Unveiling I Zw 18 age's mystery

Resolved Stellar Populations and Star Formation History Study with JWST/NIRCam

Giacomo Bortolini

PhD student

email: giacomo.bortolini@astro.su.se

IAU symposium 395
Paraty, Brazil 2024

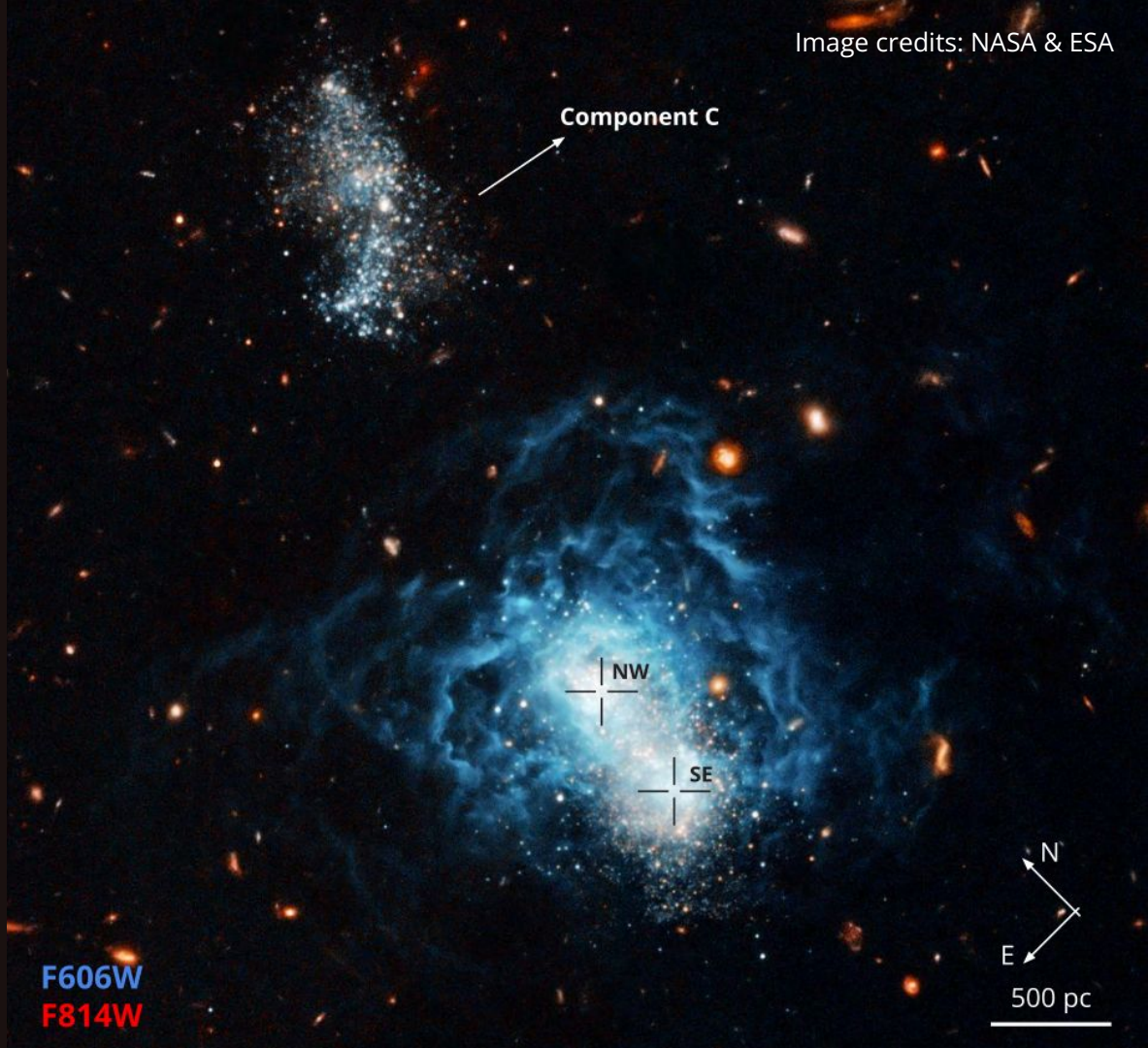
Stockholms universitet

Oskar Klein centre

image credits: ESA/Webb, NASA, CSA

