

A large white letter 'W' on a purple square background, representing the University of Washington logo.

PHAST: Panchromatic Hubble Andromeda Southern Treasury — Resolving 90 Million Stars in the Southern half of M31

Zhuo Chen

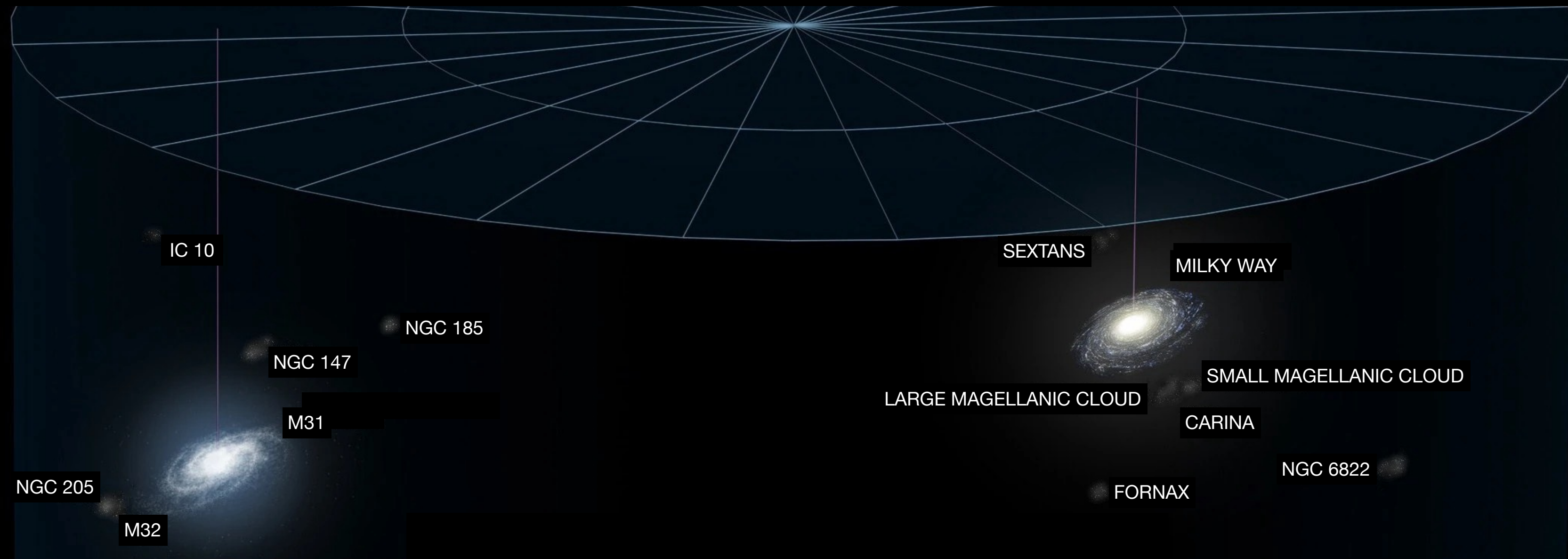
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Coauthors: B. Williams, M. Durbin, D. Lang, L. C. Johnson, J. Dalcanton, M. McKay, P. Guhathakurta, K. Gilbert; the PHAST team

Image Credit: By David (Deddy) Dayag - Own work, CC BY-SA 4.0

Andromeda: Like the Milky Way, but Easier to See



Andromeda: Like the Milky Way, but Easier to See

Circumvents challenges like:

- Line-of-sight reddening
- Uncertain distances
- Background/foreground confusion

Enables studies in the context of M31's local environment





HST
PHAT

Panchromatic Hubble Andromeda Treasury

(PI: J. Dalcanton)

