

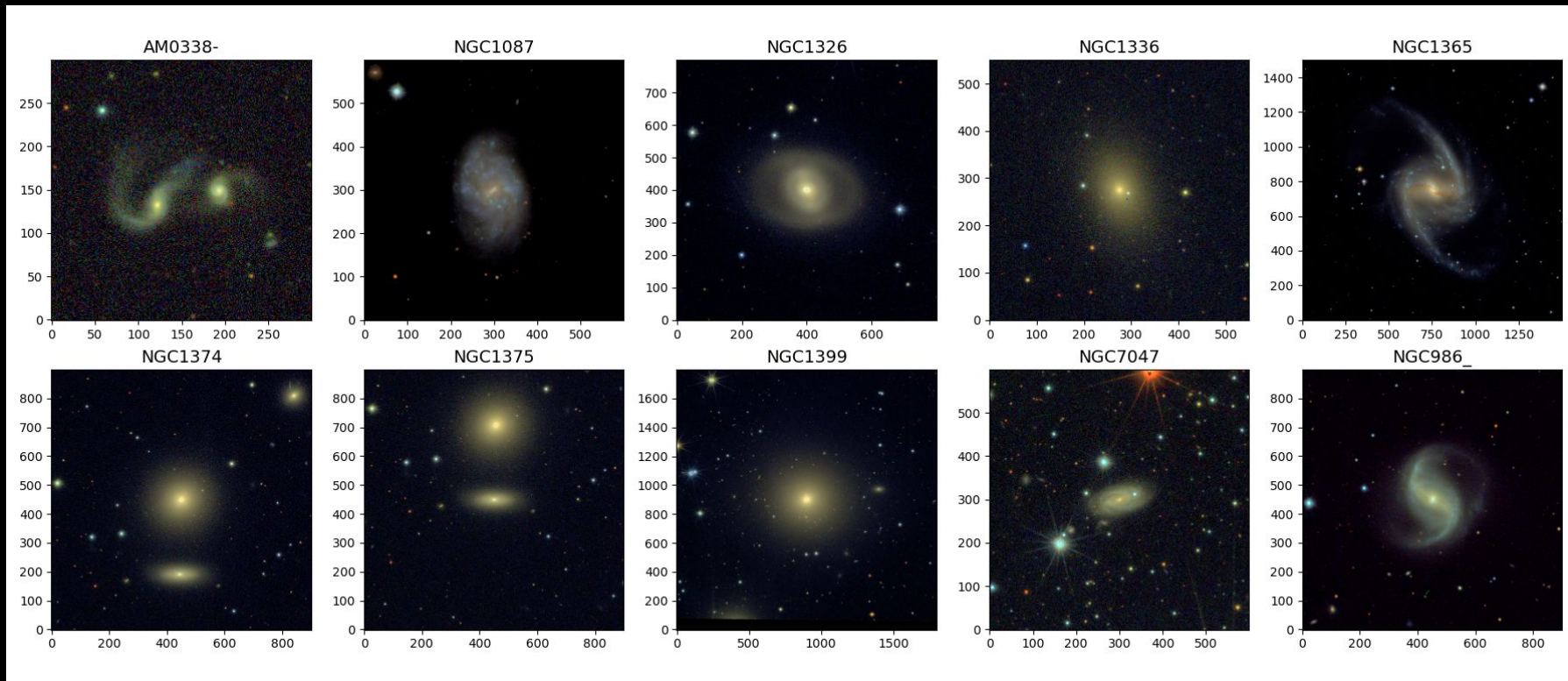
Analysis of S-cubes with PCA Tomography and AIStar's fitting

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Supervisor: Roberto Cid Fernandes

