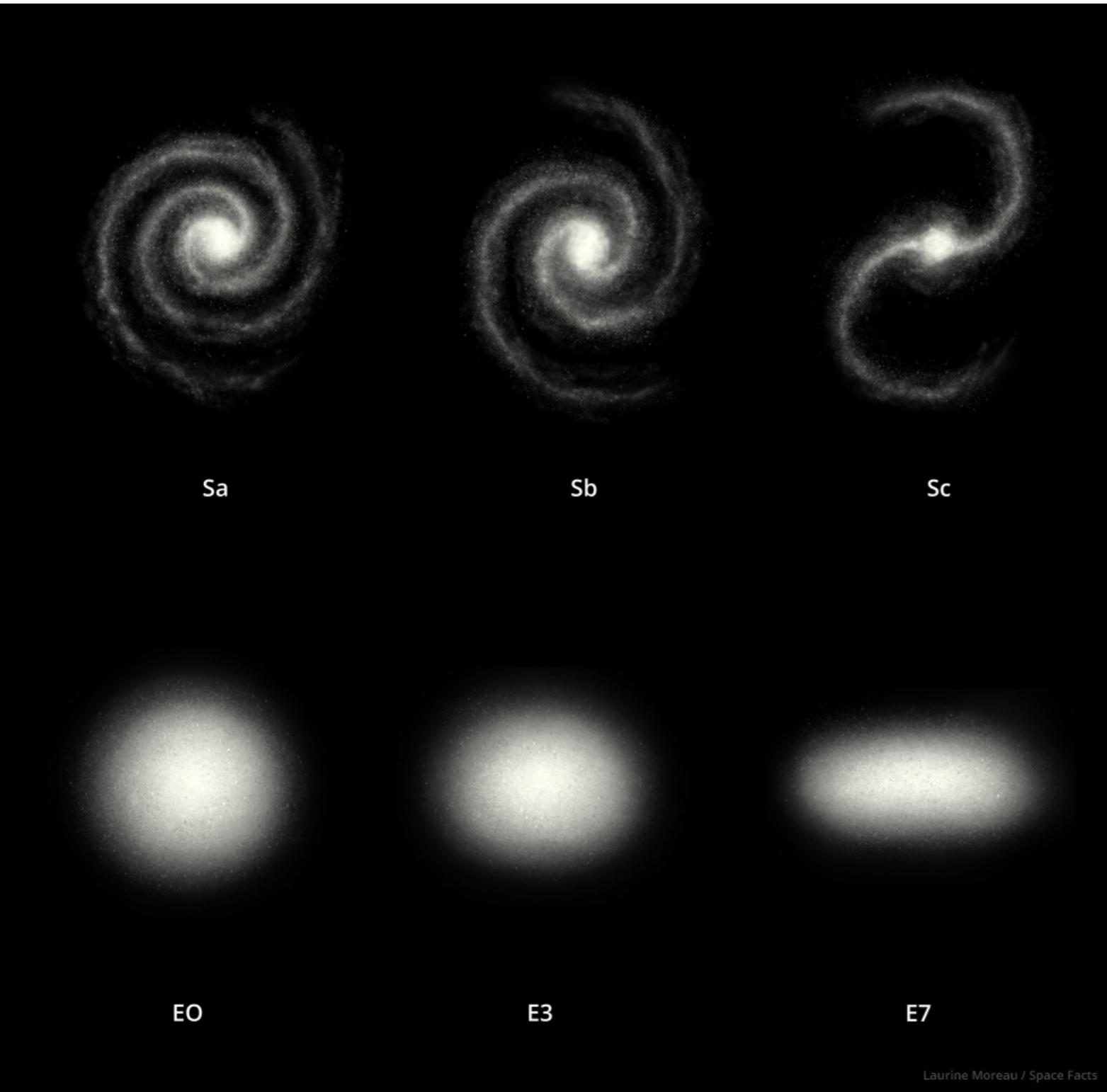
Age tracer : colors



Age tracer : morphology

- Radius containing 50% of the Petrosian flux in “r” band: R50
- Radius containing 90% of the Petrosian flux in “r” band: R90
- Inverse Concentration Index: $ici = R50 / R90$

