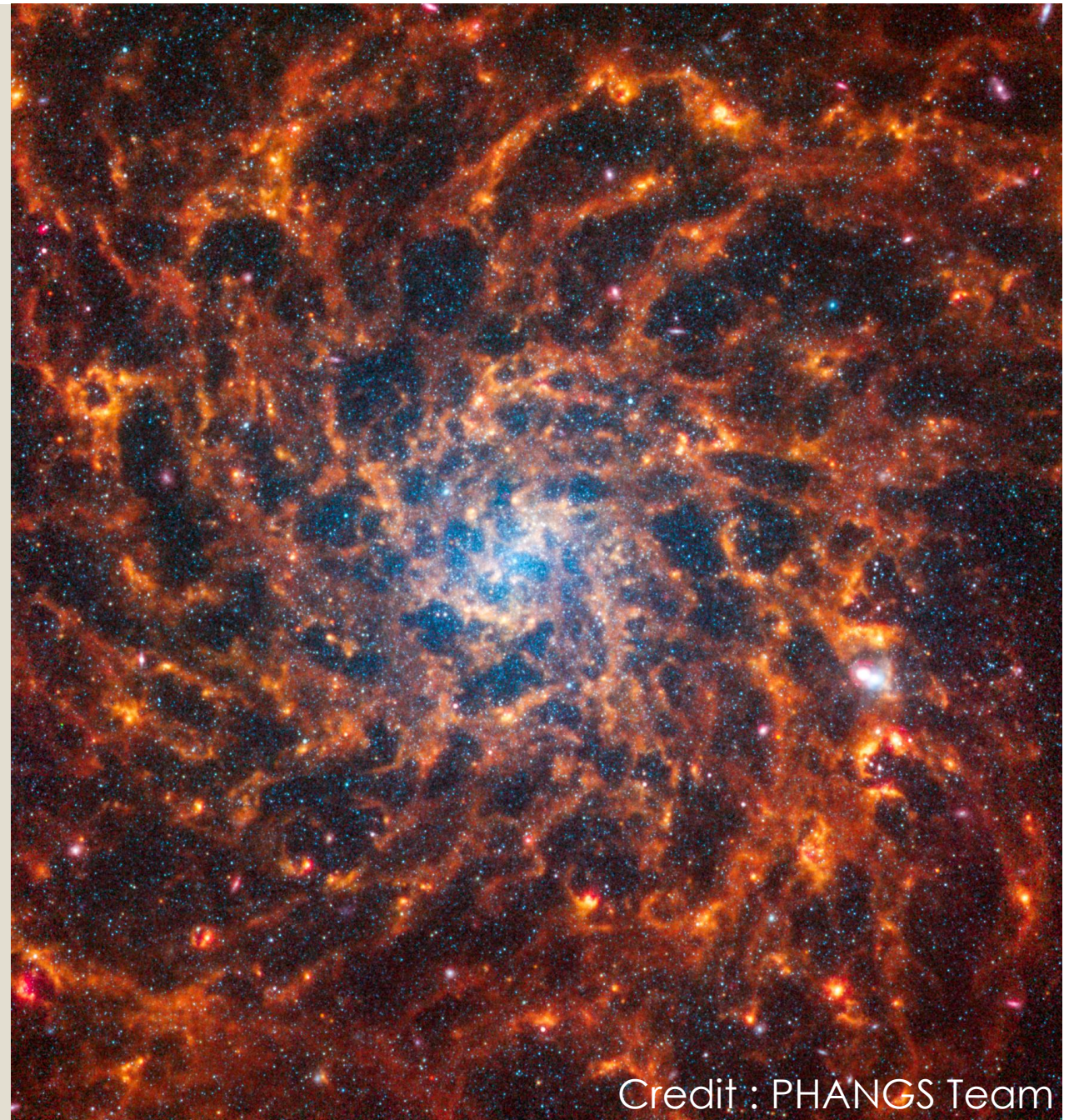# Exploring the association of Star Formation and PAH dust emissions

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Dr Stacey Alberts
Dr Prajwal Joseph

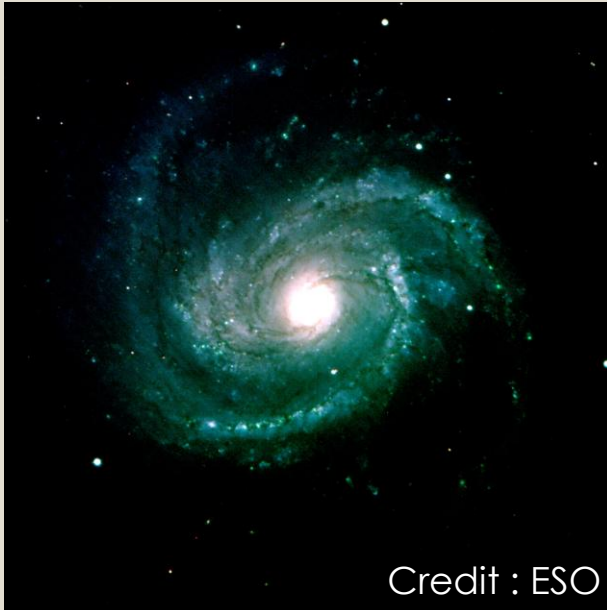**COSPAR Capacity Building Workshop – 2025, Bangalore, India**