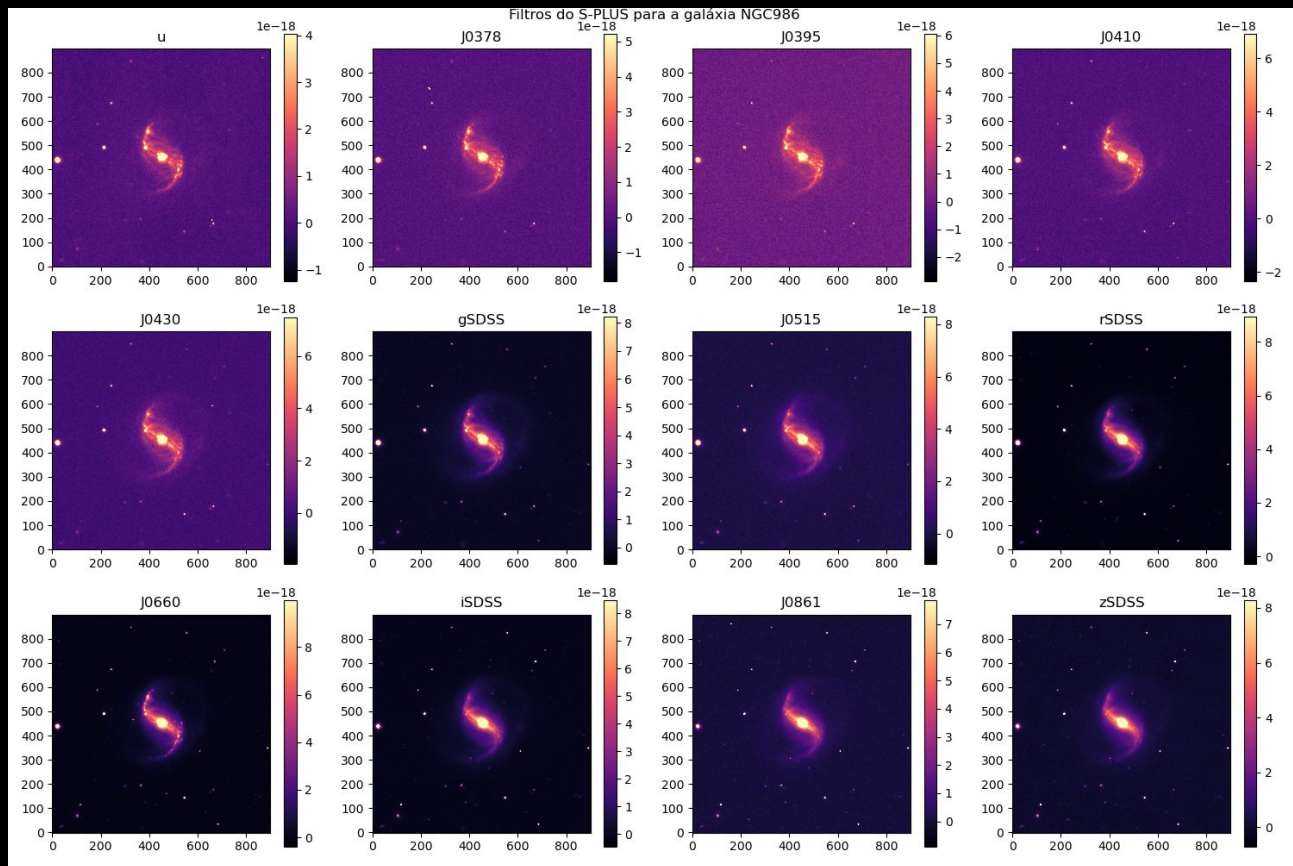


Galaxies

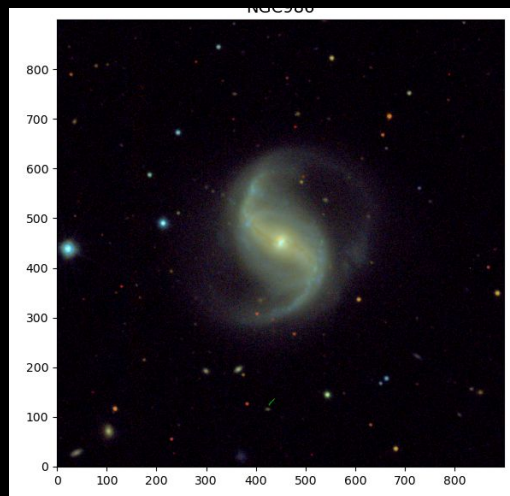


RGB from S-PLUS filters

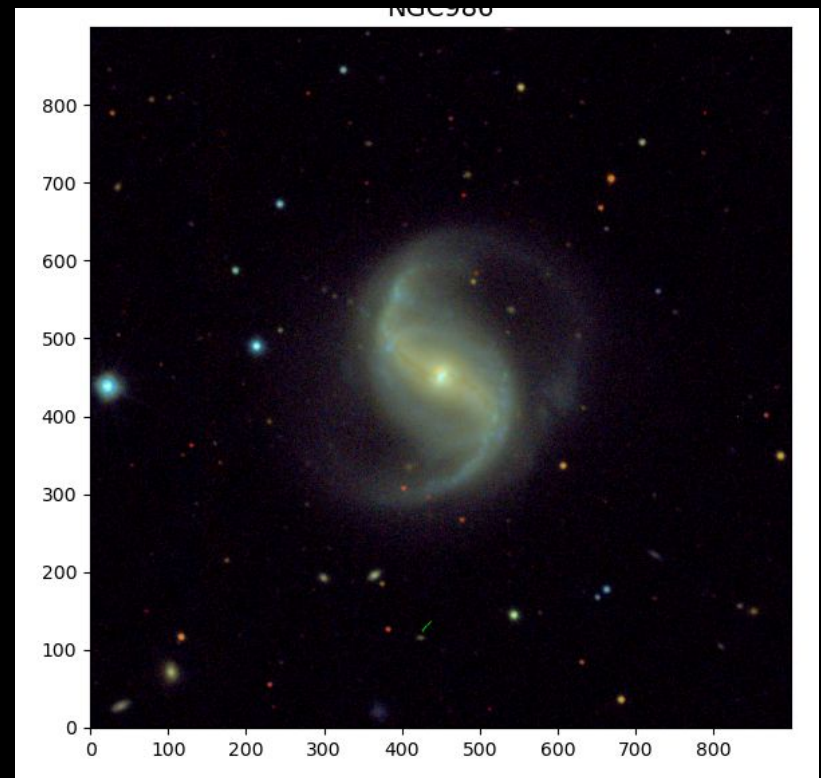
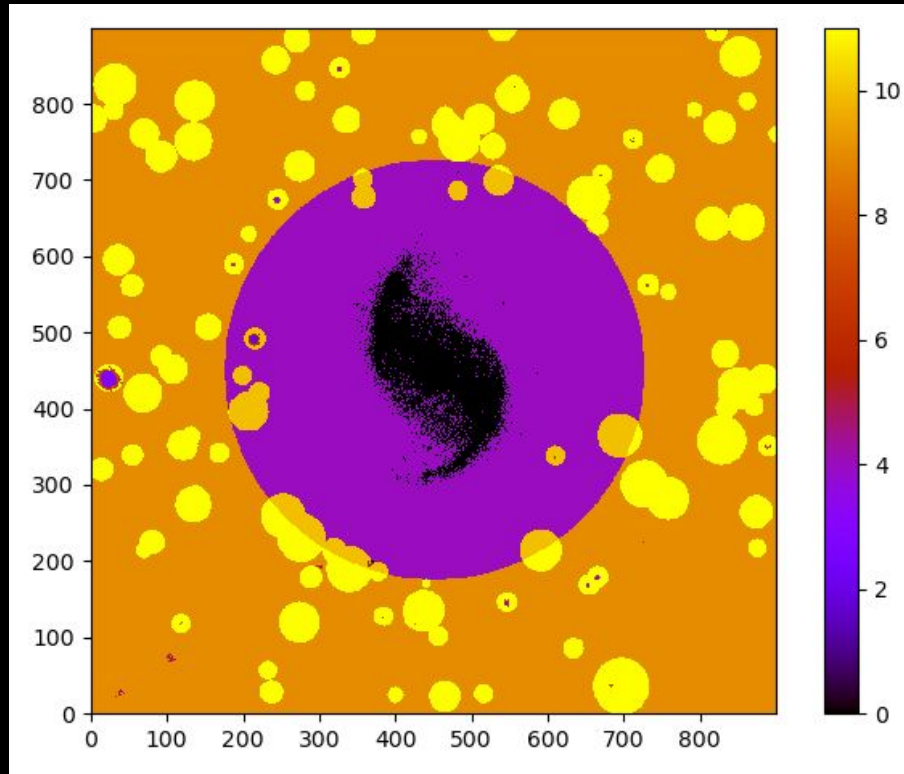
S-PLUS Filters NGC986



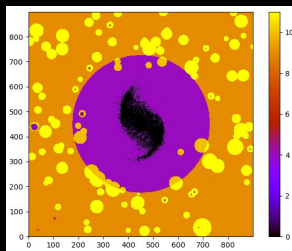