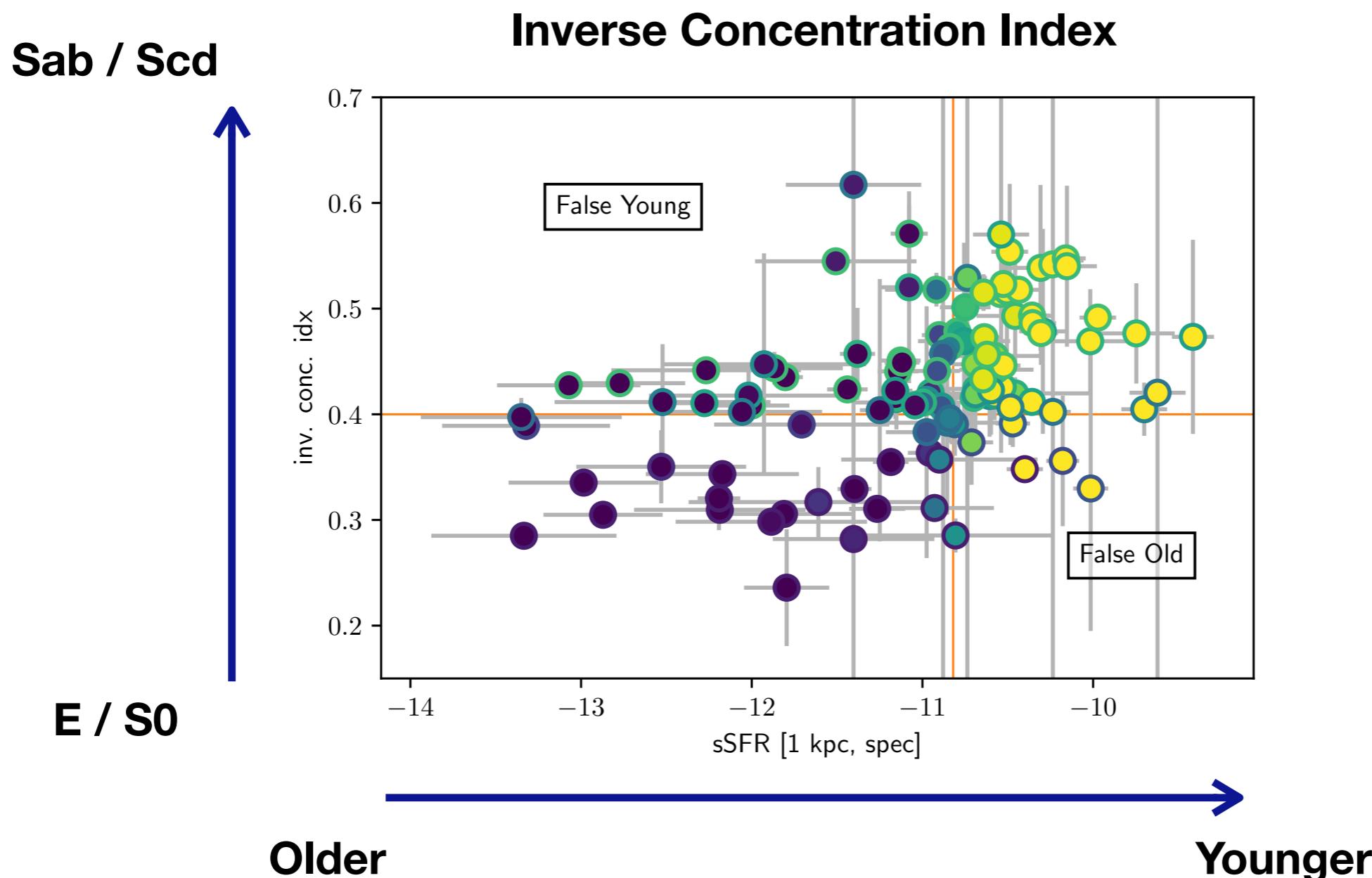
Age tracer : morphology



Sab / Scd : ici ~ 0.43