The crime scene: I Zw 18

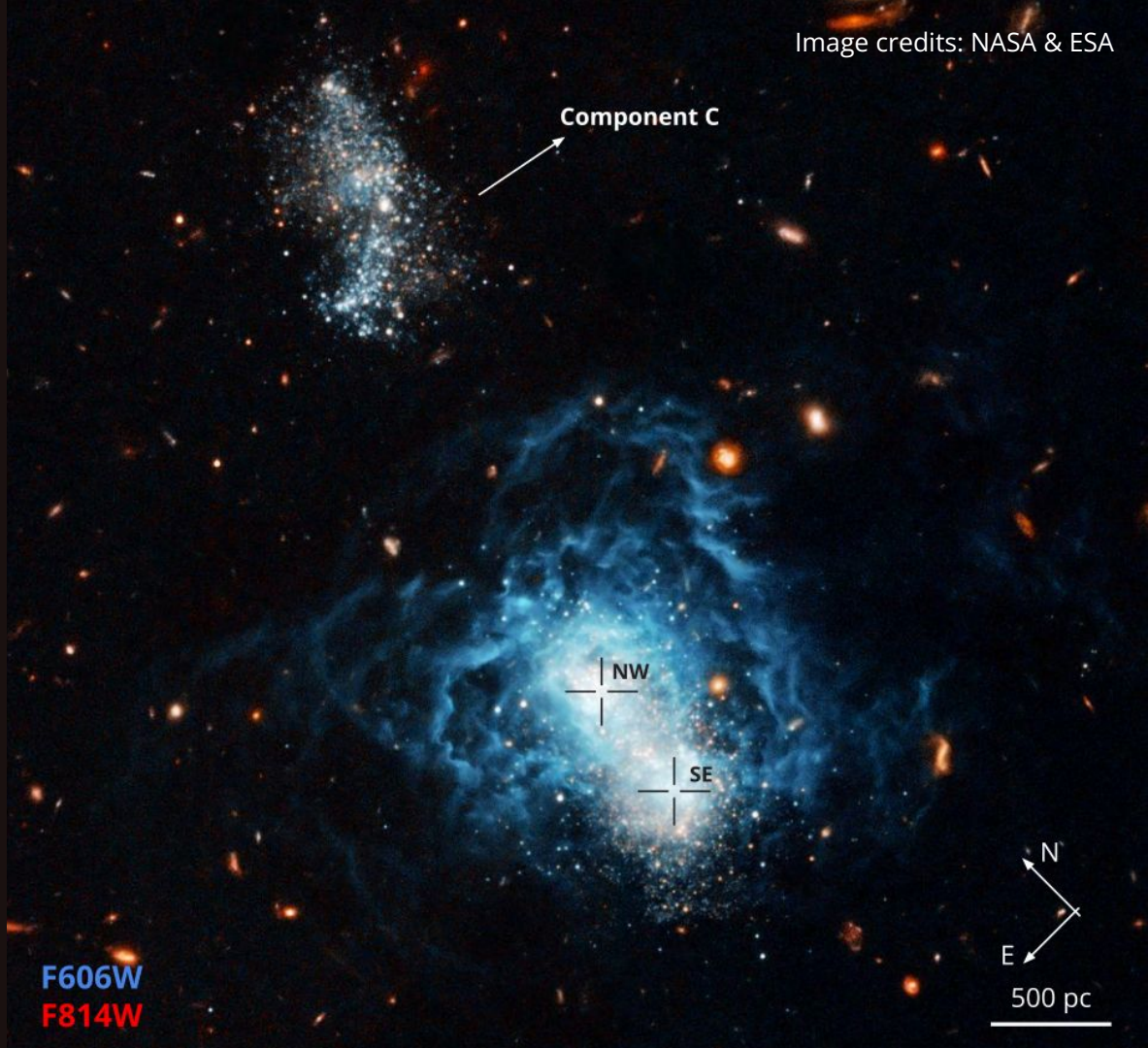
Blue compact dwarf



The crime scene: I Zw 18

Blue compact dwarf

Distance ~ 18 Mpc

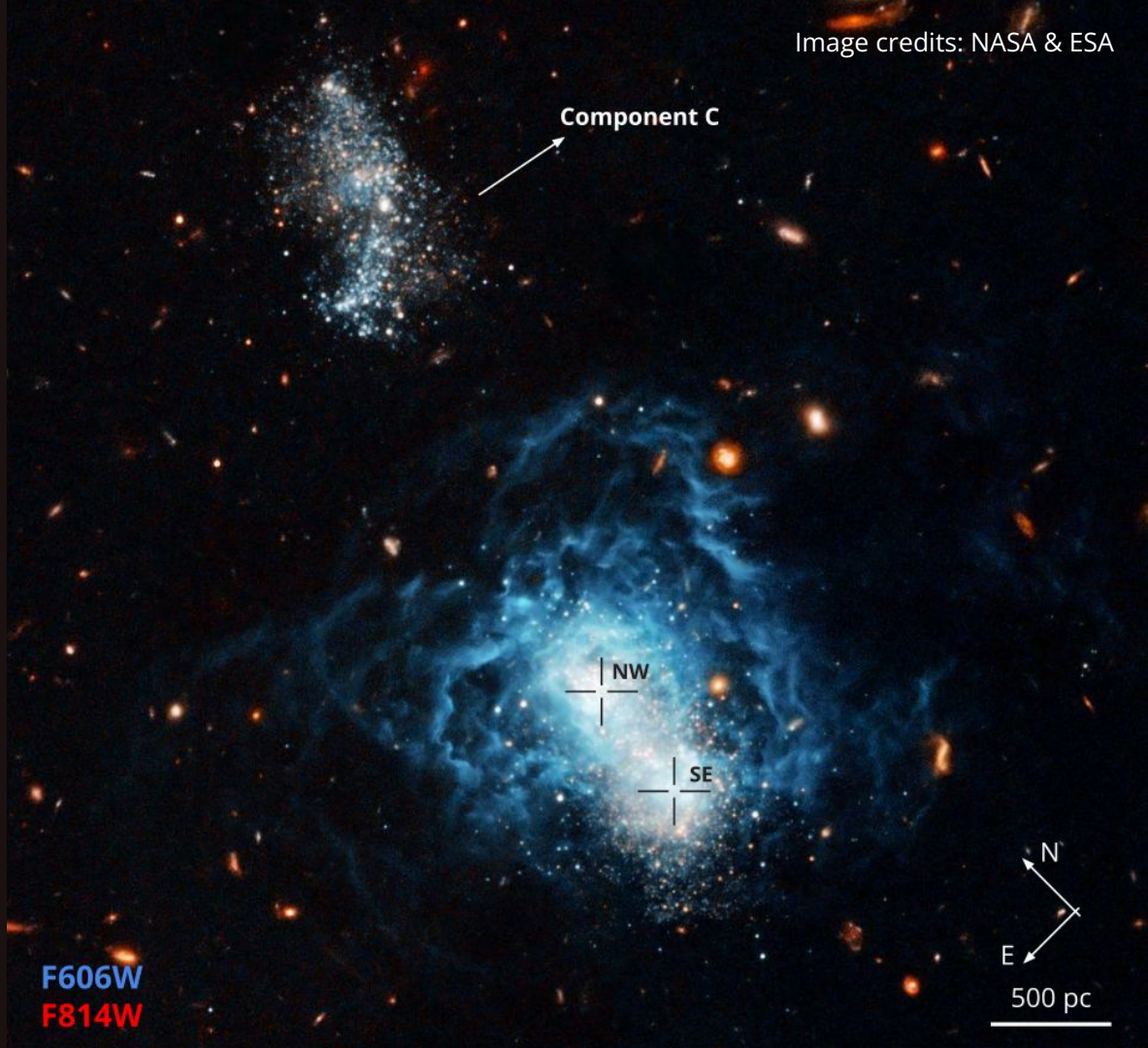


The crime scene: I Zw 18

Blue compact dwarf

Distance ~ 18 Mpc

Component C



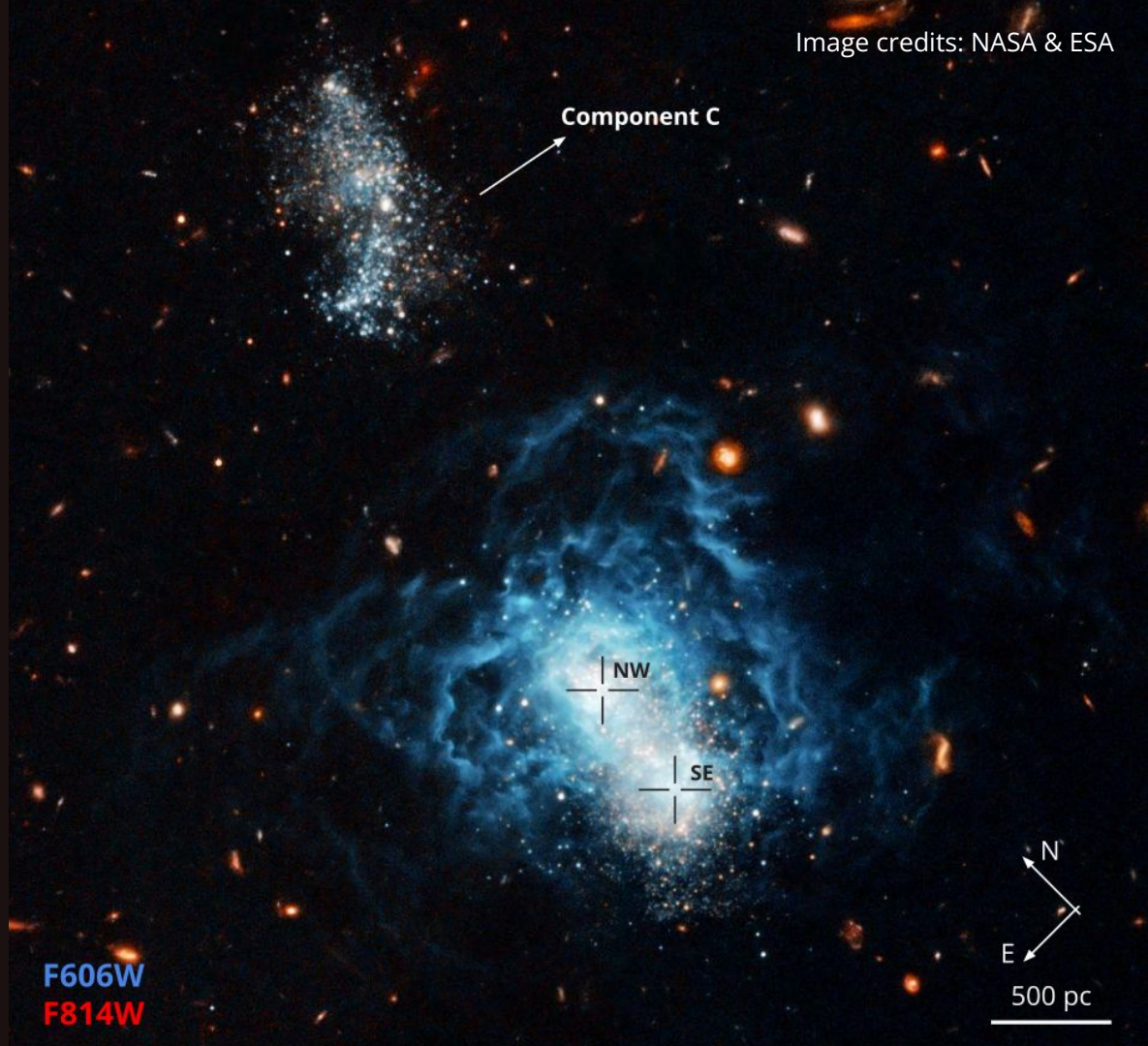