Credit : PHANGS Team

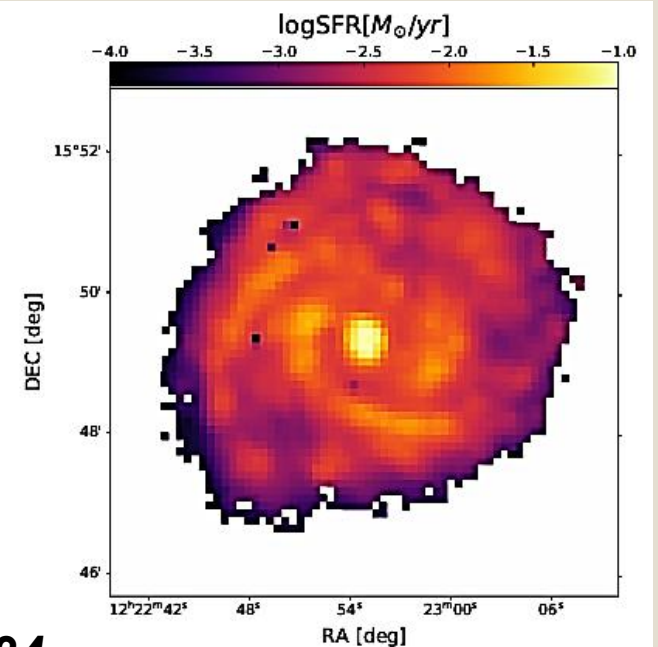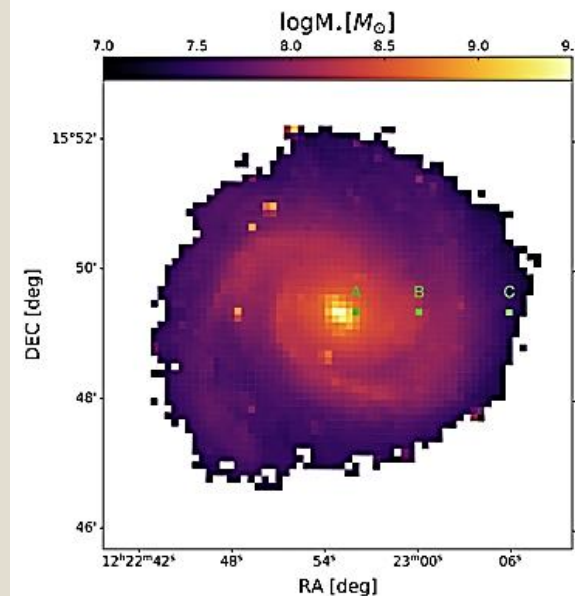# Spatially Resolved Star Formation History