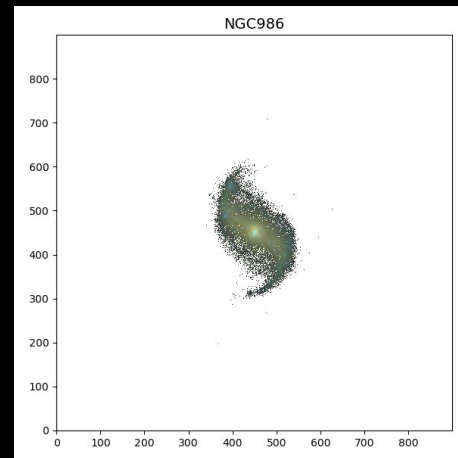
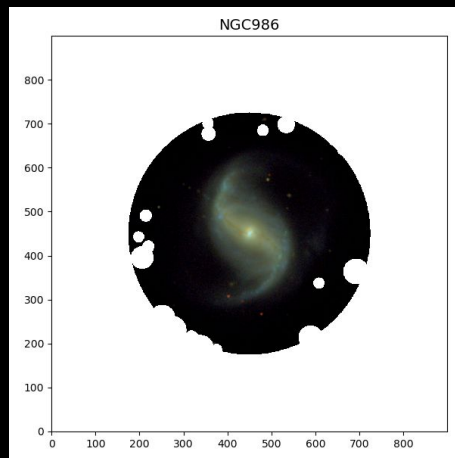
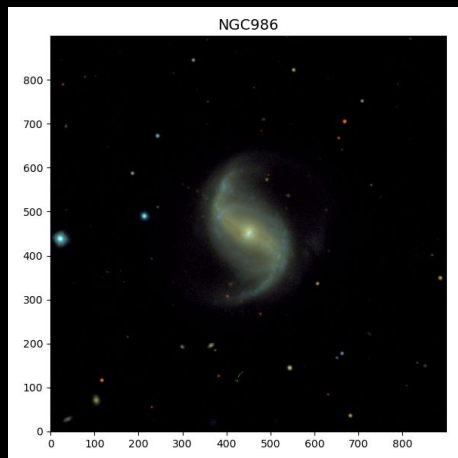
RGB from filters



Masking "useless" data



Masking "useless" data



Masks



- Stars
- circle of the main area of the galaxy
- flux < 0
- median (S/N < 2)