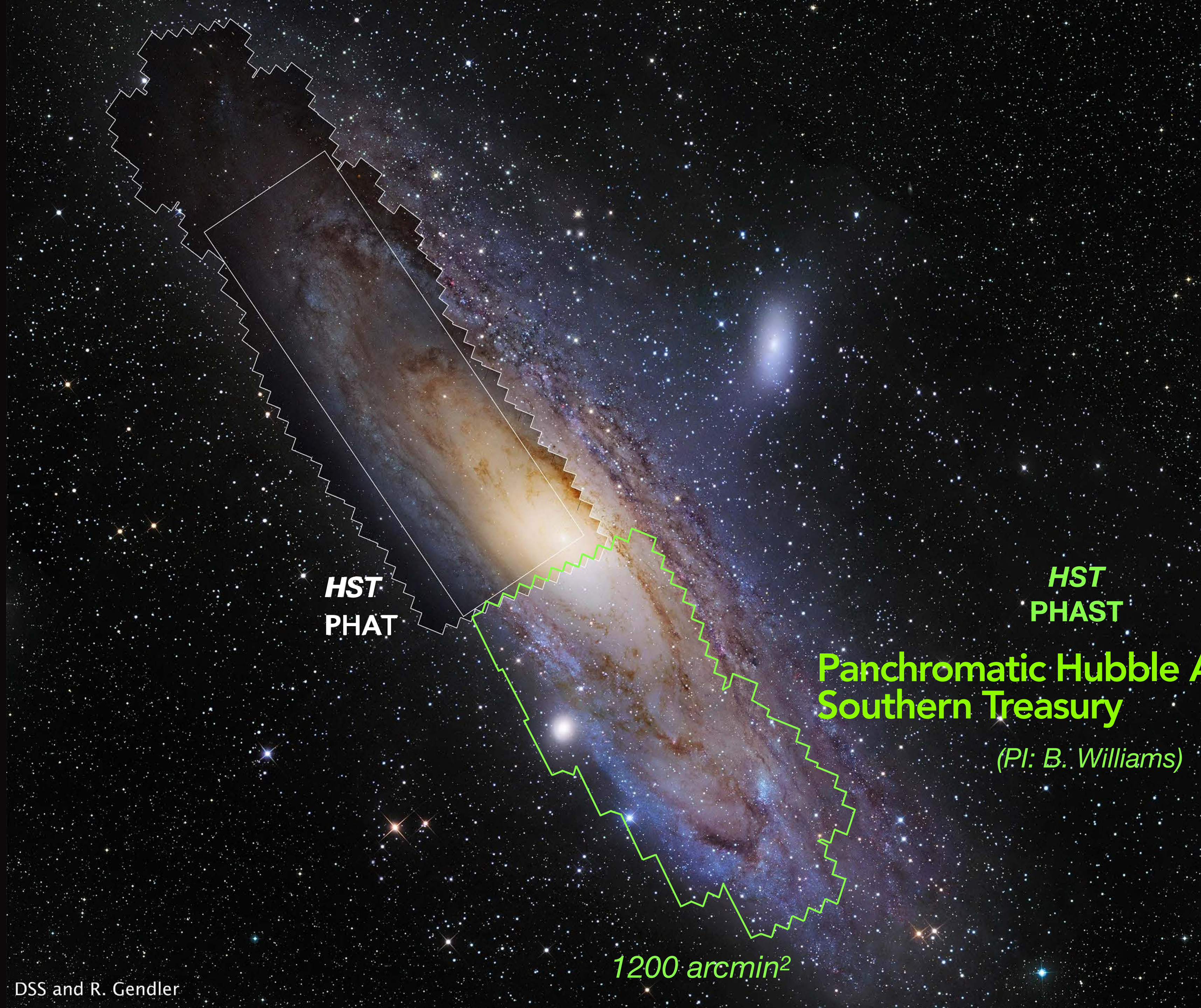


12,834 images at 414 positions
over 39 months!