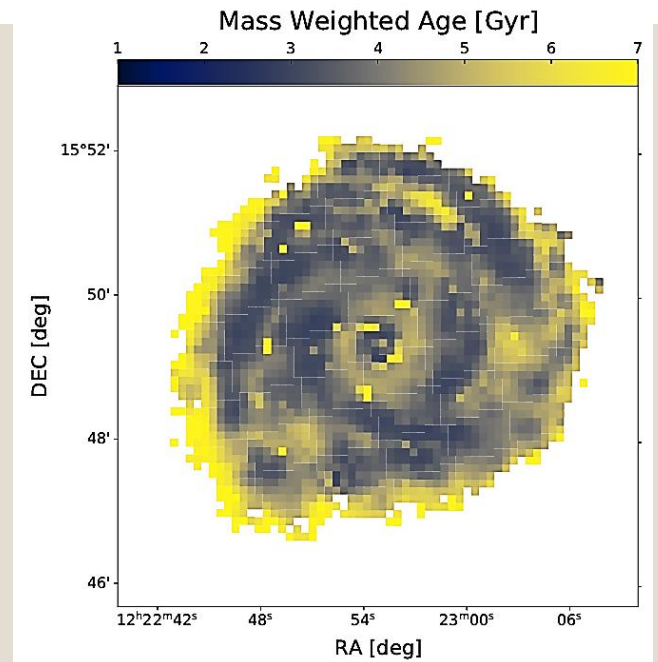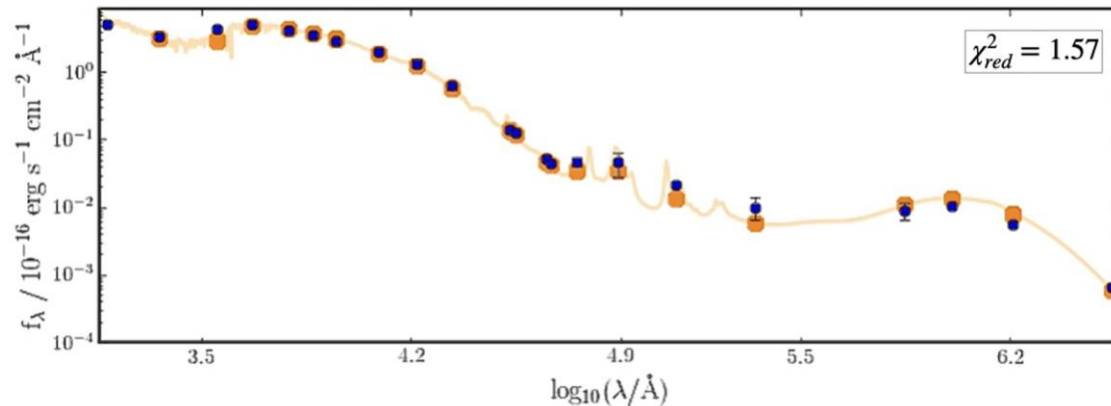
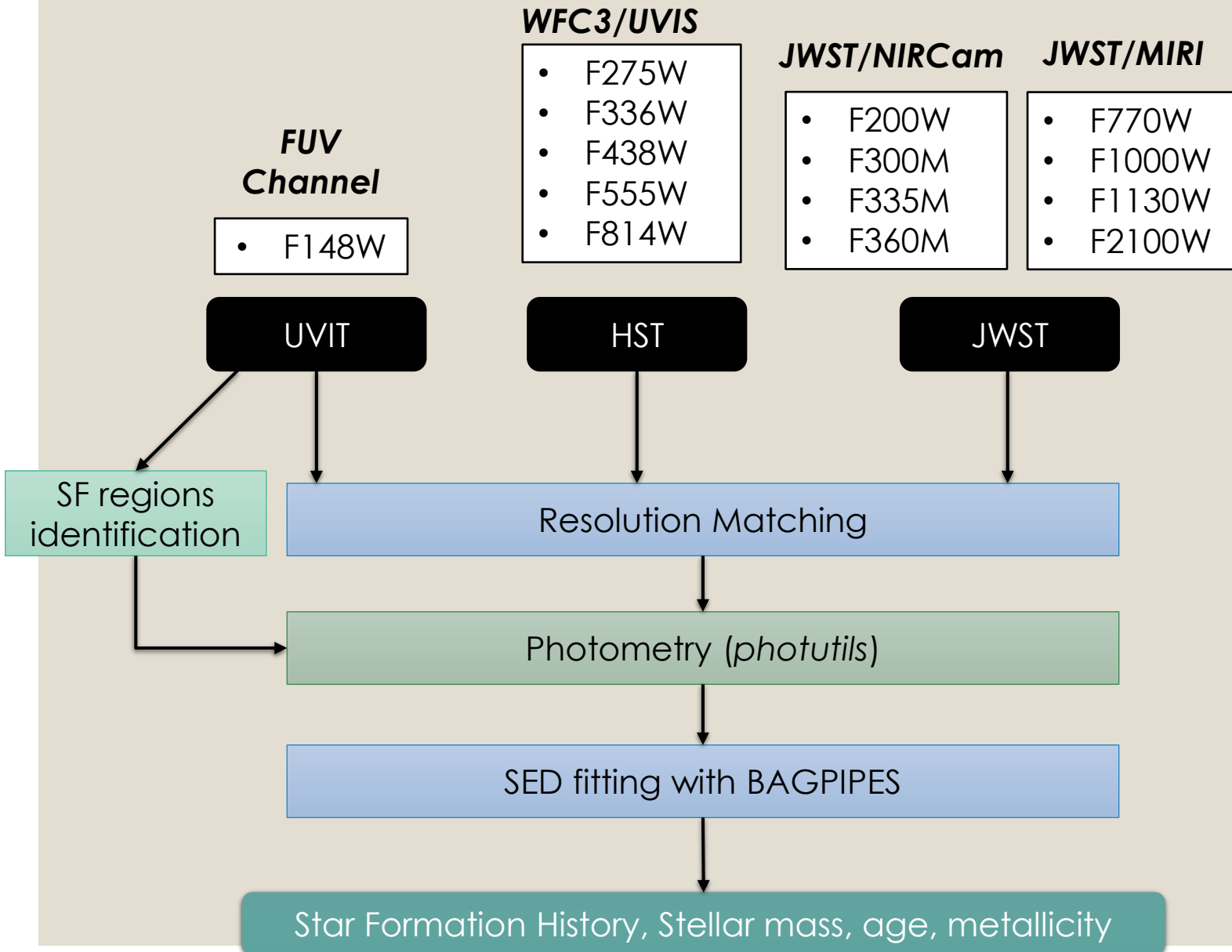**NGC4321**