Data



Mask

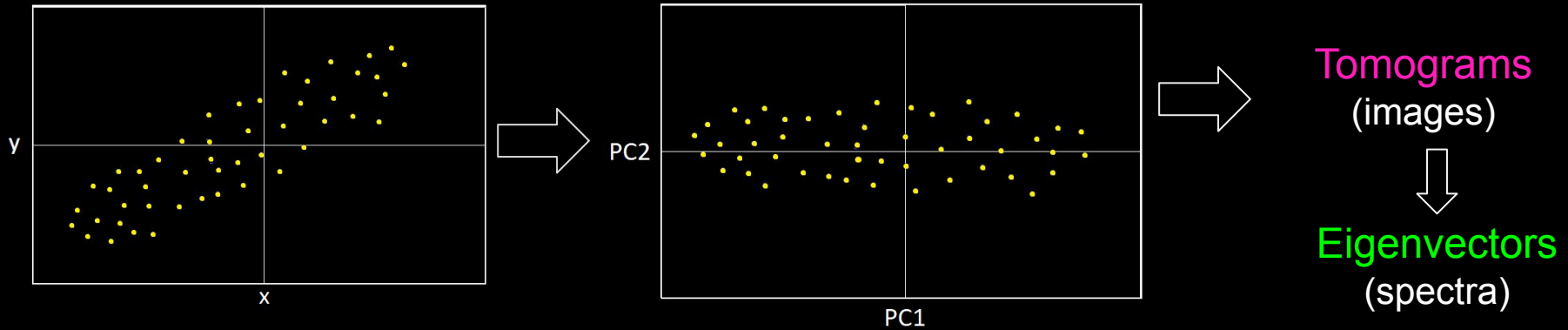


PCA Tomography



AIStar's Fitting

PCA tomography



PCA (Principal Components Analysis) change the coordinates of the system by the variance (decreasing)

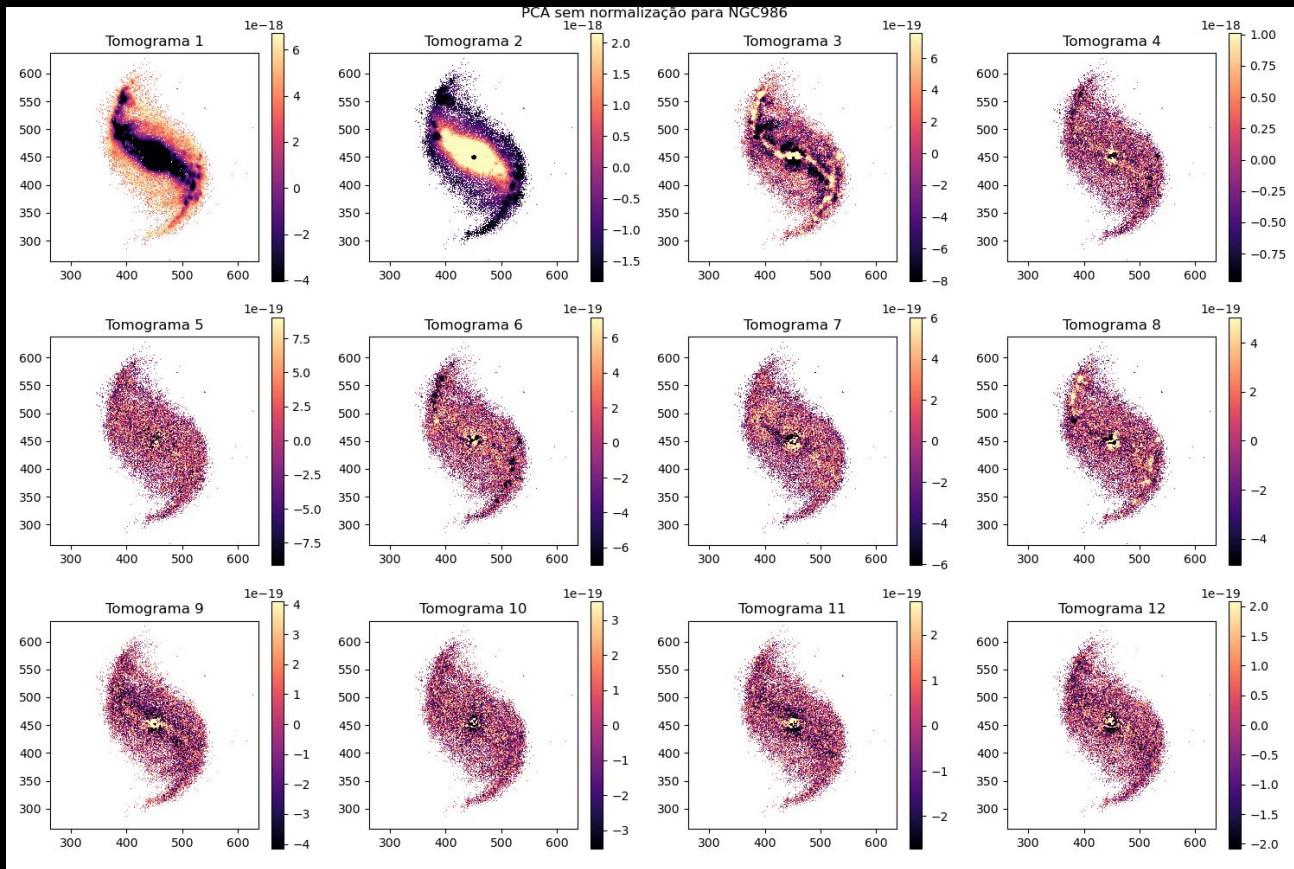
$$\text{Flux}(\lambda) = \text{Flux}_{\text{mean}} + \text{PC}_1 \times \text{E}_1(\lambda) + \text{PC}_2 \times \text{E}_2(\lambda) + \text{PC}_3 \times \text{E}_3(\lambda) + \dots$$