3 cameras: UV, Optical, NIR

HST
PHAT





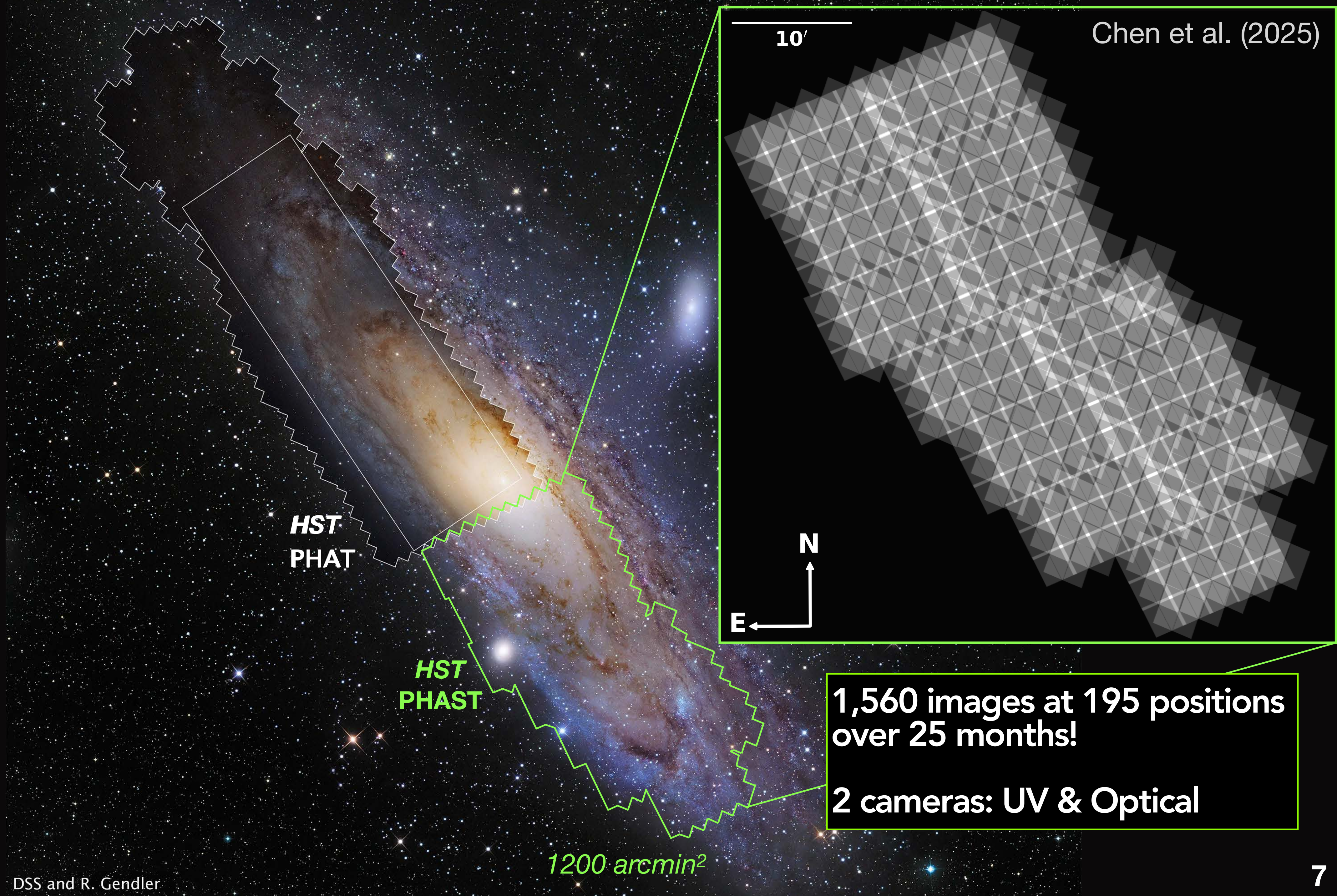
**HST
PHAT**

**HST
PHAST**

**Panchromatic Hubble Andromeda
Southern Treasury**

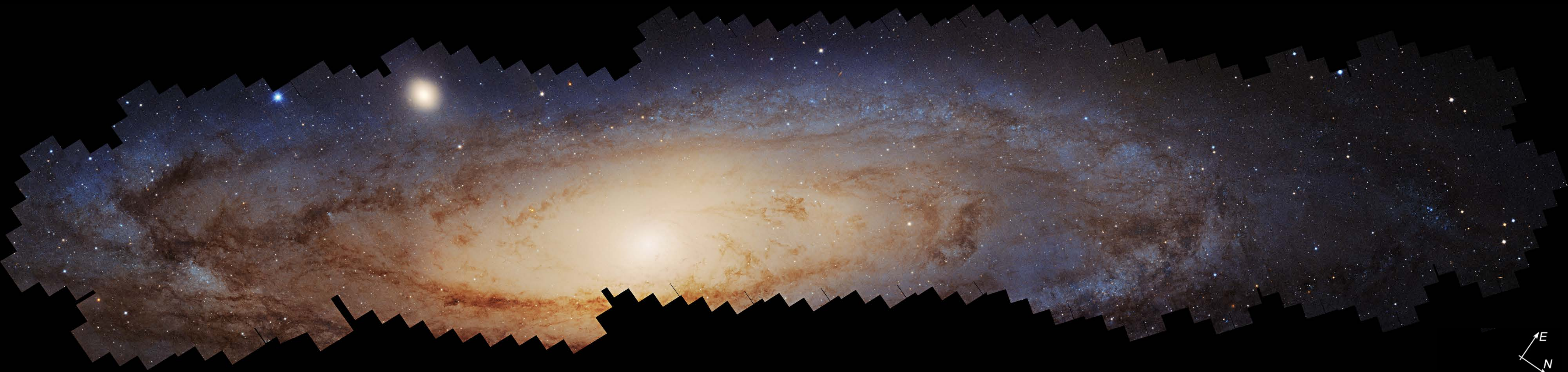
(PI: B. Williams)

1200 arcmin²



1,560 images at 195 positions over 25 months!
2 cameras: UV & Optical

Largest photomosaic ever assembled from HST observations