A grand design spiral galaxy

D ~ 15.92 Mpc

Credit : ESO

- - Key Idea - -
Use of Multiwavelength Photometric data to obtain spatially resolved star formation history
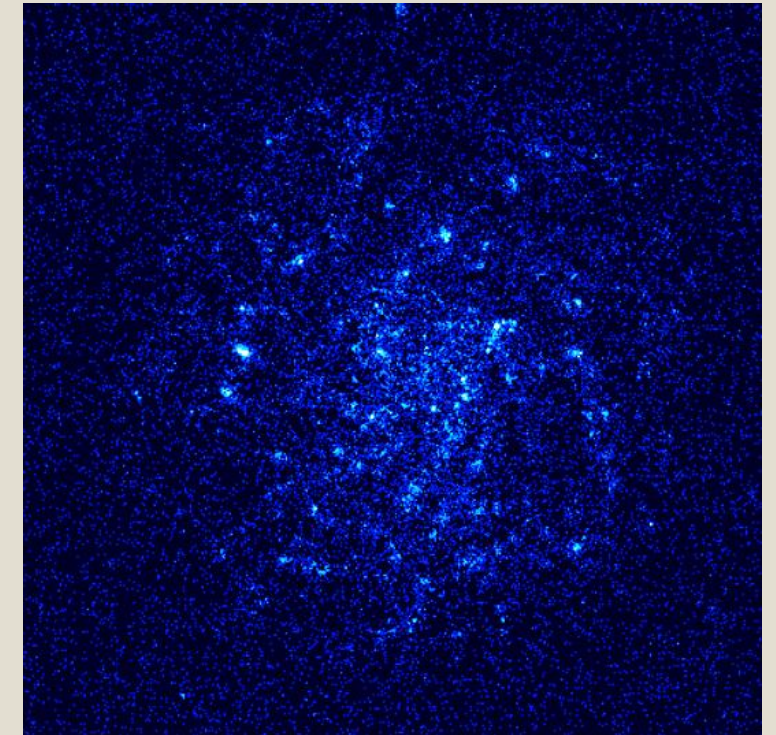

Source – Lofaro et al. 2024
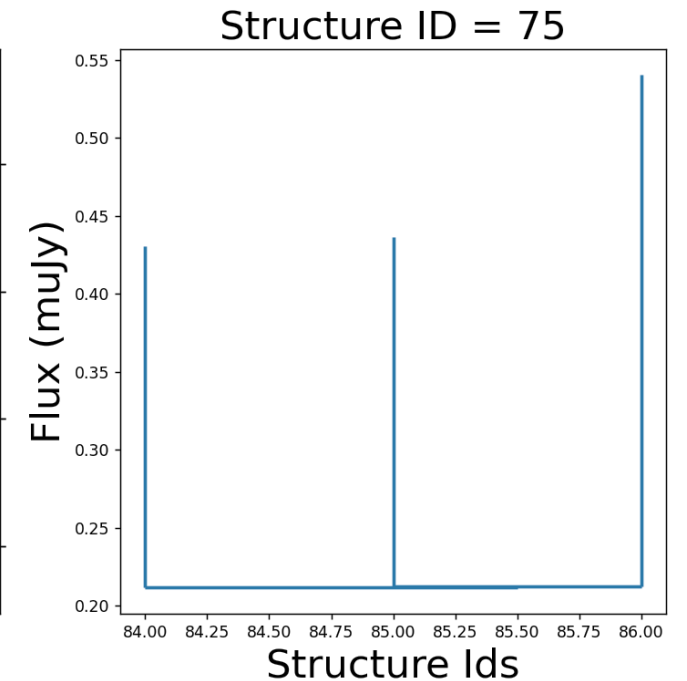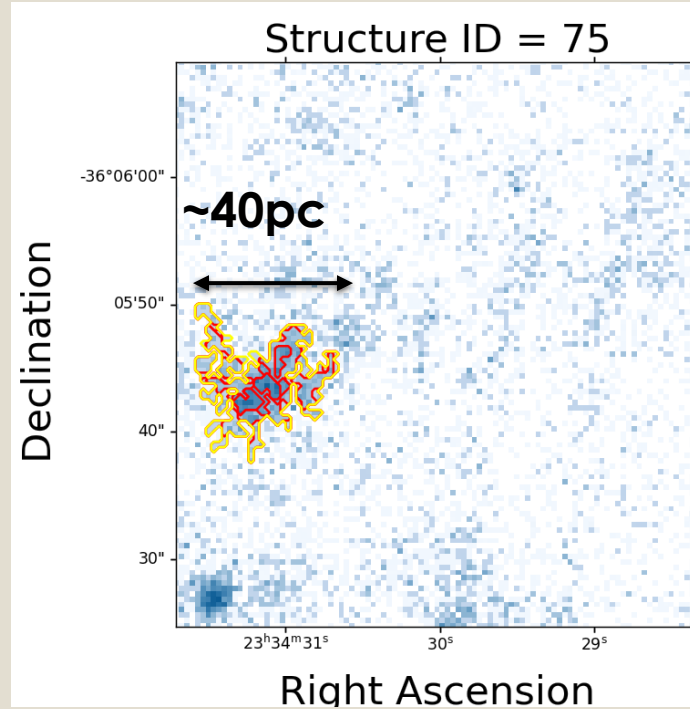
Roadmap for Star formation activity study

WFC3/UVIS

JWST/NIRCam

JWST/MIRI

FUV Channel

- F148W

- F275W
- F336W
- F438W
- F555W
- F814W

- F200W
- F300M
- F335M
- F360M

- F770W
- F1000W
- F1130W
- F2100W

UVIT

HST

JWST

SF regions identification

Resolution Matching

Photometry (*photutils*)