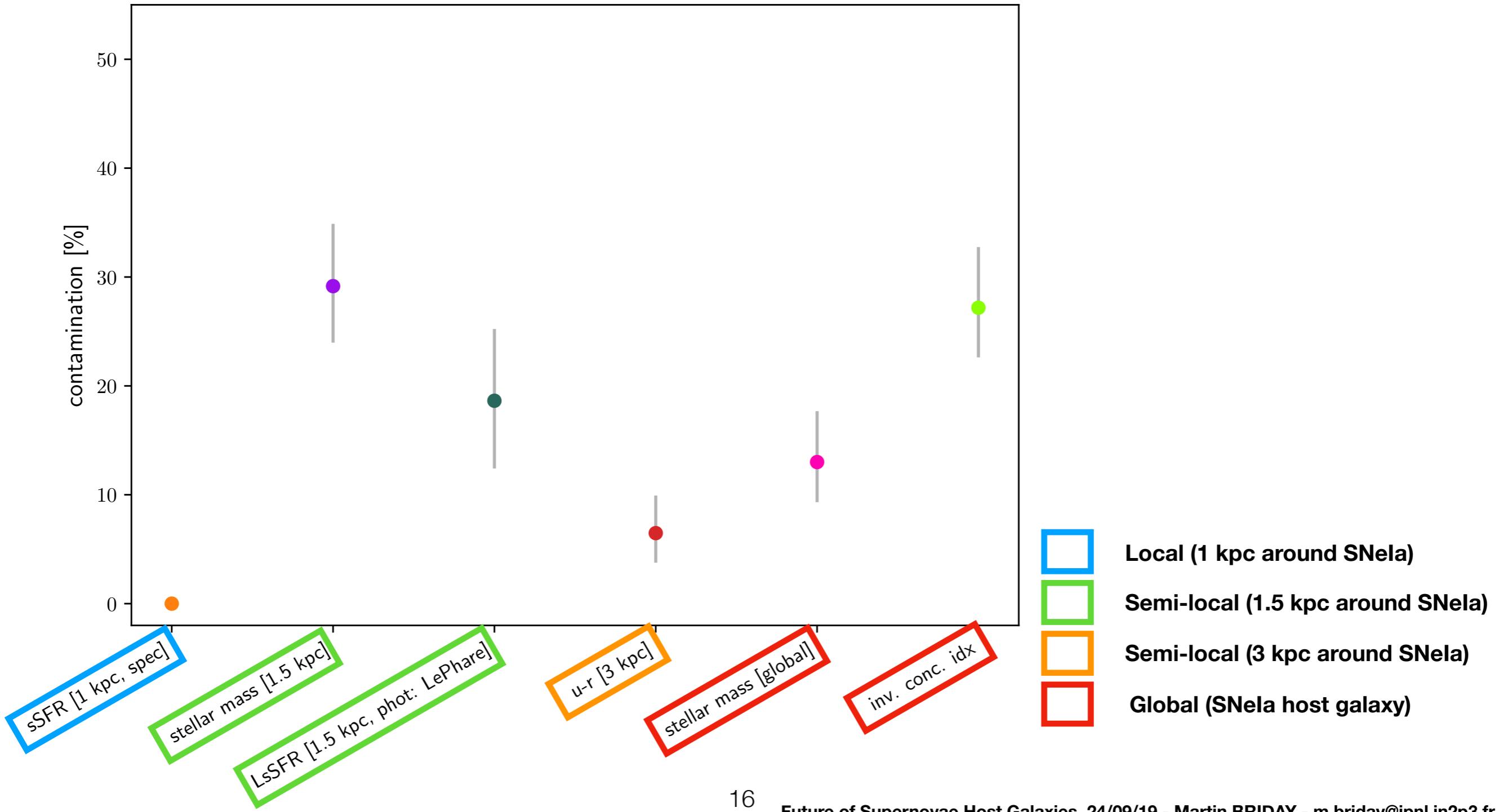
E / S0 : ici ~ 0.3

Age tracers : morphology