The crime scene: I Zw 18

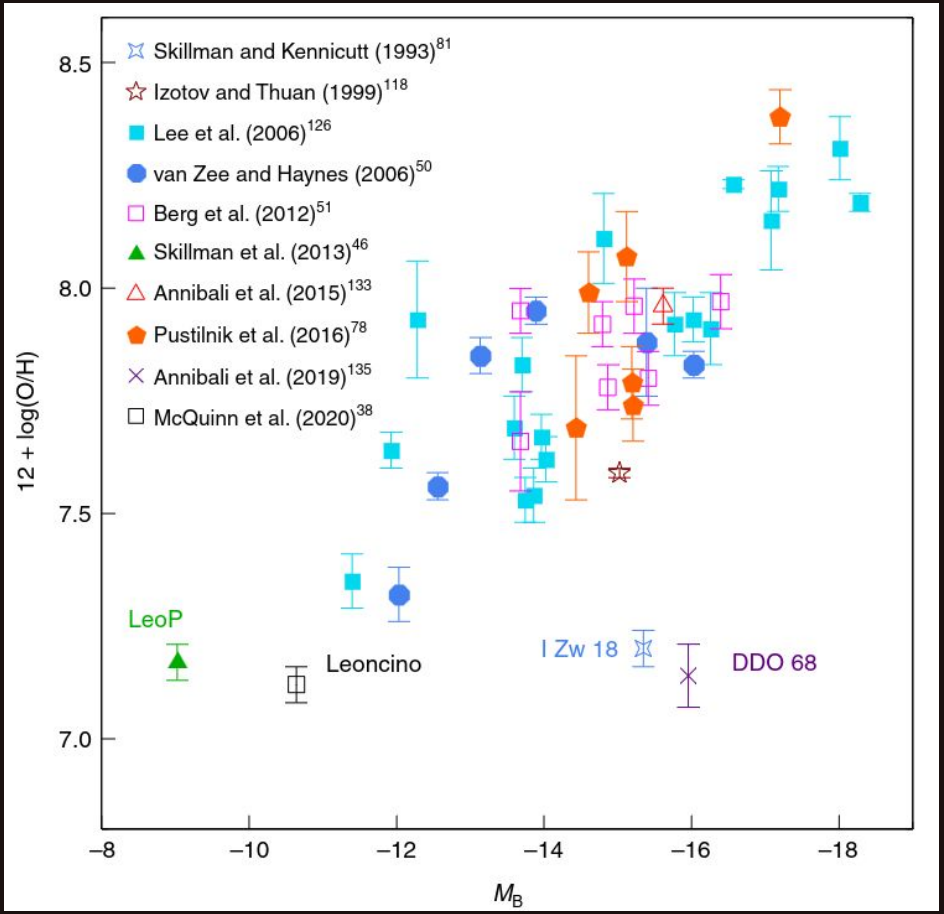
Blue compact dwarf

Distance ~ 18 Mpc

Component C

12 + log(O/H) ~ 7.2





Annibali & Tosi 2022

Why is it so metal-poor?

How?

Forming their first stars?

How?

Forming their first stars?

Slow secular evolution?

How?

Forming their first stars?

Slow secular evolution?