SED fitting with BAGPIPES
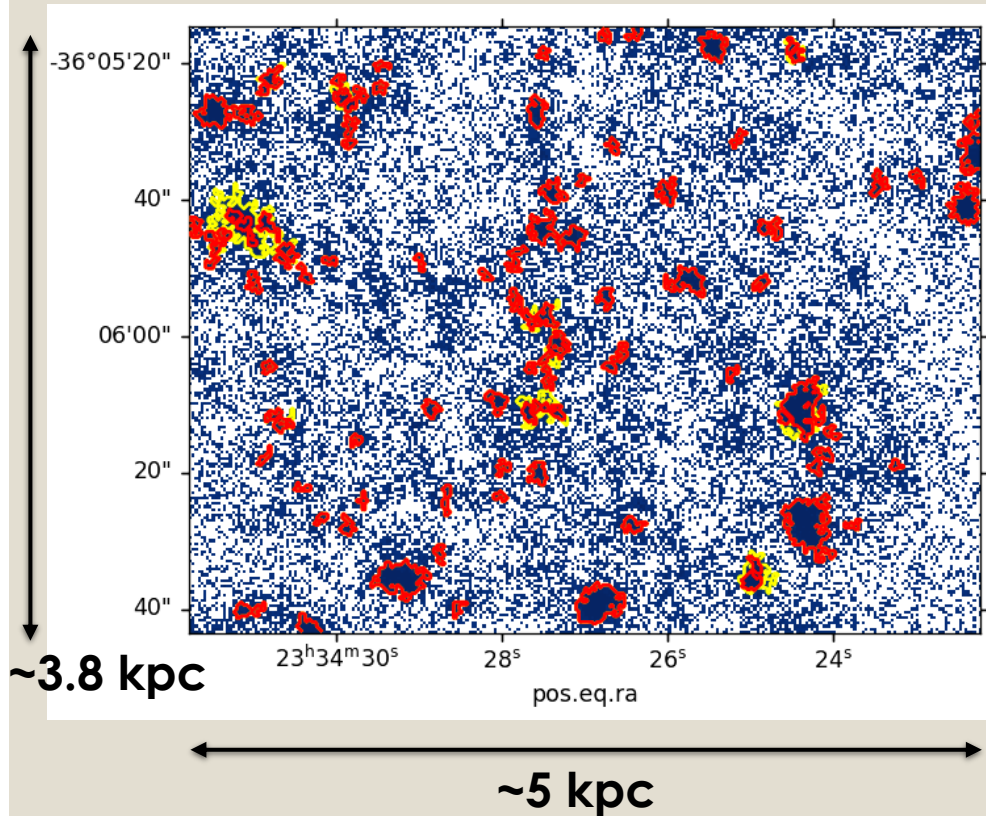
Star Formation History, Stellar mass, age, metallicity

IC5332

- $M_\star = 4.1 \times 10^9 M_\odot$
- $D = 9\ Mpc$
- A sample from PHANGS - ASTROSAT

Hassani et al., 2024

Star forming regions in IC5332

Total structures
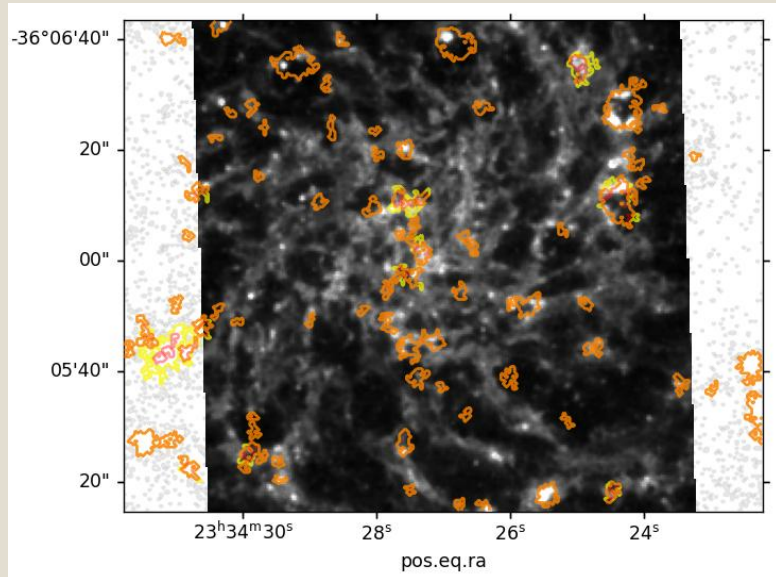120

Red : Children structures
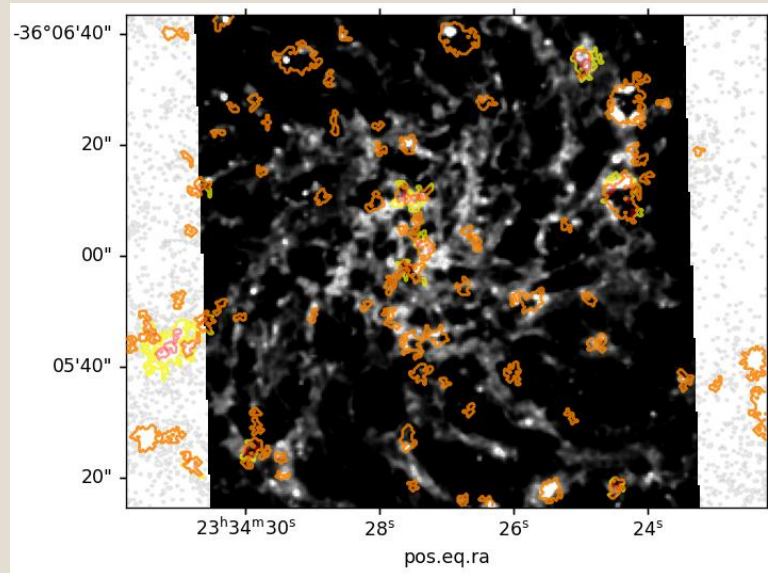
Yellow : Parent structures