Panchromatic Hubble Andromeda Southern Treasury (PHAST) | Panchromatic Hubble Andromeda Treasury (PHAT) - 2015 Image

Distance to M31: 2.5Mly = 780kpc | 1 ACS pixel = 0".05 = 0.62ly = 0.19pc

10,000 light-years
3,100 parsecs
13.5

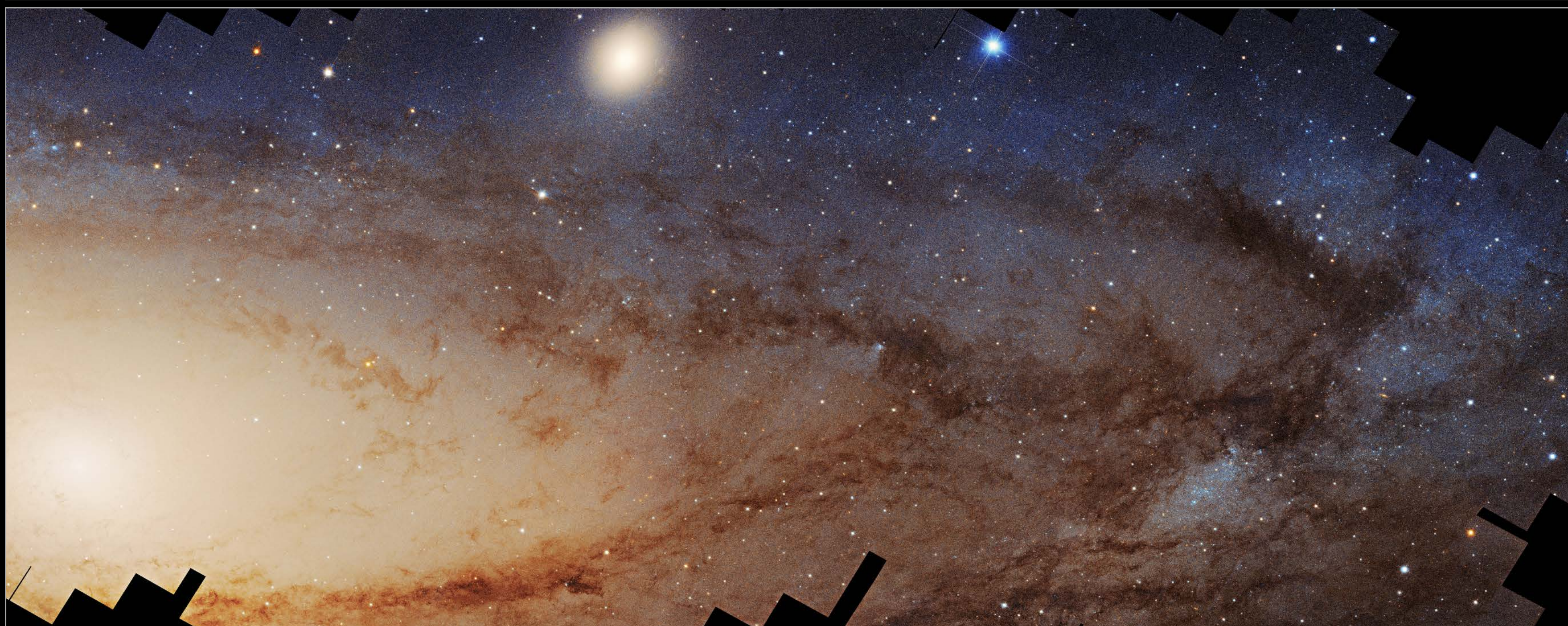
NASA, ESA, Benjamin F. Williams (UWashington), Zhuo Chen (UWashington), L. Clifton Johnson (Northwestern)