Mergers, gravitational interactions

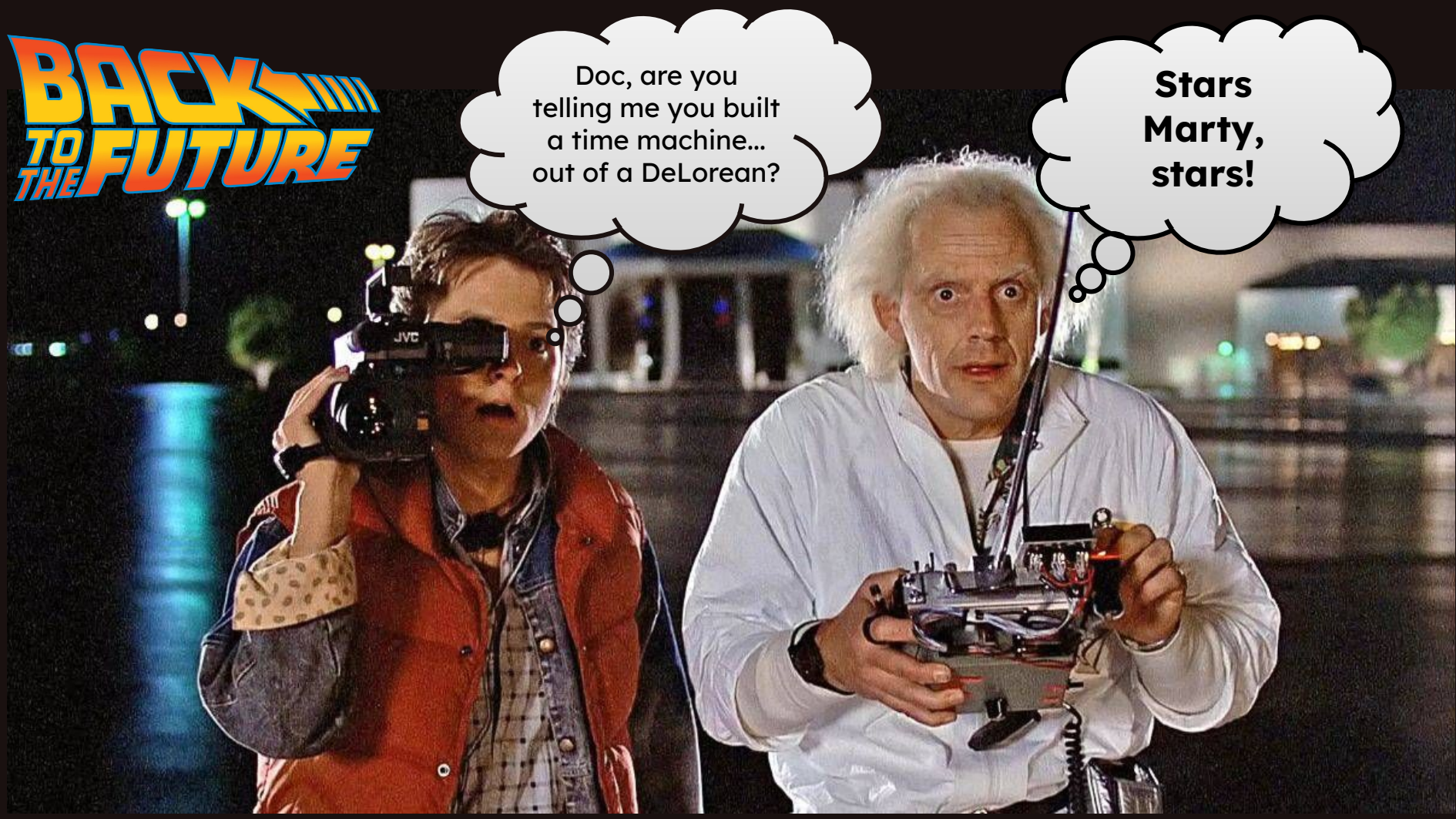
How?

Forming their first stars?

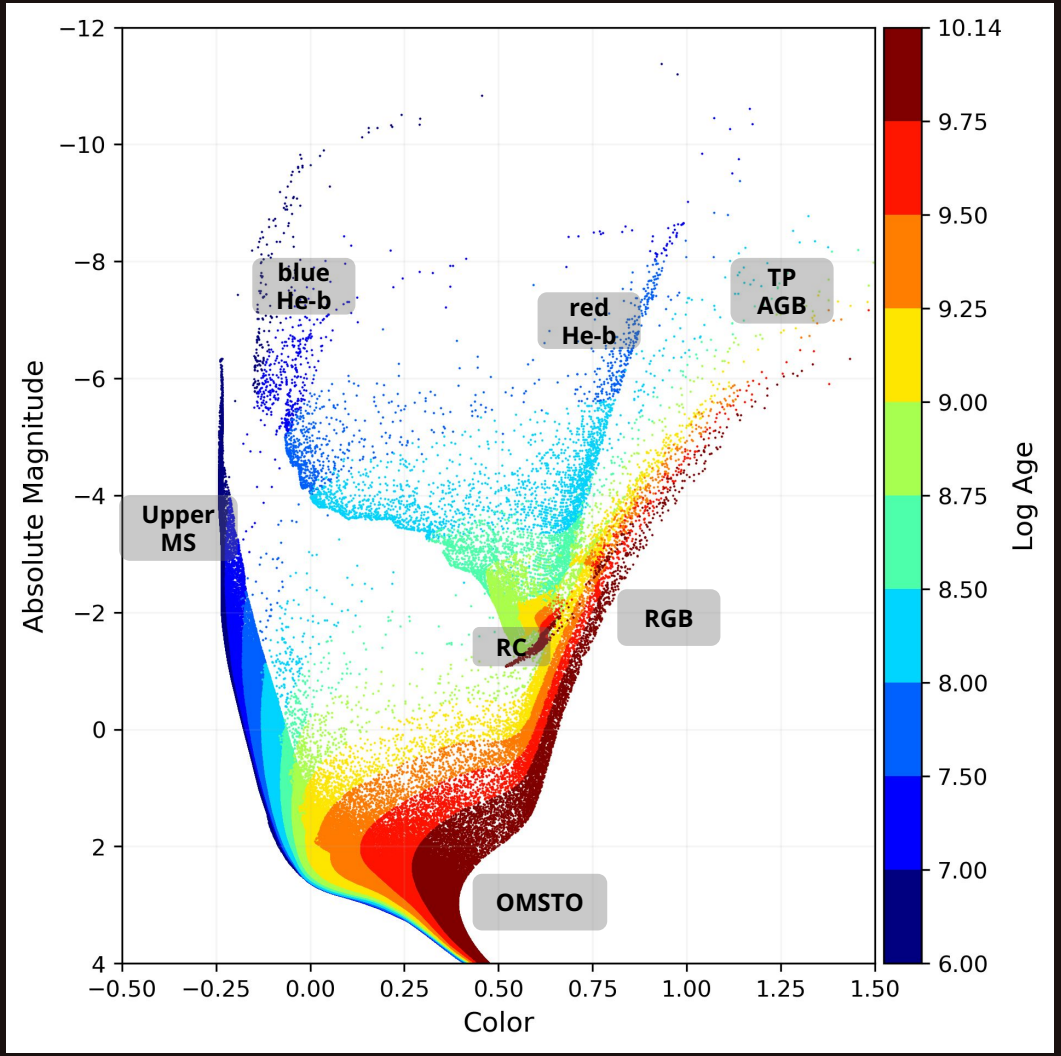
Slow secular evolution?

Mergers, gravitational interactions

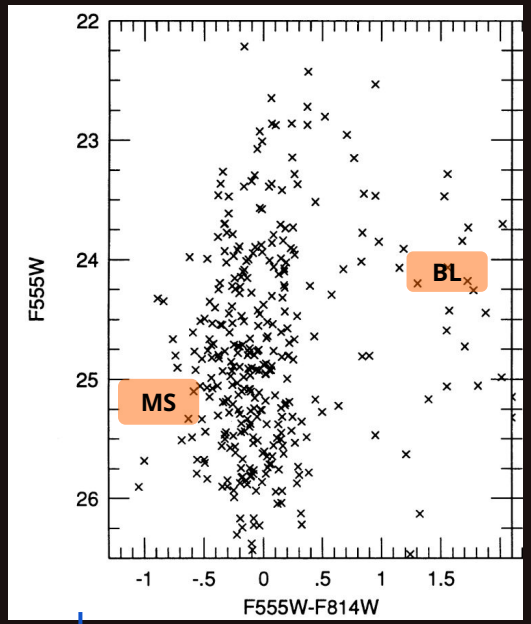
starburst driven outflows


BACK TO THE FUTURE
Doc, are you telling me you built a time machine... out of a DeLorean?
Stars Marty, stars!