Different results of PCA

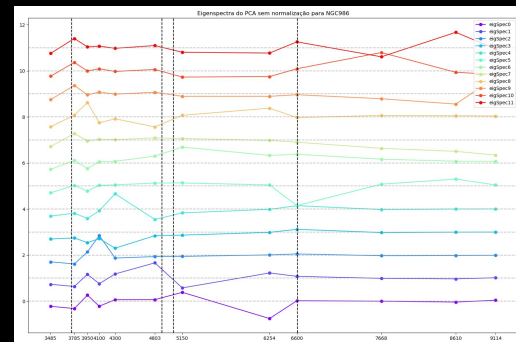
➤ changing the variance → different “flavors” of PCA

- without normalization
- scaled by log
- normalized by mean filter
- normalized by mean spaxel
- normalized by filter rSDSS

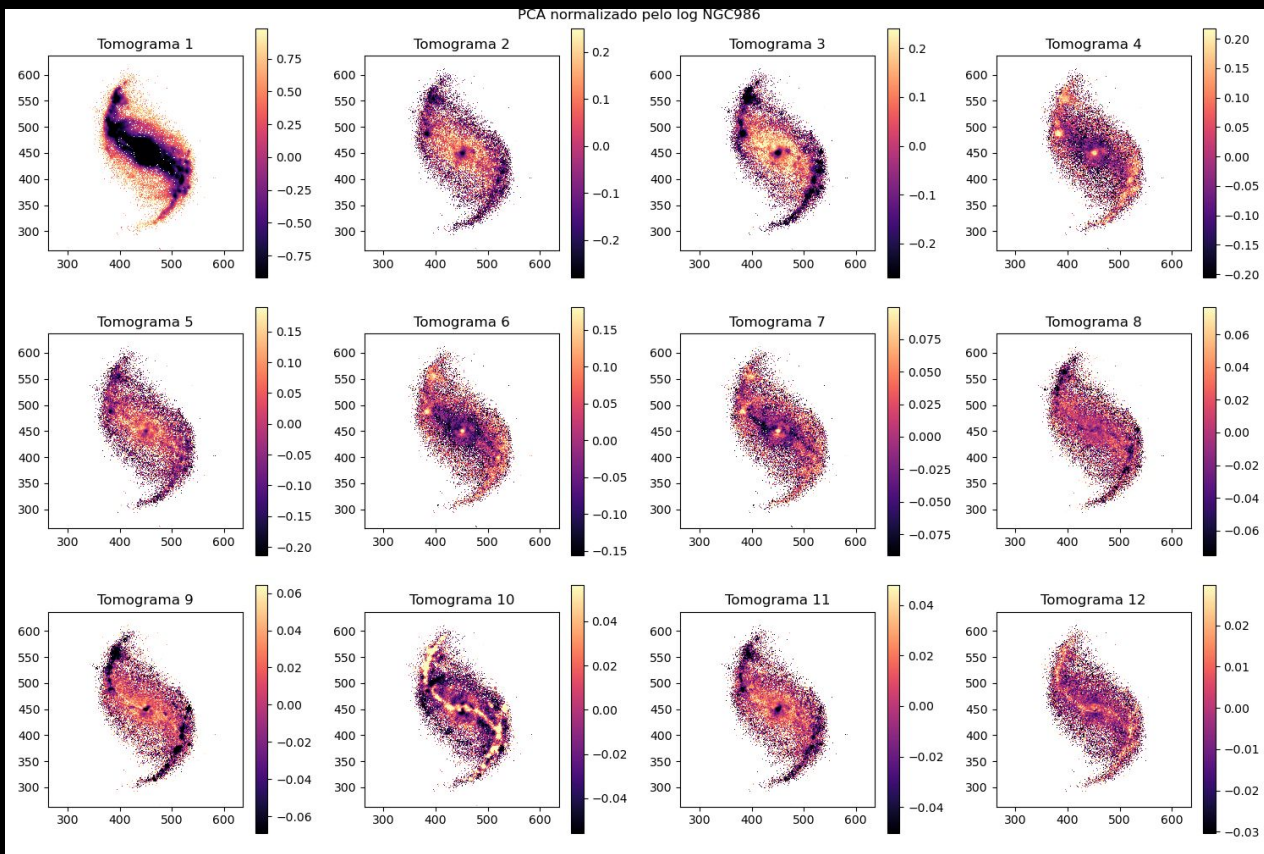
PCA without normalization



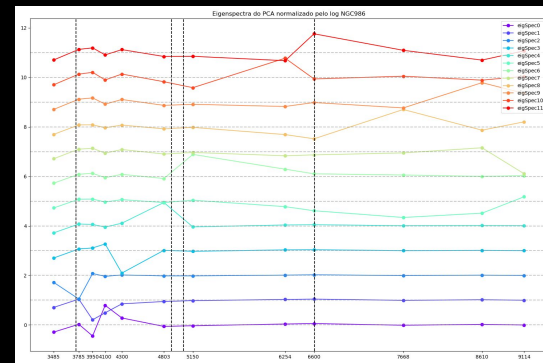
Eigenspectra



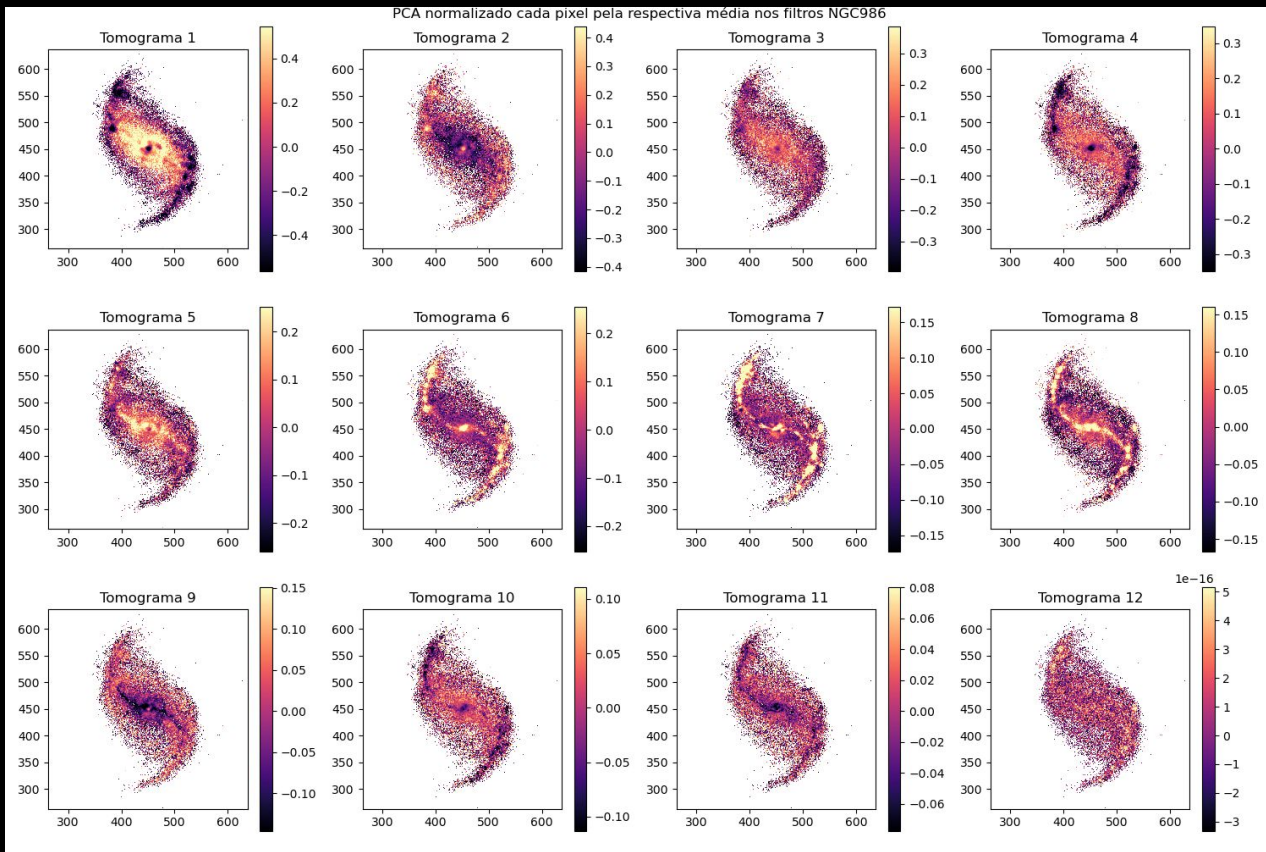
PCA scaled by log



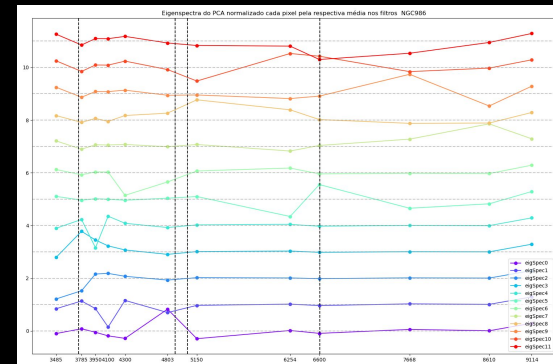