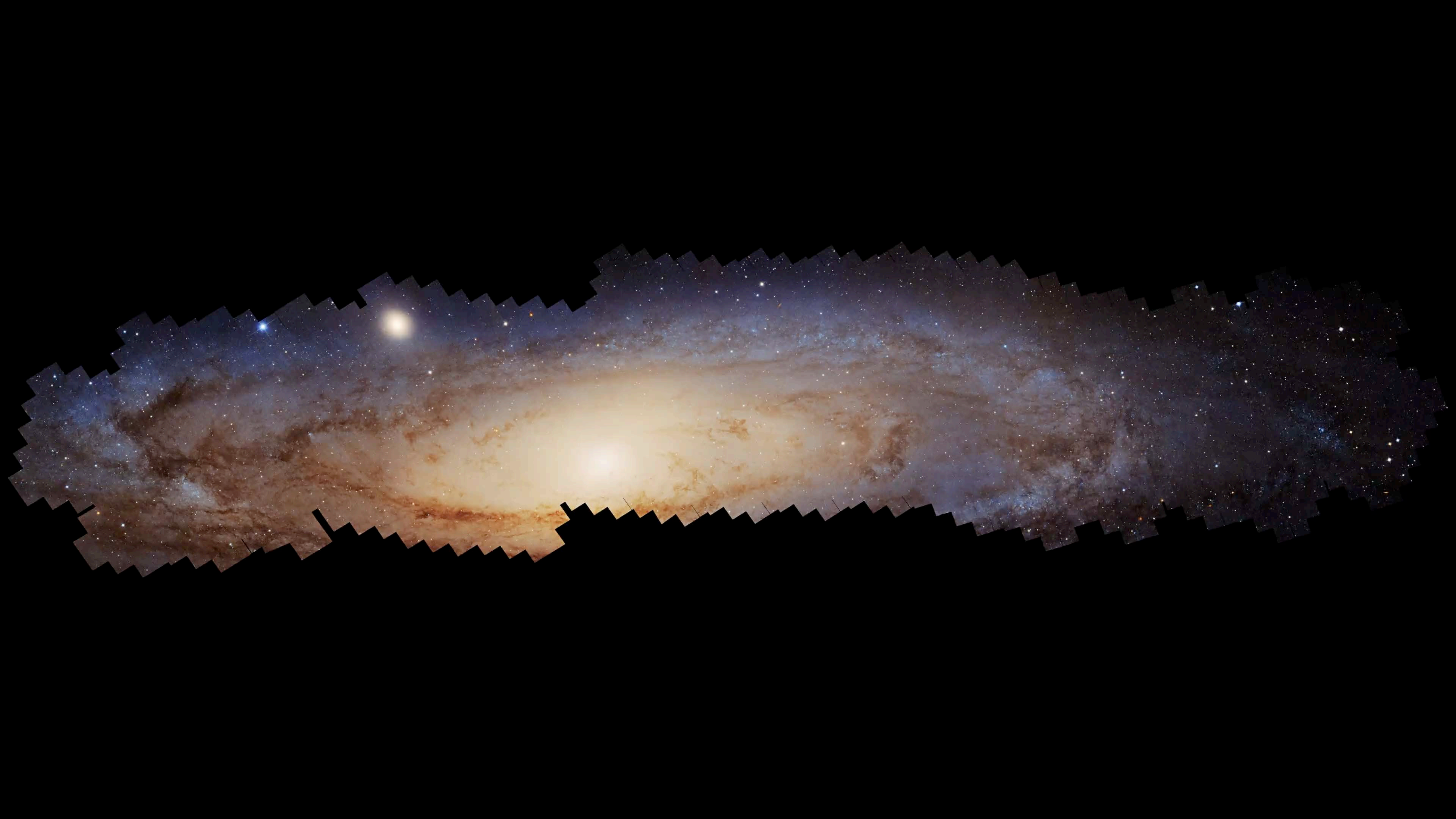


North
PHAT

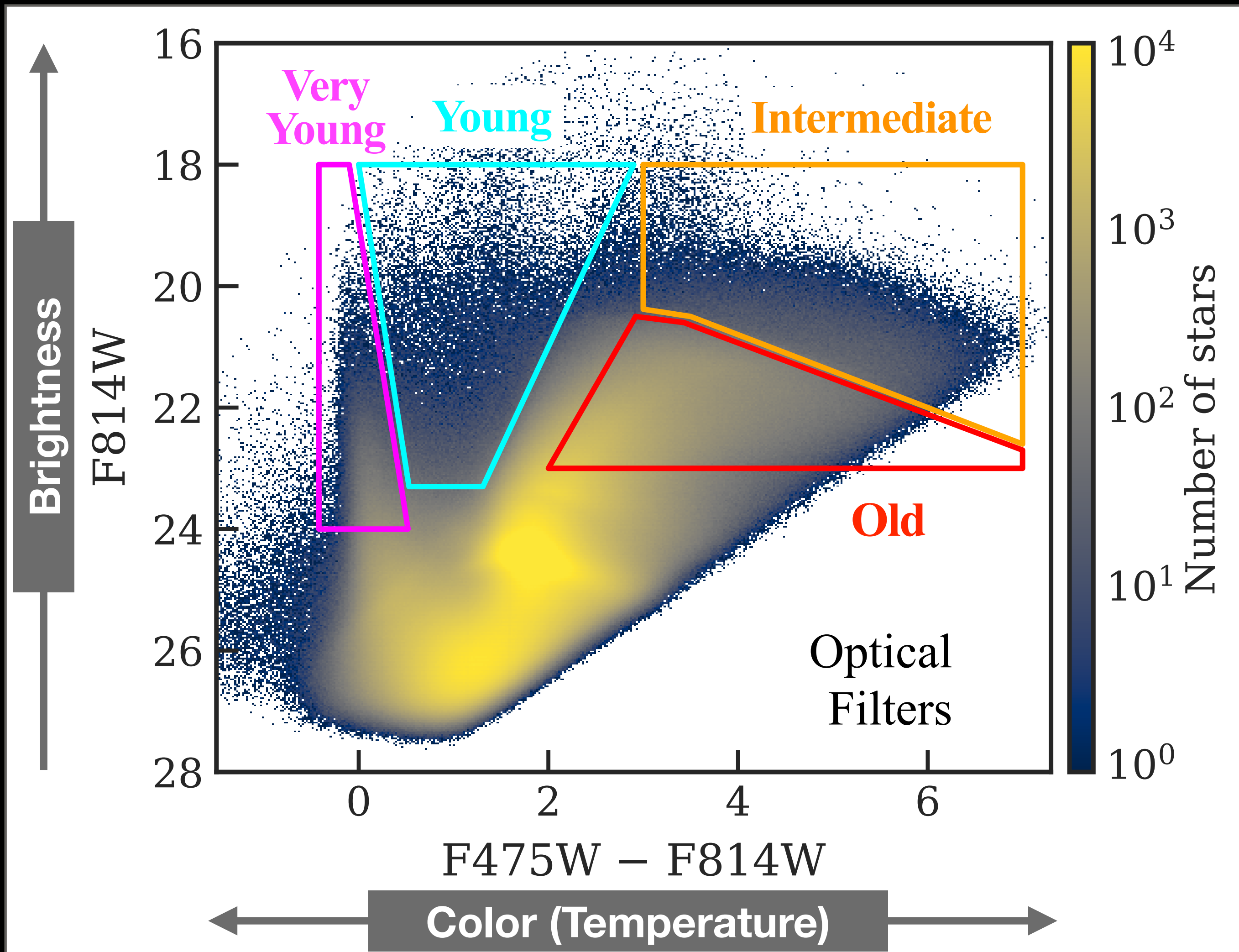


South
PHAST