Color-magnitude diagram as a time machine!



I Zw 18 with the HST



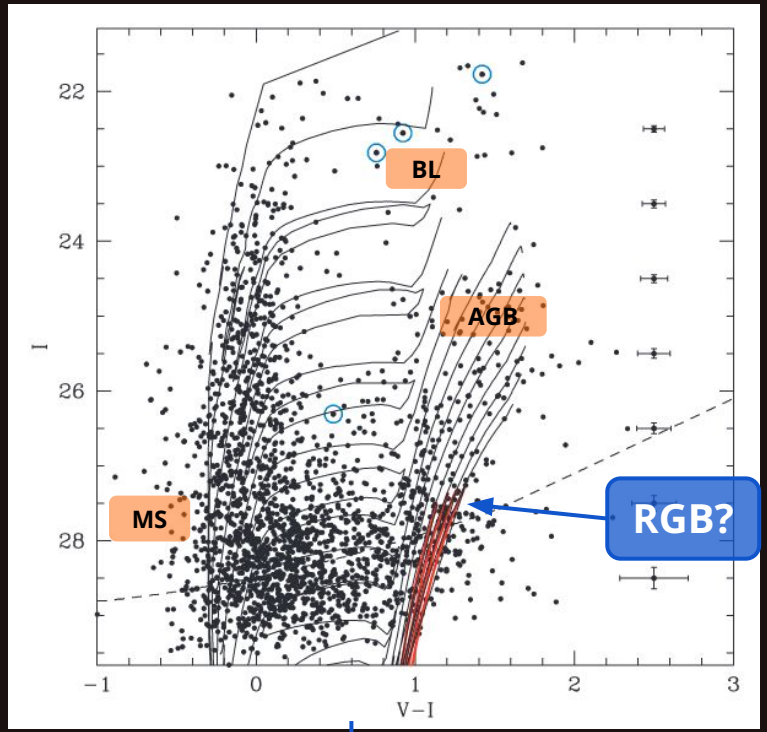
WFPC2

Time

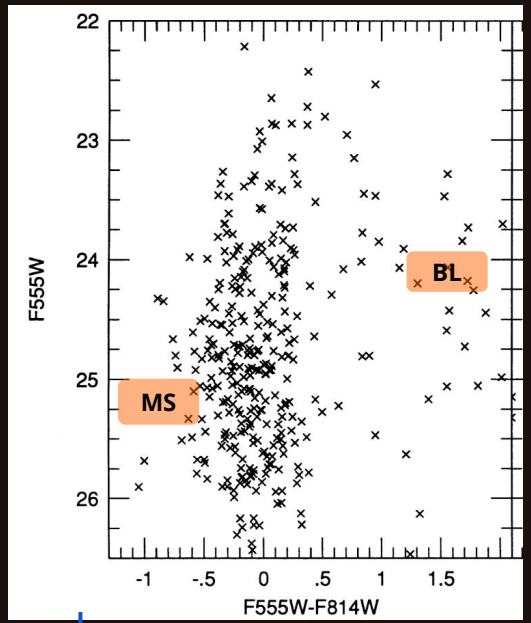
Hunter+ 1995

I Zw 18 with the HST

ACS



WFPC2

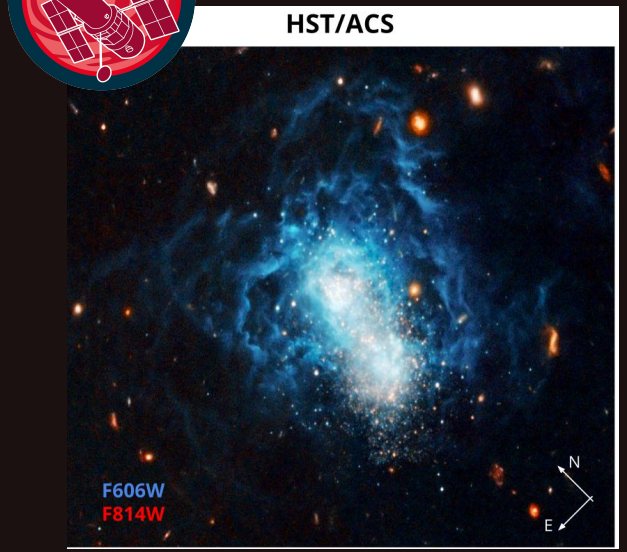


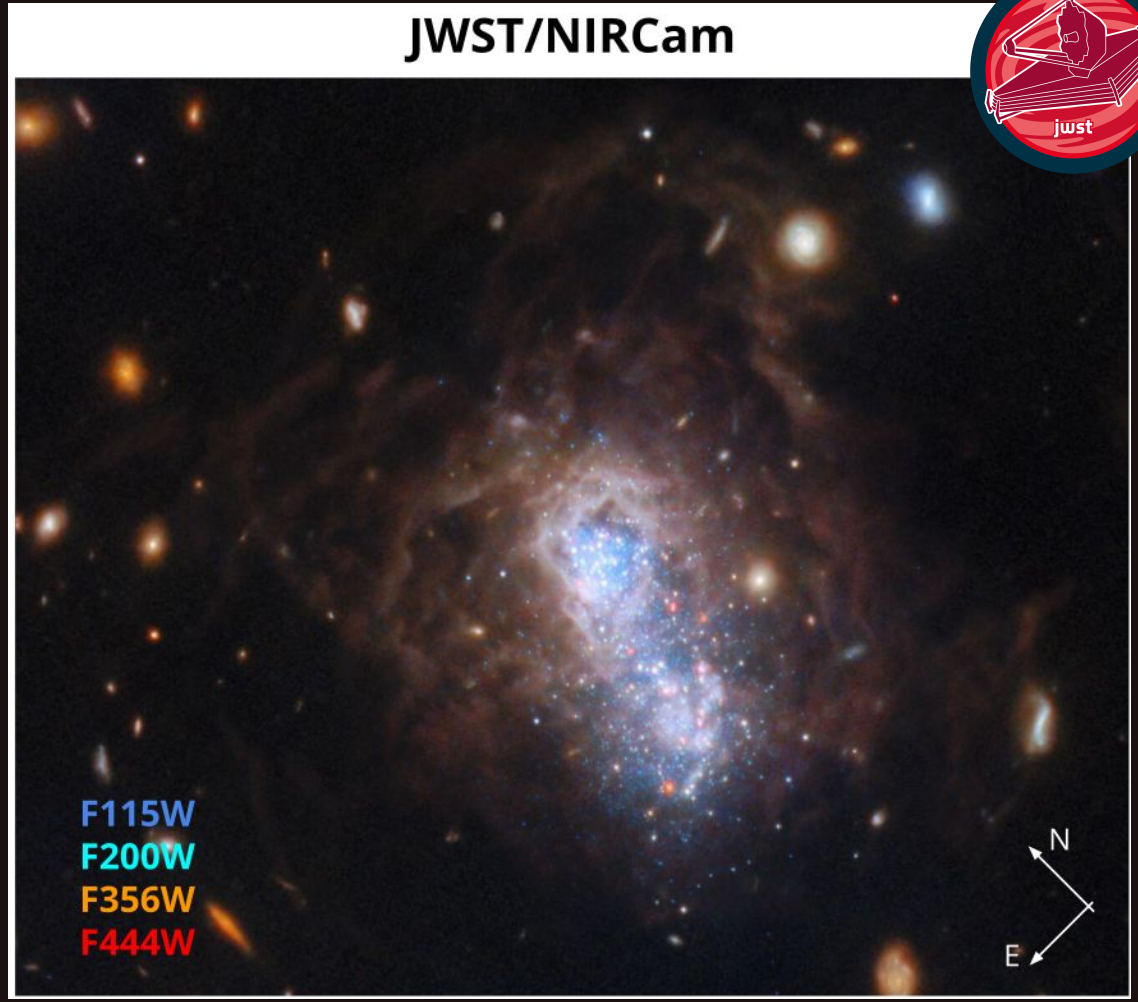
Time

Hunter+ 1995

Aloisi+ 2007

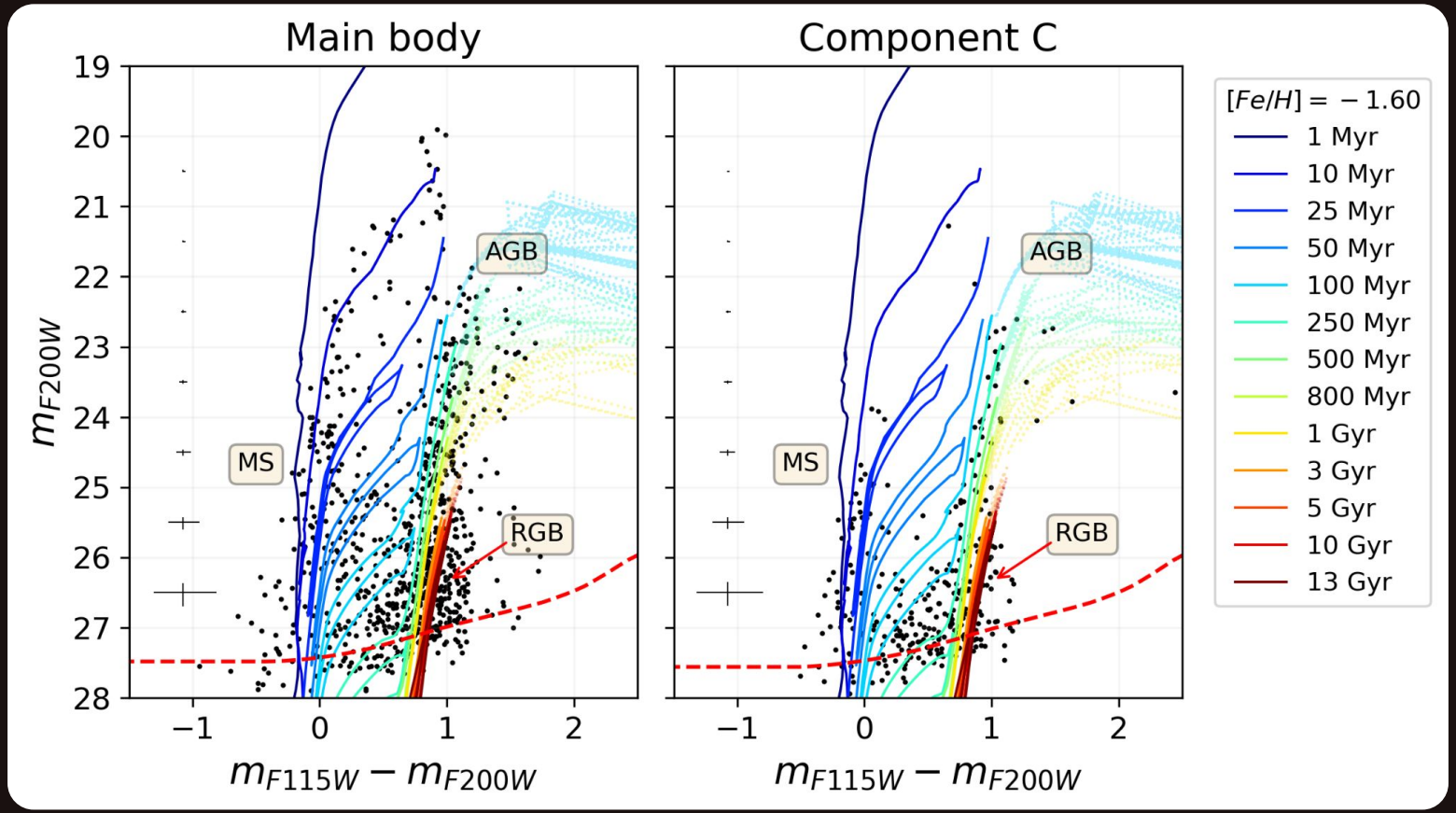