Preliminary results

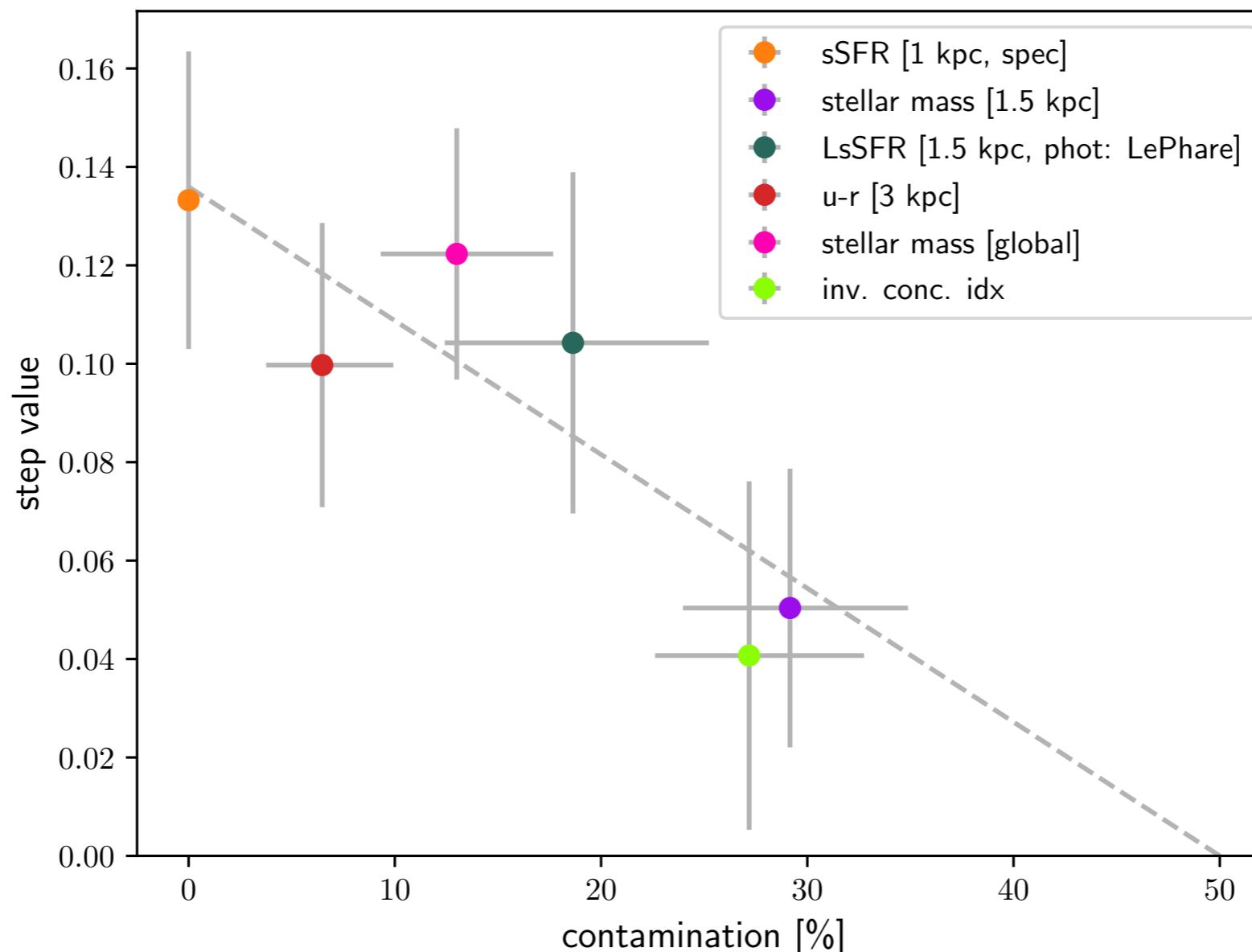
Contaminations



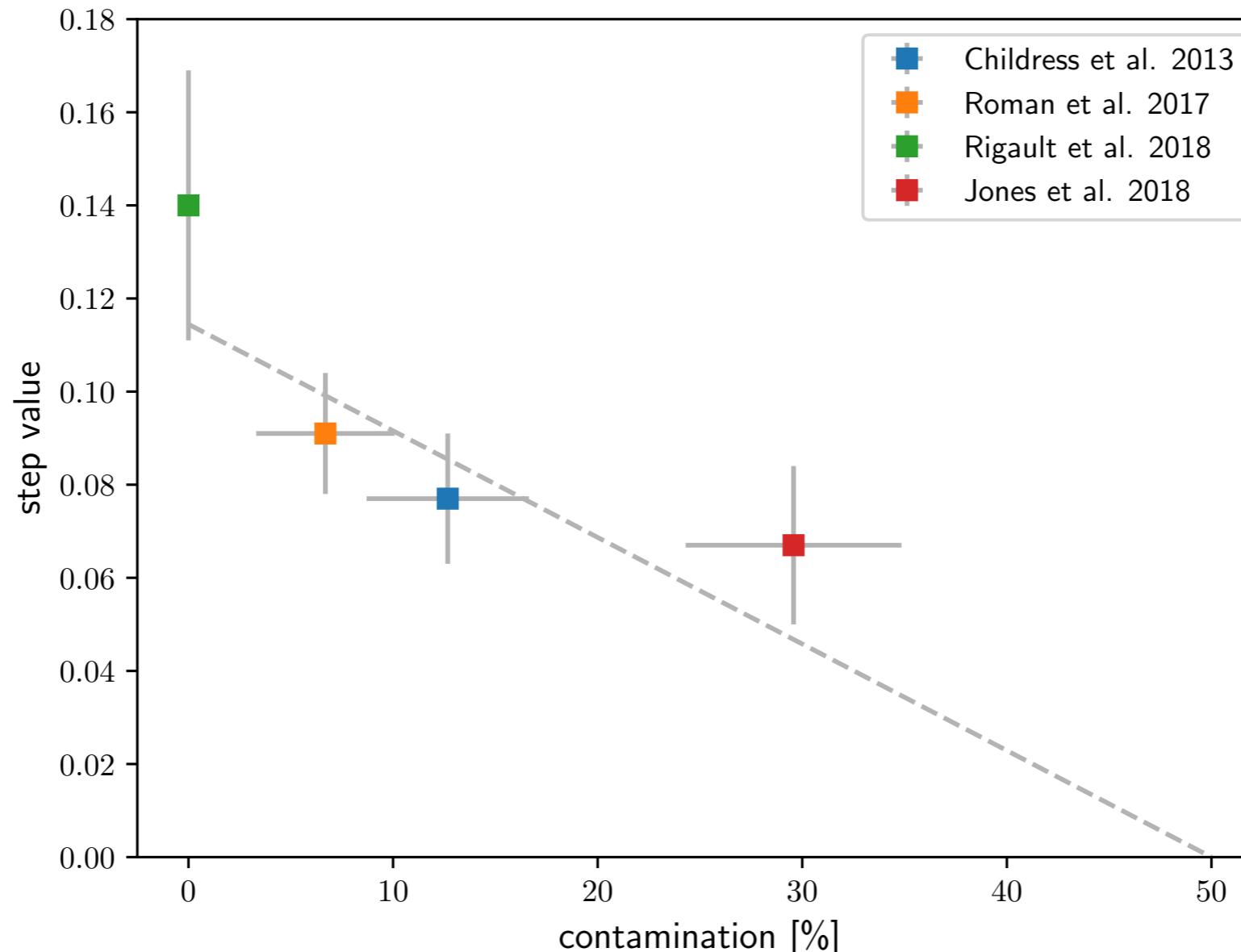
Preliminary results

Age step vs contamination

Briday et al. in prep.