Star forming regions and PAHs
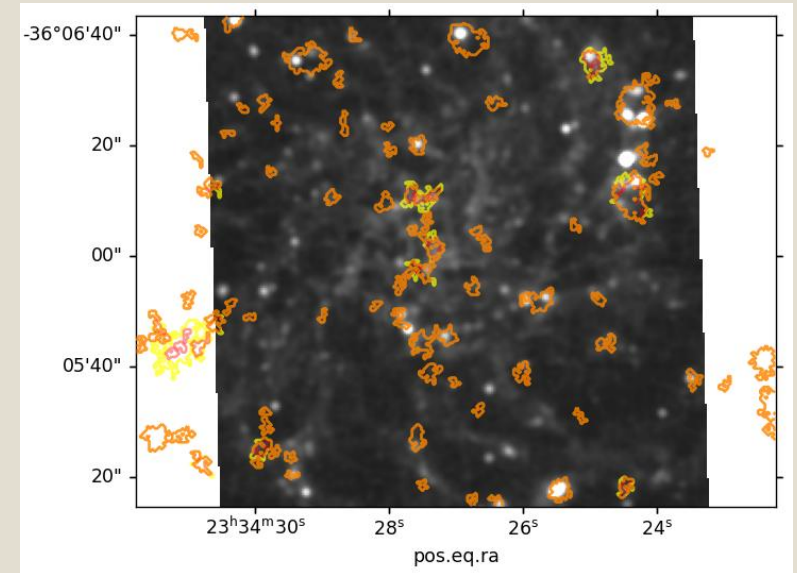
Red : Children structures

Yellow : Parent structures

F770W
Ionised Large PAHs

F1130W
Neutral Large PAHs

F2100W
Associated with
Embedded Star Formation

Large => more than 100 C atoms

Preparation for SED fitting

Pixel scales

- **UVIT** : 0.4168''/pix
- **UVIS** : 0.04''/pix
- **NIRCam** : 0.031''pix (SW channel)
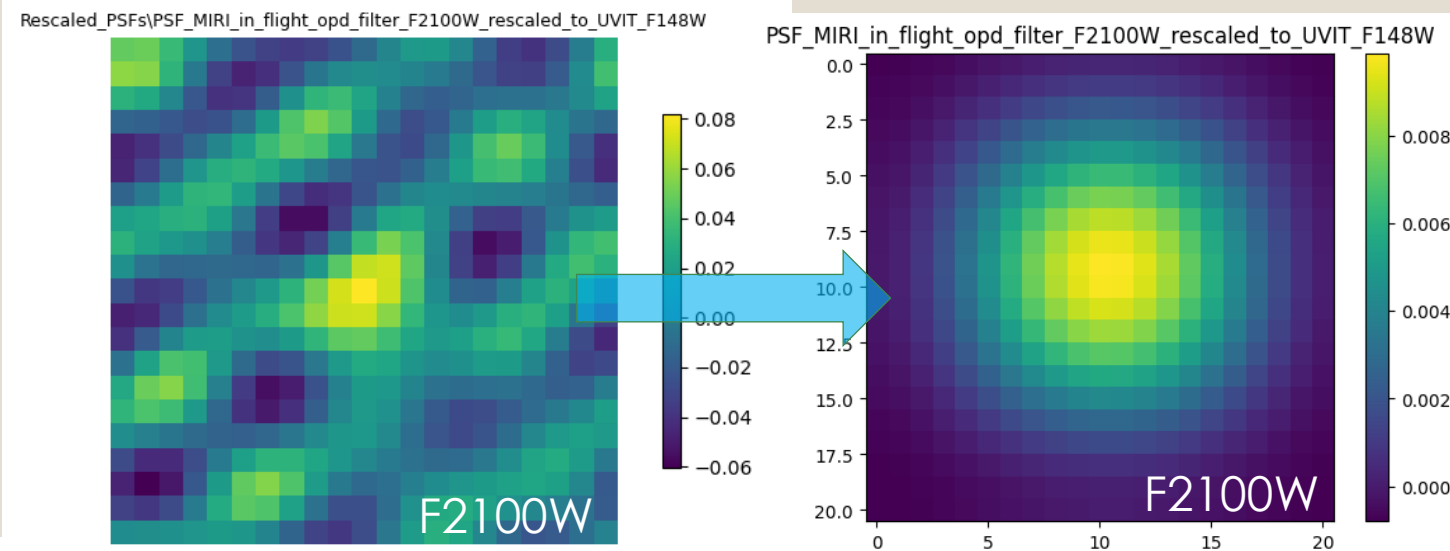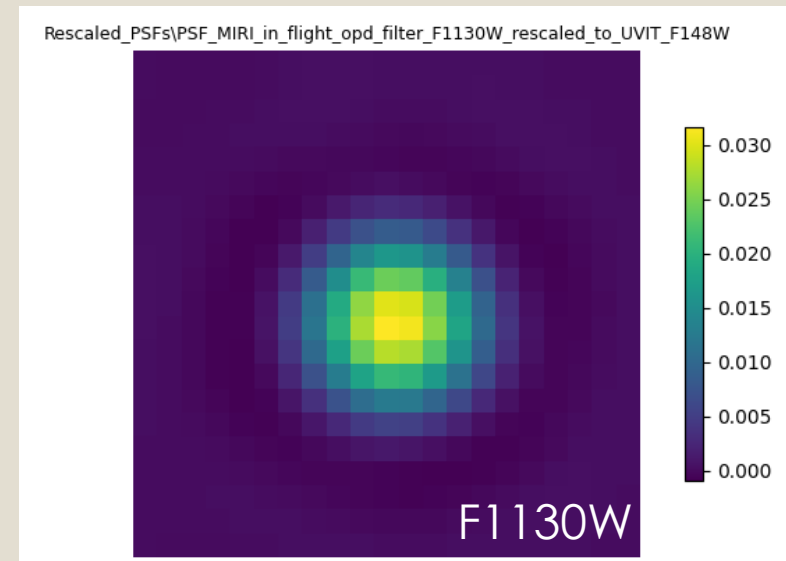   : 0.063''/pix (LW channel)
- **MIRI** : 0.11''/pix