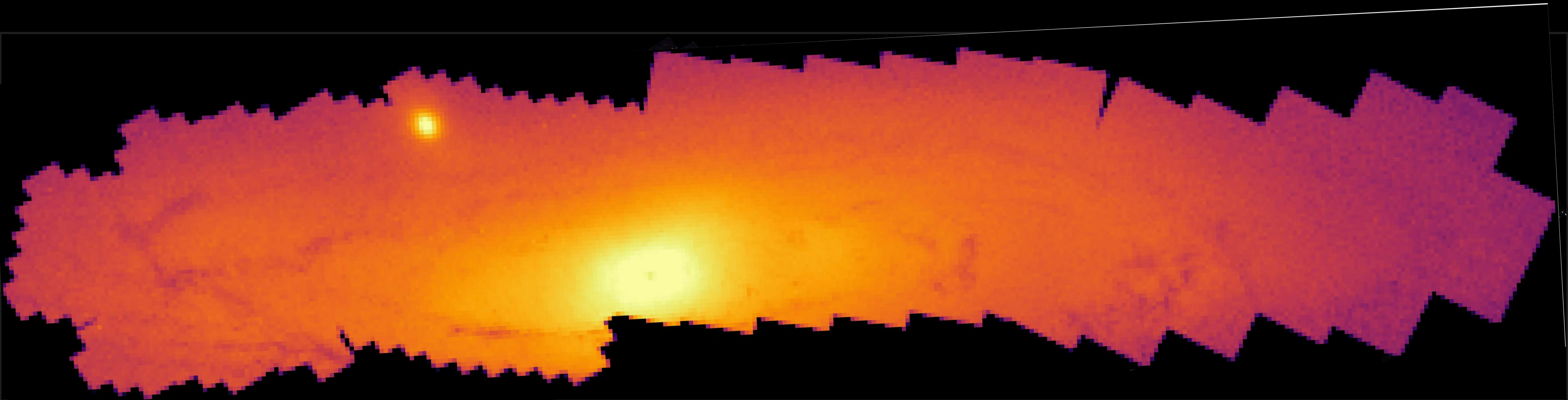
We can select broad populations of stars using the “Color-Magnitude Diagram”