JWST/NIRCam: a new window on old stars





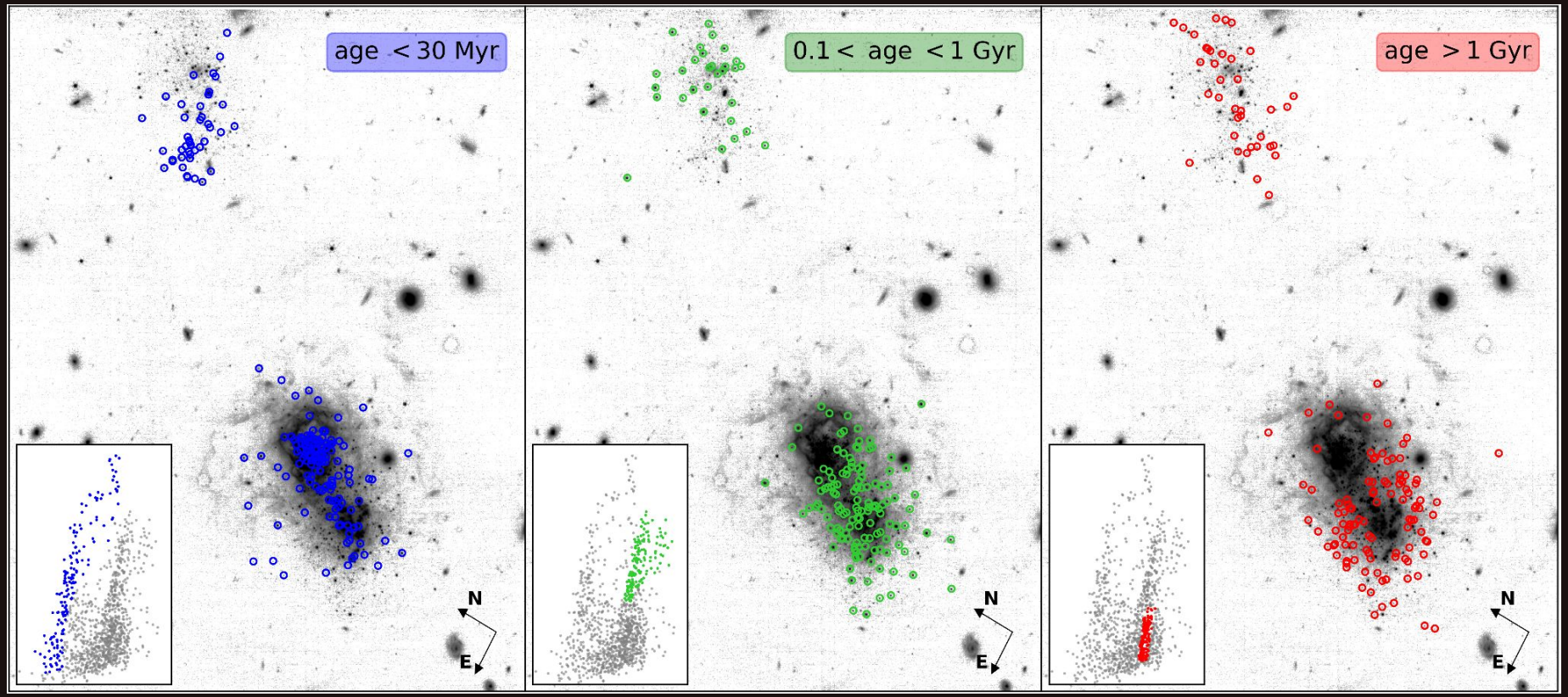
ESA/Webb, NASA, CSA, A. Hirschauer, M. Meixner et al.

The Color-Magnitude Diagram



Bortolini+ 2024b

Stellar populations spatial distribution



Bortolini+ 2024b

SFERA 2.0

(Star Formation Evolution Recovery Algorithm)

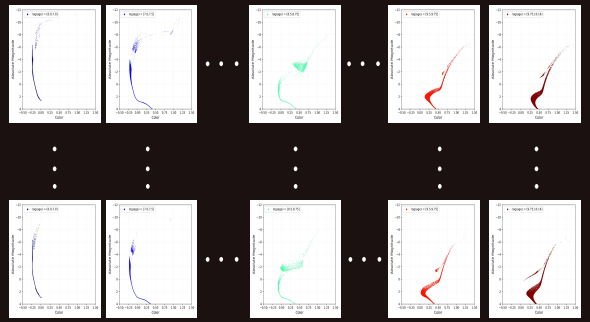
Synthetic CMD method