Eigenespectra



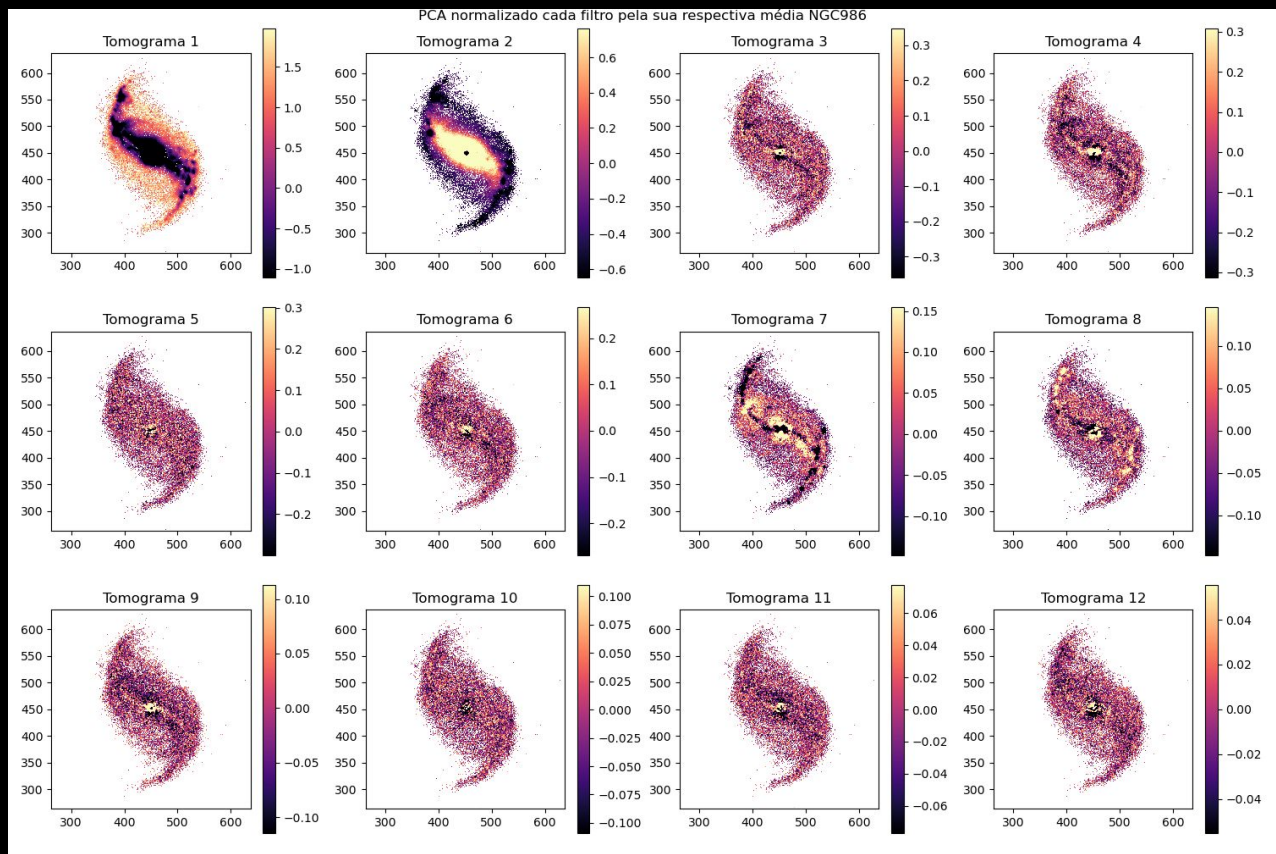
PCA normalized by mean spaxel



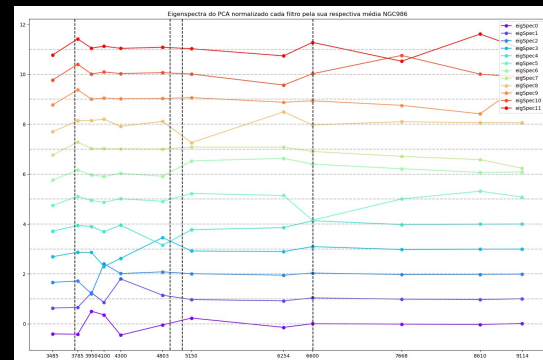
Eigenspectra



PCA normalized by mean filter

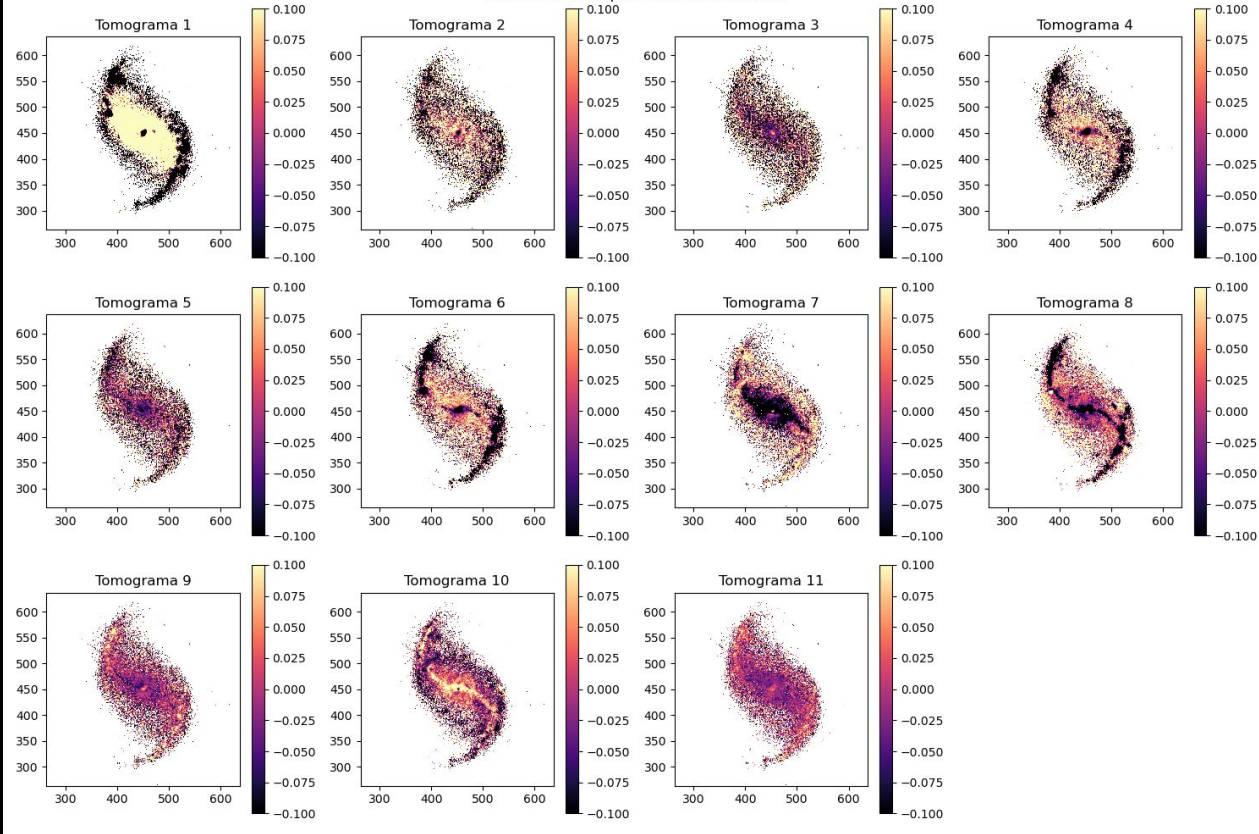


Eigenspectra