Steps from literature



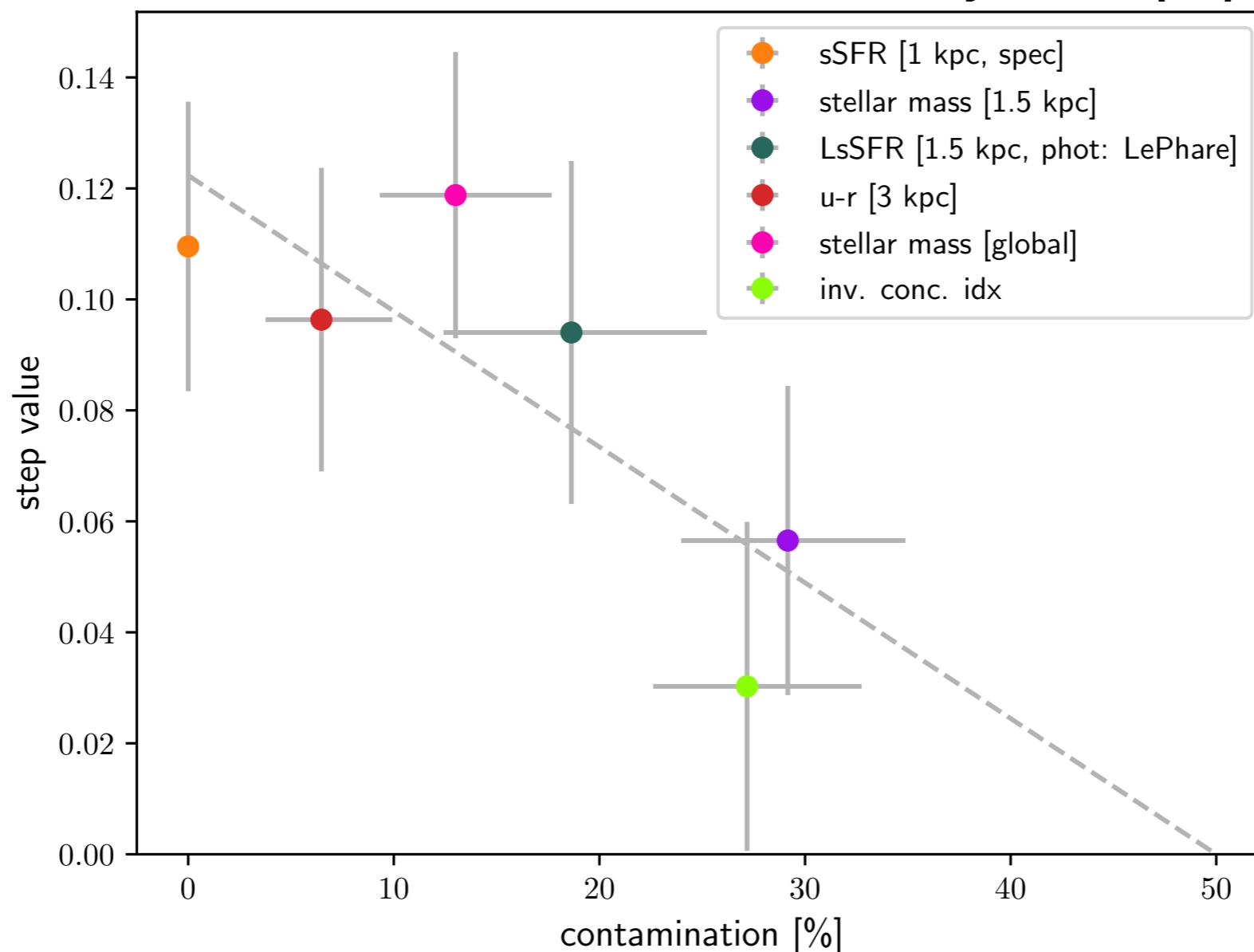
Conclusion

- Still working on contamination measurement
- Apply on SH0ES sample
- Fit the LsSFR contamination → provide the “true” magnitude step

Back-up

**Age step vs contamination
SN parameters fitted knowing LsSFR step**

Briday et al. in prep.



Back-up