Fit the observed CMD with synthetic CMDs created from stellar isochrones

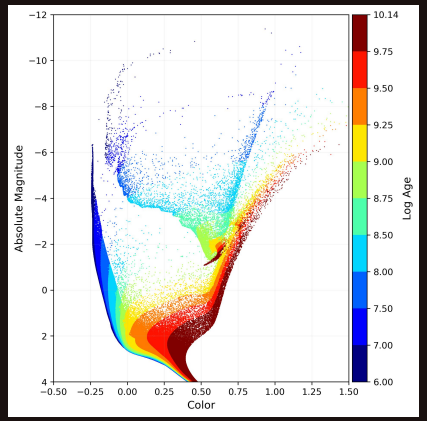
Scan me!

Bortolini et al. 2024a

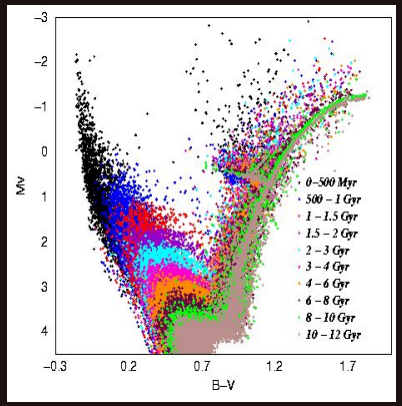
STEP 1: Building a library of partial CMDs



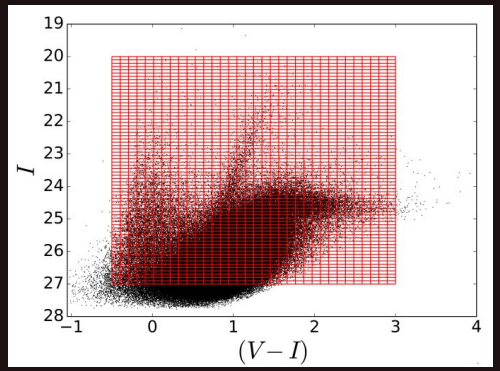
STEP 2: Linear combinations of partial CMDS



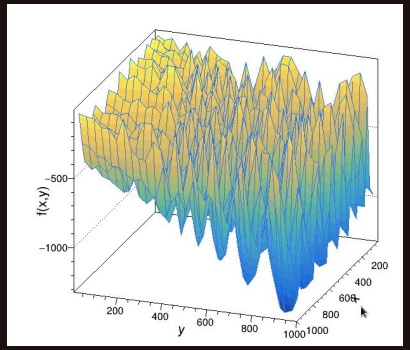
STEP 3: Simulating observational conditions