Resolution Matching

Matching pixel scale of all images

↓

Convolving images with matching PSF kernels
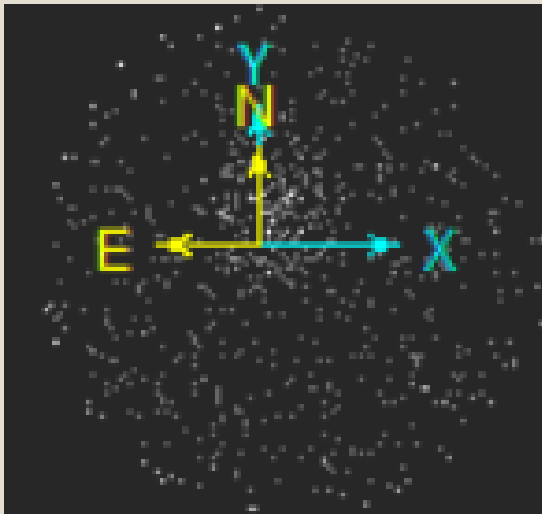
Matching Kernels for PSF degradation

- **For HST images :**
  Images were convolved with UVIT PSF directly
- **For JWST F2100W :**
  Adjusted the Cosine Bell Window to remove the noise

Rescaled_PSFs\PSF_MIRI_in_flight_opd_filter_F1130W_rescaled_to_UVIT_F148W

F1130W

Rescaled_PSFs\PSF_MIRI_in_flight_opd_filter_F2100W_rescaled_to_UVIT_F148W

F2100W

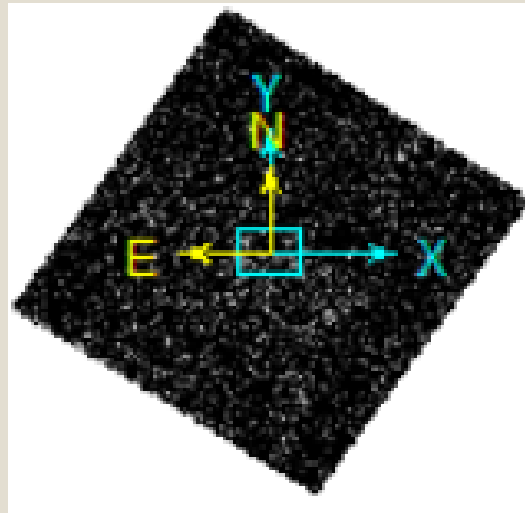PSF_MIRI_in_flight_opd_filter_F2100W_rescaled_to_UVIT_F148W