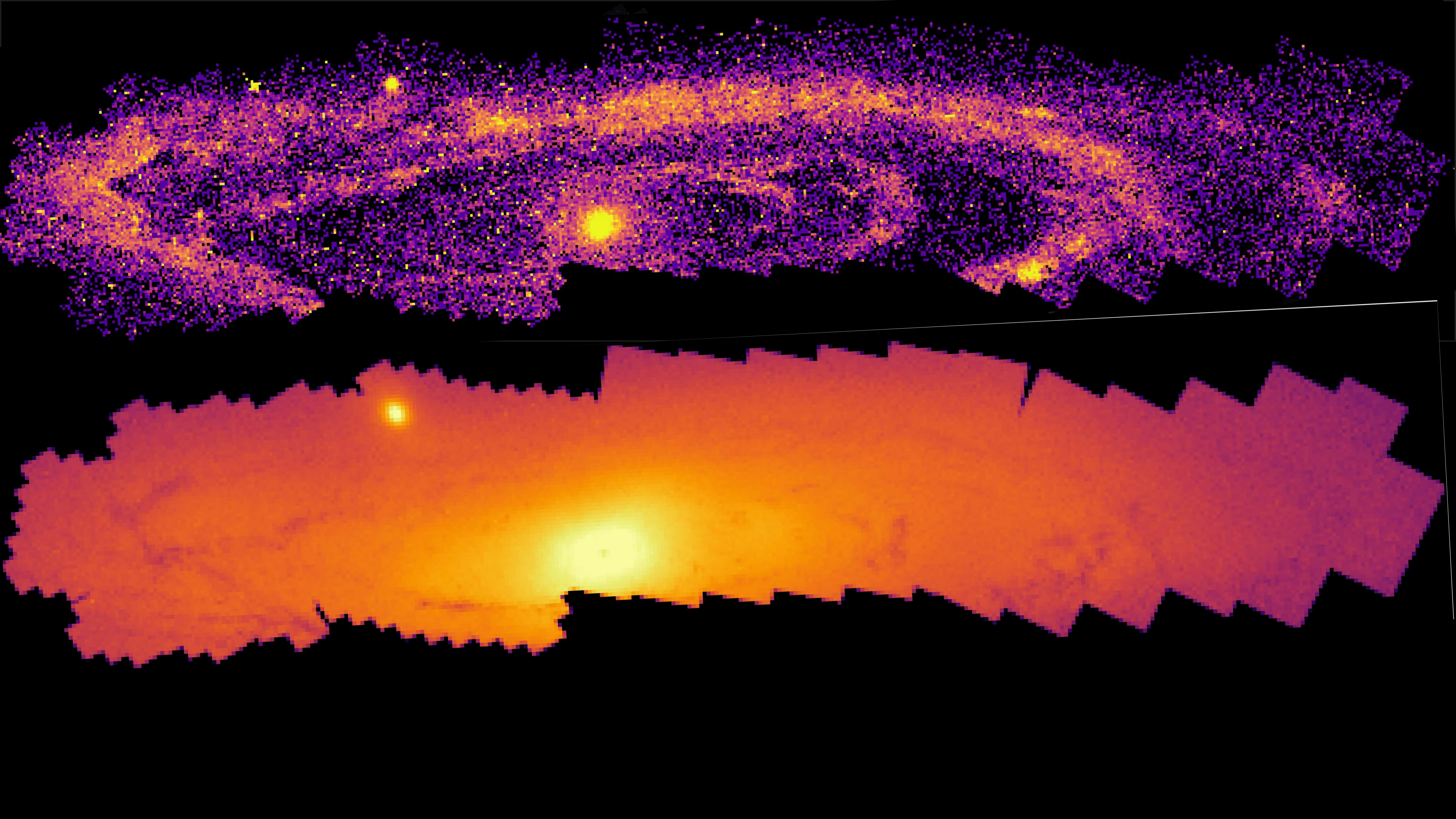


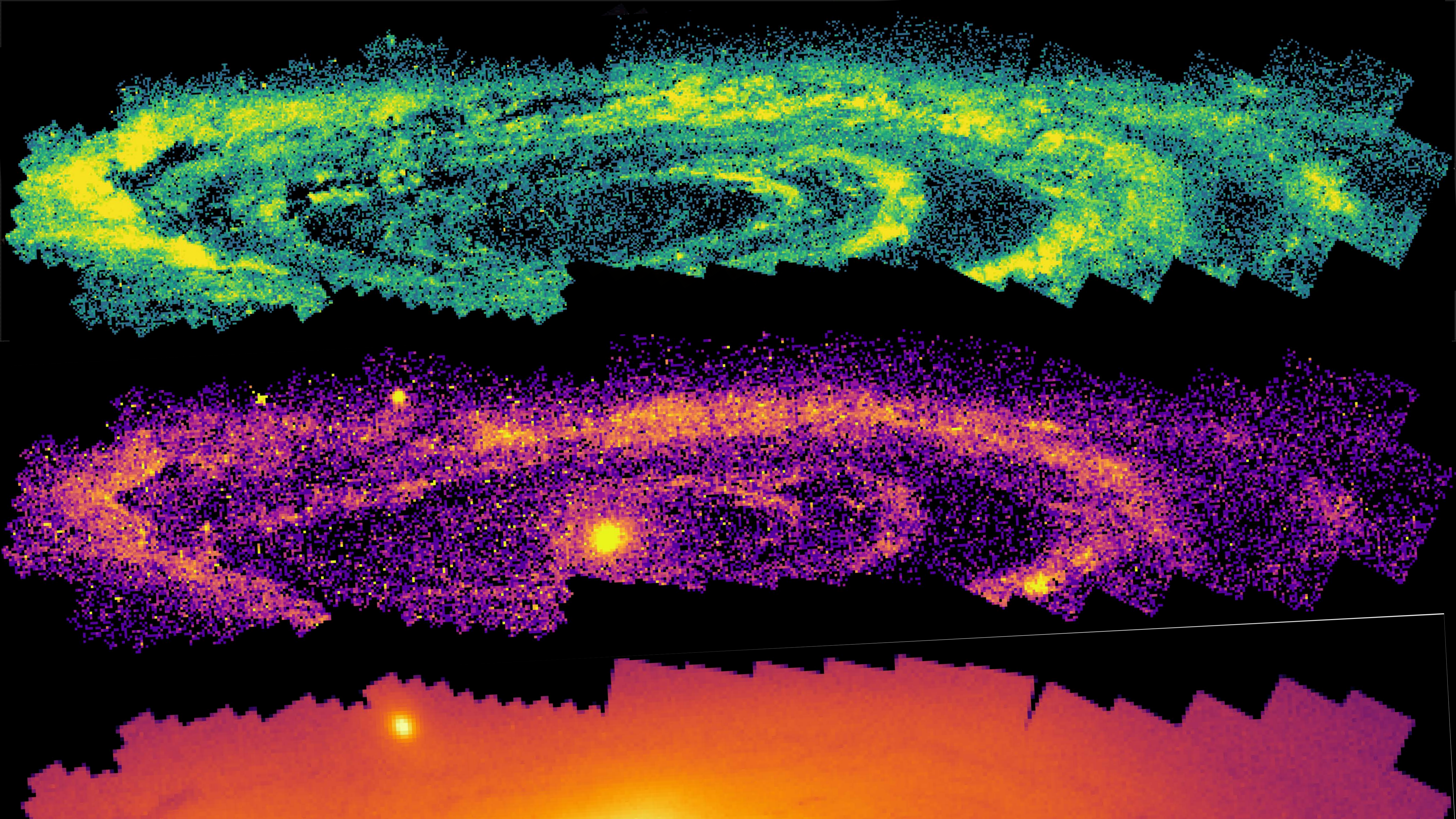
4 approximate age groups:

| | |
|----------------------|--------------|
| Very Young: | 3 - 200 Myr |
| Young: | 30 - 500 Myr |
| Intermediate: | 0.8 - 2 Gyr |
| Old: | > 2 Gyr |

Chen et al. (2025)