STEP 4: CMD Binning

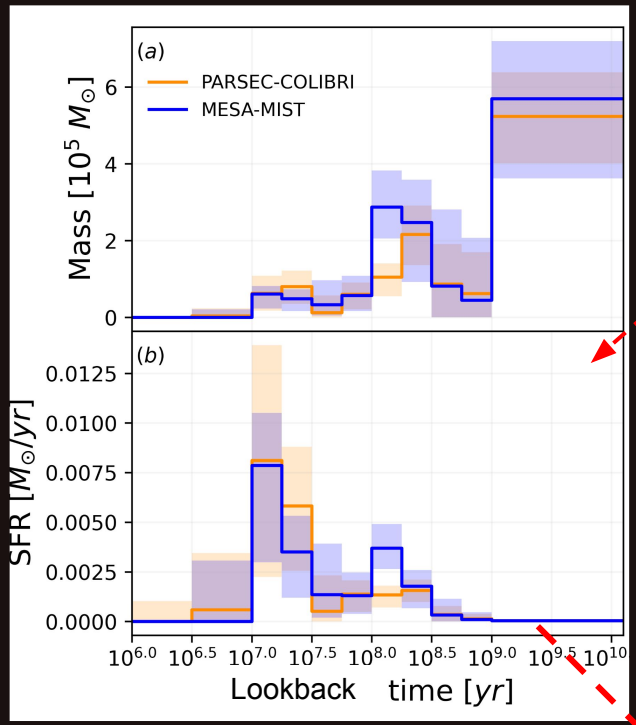


STEP 5: Searching for the best solution

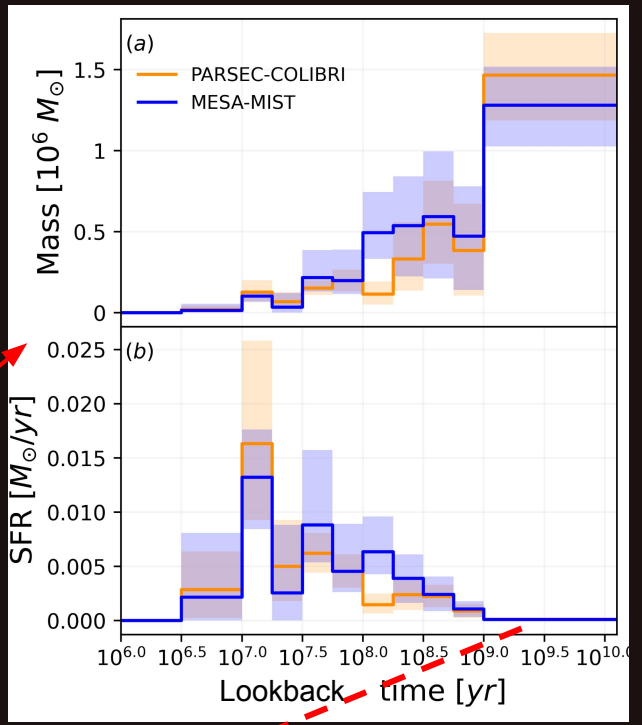


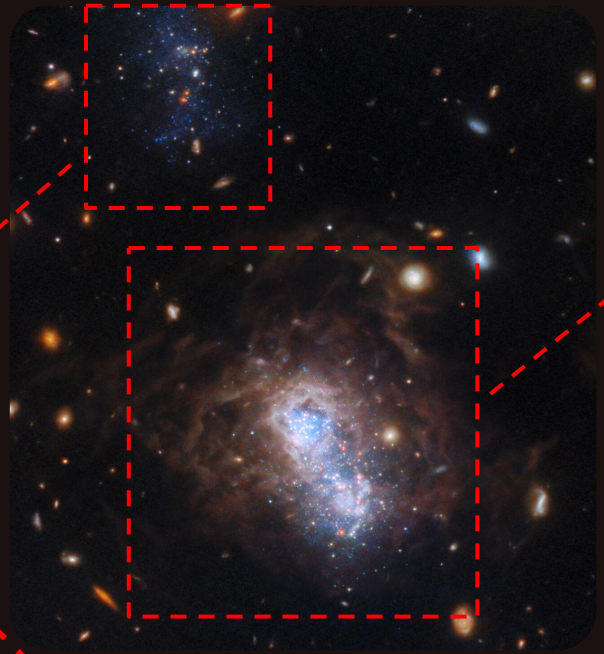
“Best” fit SFH and AMR

Component C



Main body





SFR ~ 10^{-4} $M_\odot$/yr

Bortolini+ 2024b

Conclusions

I Zw 18 shows an halo of stars as old as 1 Gyr

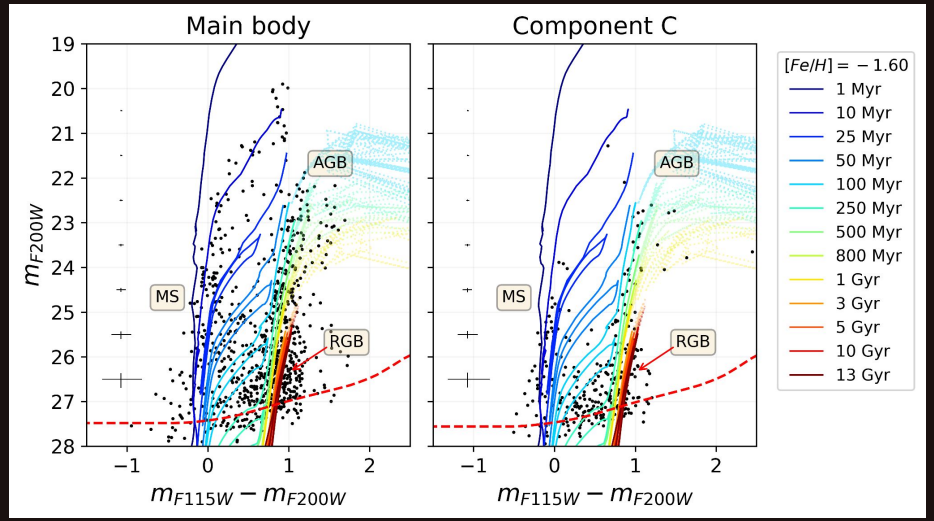
Age gradient going from northwest to southeast region of the galaxy

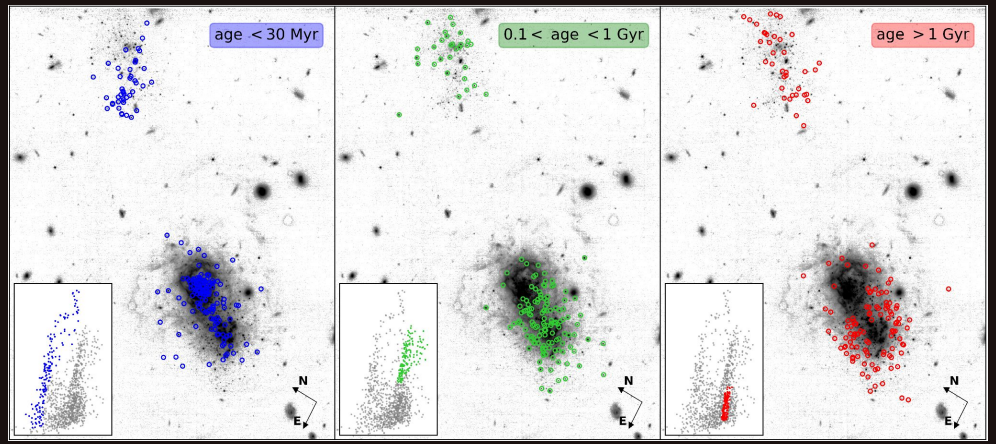
Very low SFR at epochs older than 1 Gyr ago: slow secular evolution

Gravitational interaction with Component C likely triggered the recent burst of star formation

To the paper:

Bortolini et al. 2024b





Giacomo Bortolini | Stockholm University

email: giacomo.bortolini@astro.su.se