F2100W

Creating WCS aligned cutouts

- Aligned between HST and UVIT images
- For JWST images Needs to be North aligned
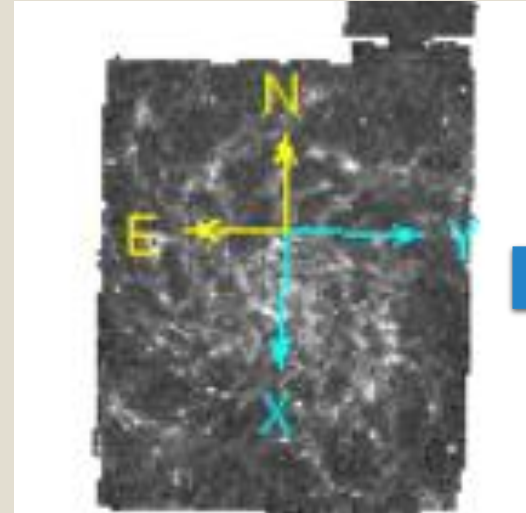
- **Reprojecting helped fix the issue**
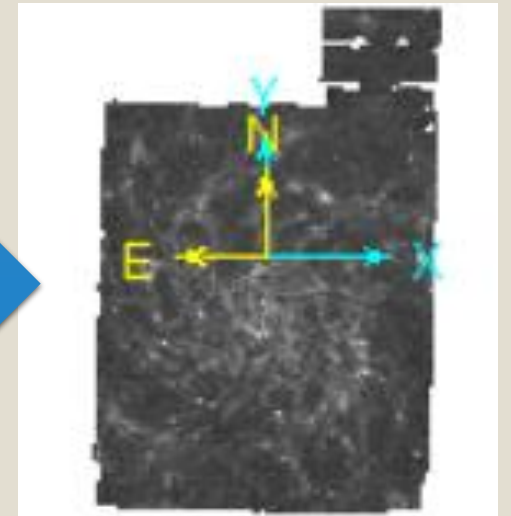- Creates issue during degradation process

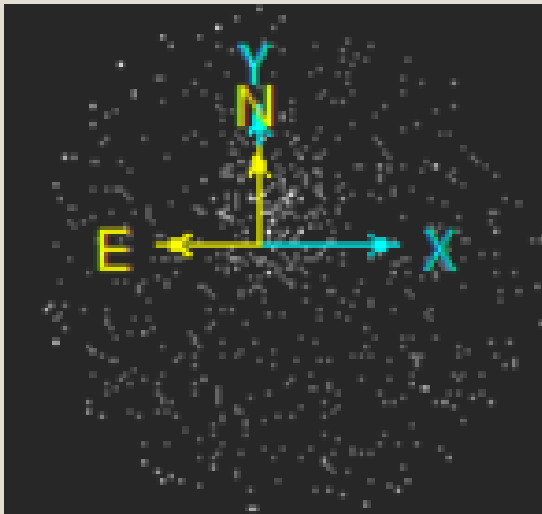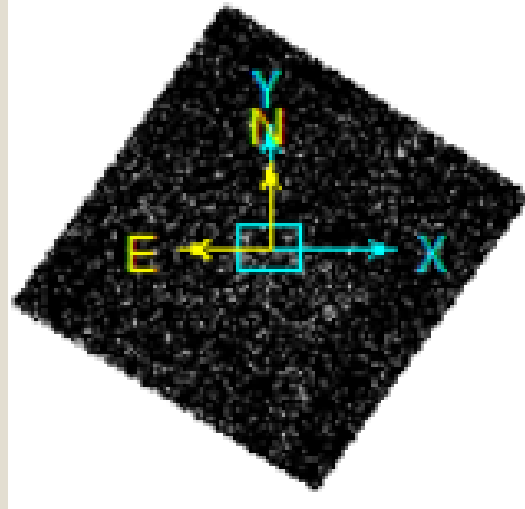UVIT   HST/UVIS   JWST/MIRI   JWST/MIRI

Creating WCS aligned cutouts

- Aligned between HST and UVIT images
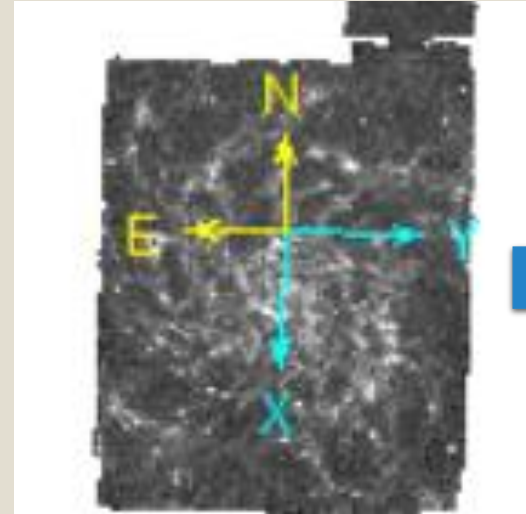- For JWST images Needs to be North aligned

- **Reprojecting helped fix the issue**
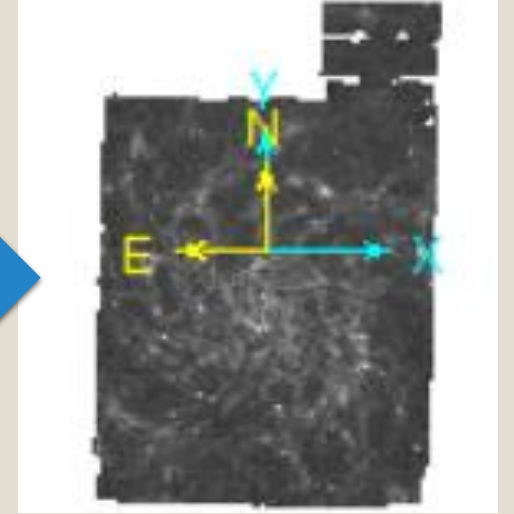- Creates issue during degradation process

UVIT **HST/UVIS** **JWST/MIRI** **JWST/MIRI**

Will continue further …

Thank You