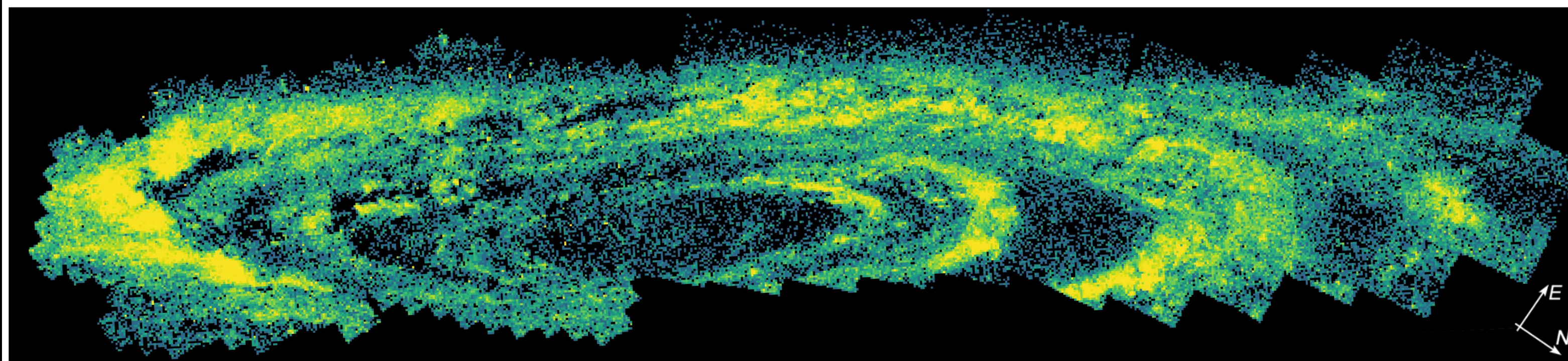






Very young

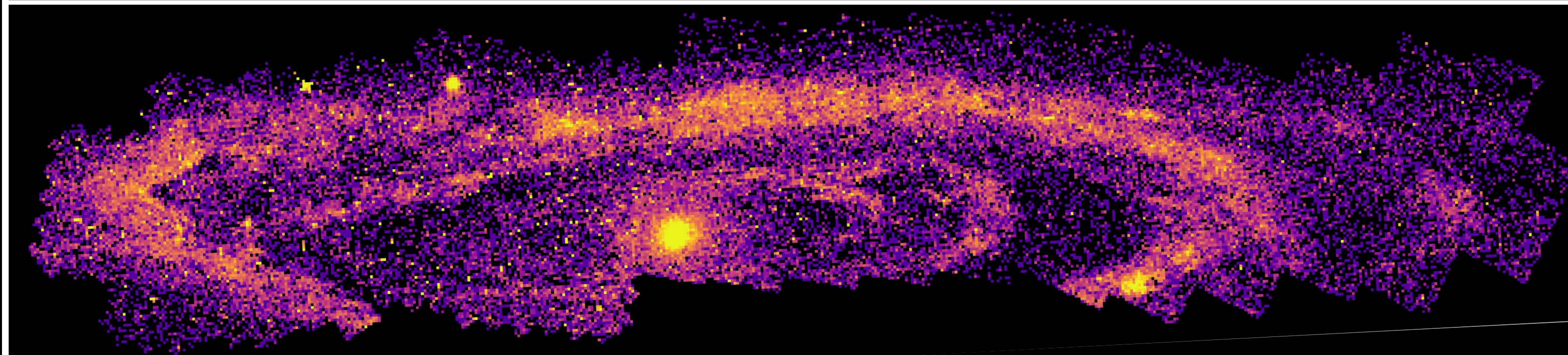
3 - 200 Myr



Younger populations reveal pronounced spiral arm structures

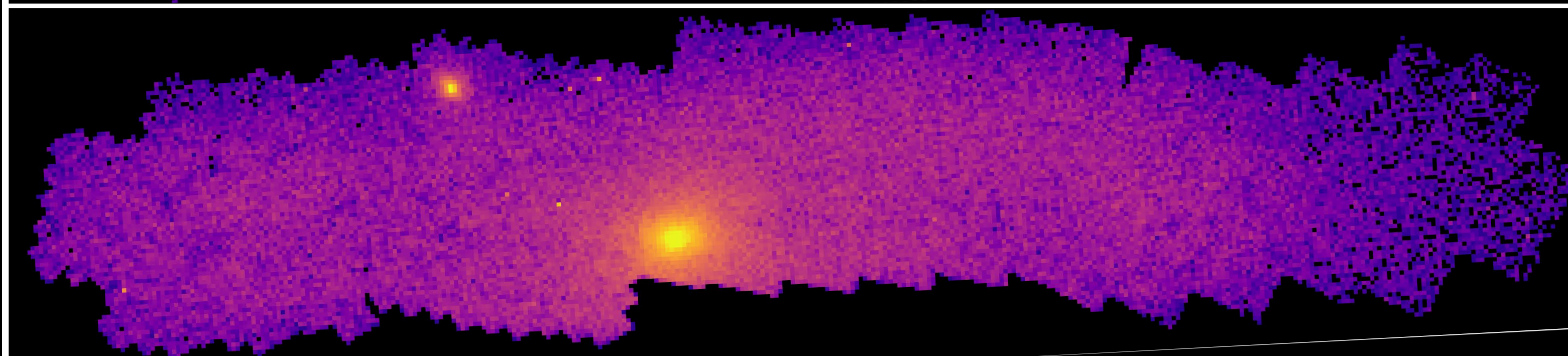
Young

30 - 500 Myr



Intermediate

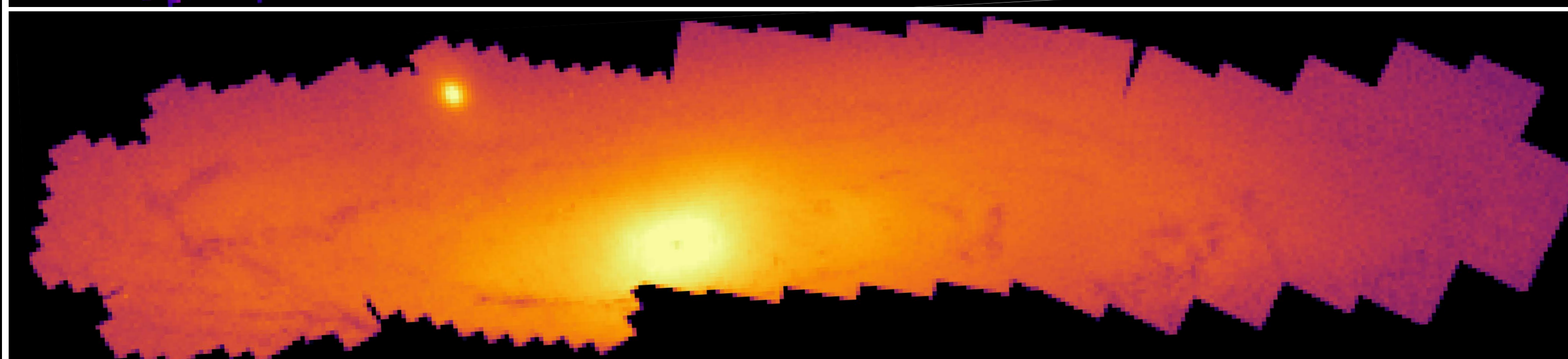
0.8 - 2 Gyr



Older populations display a smoother density gradient

Old

> 2 Gyr





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