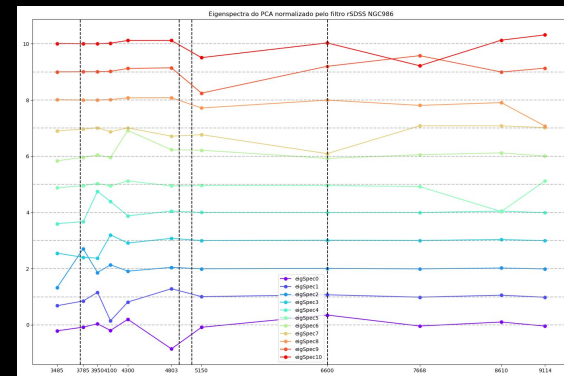


PCA normalized by rSDSS filter

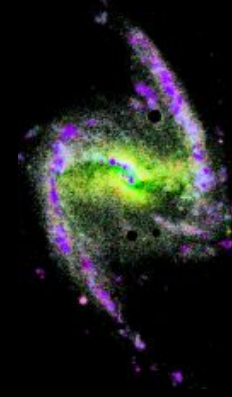
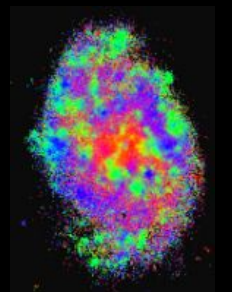
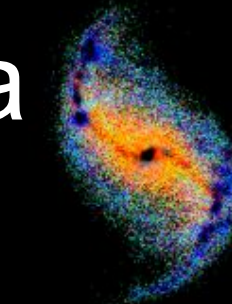
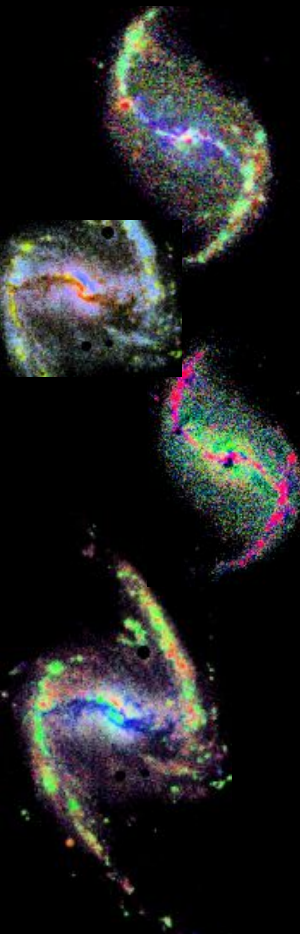
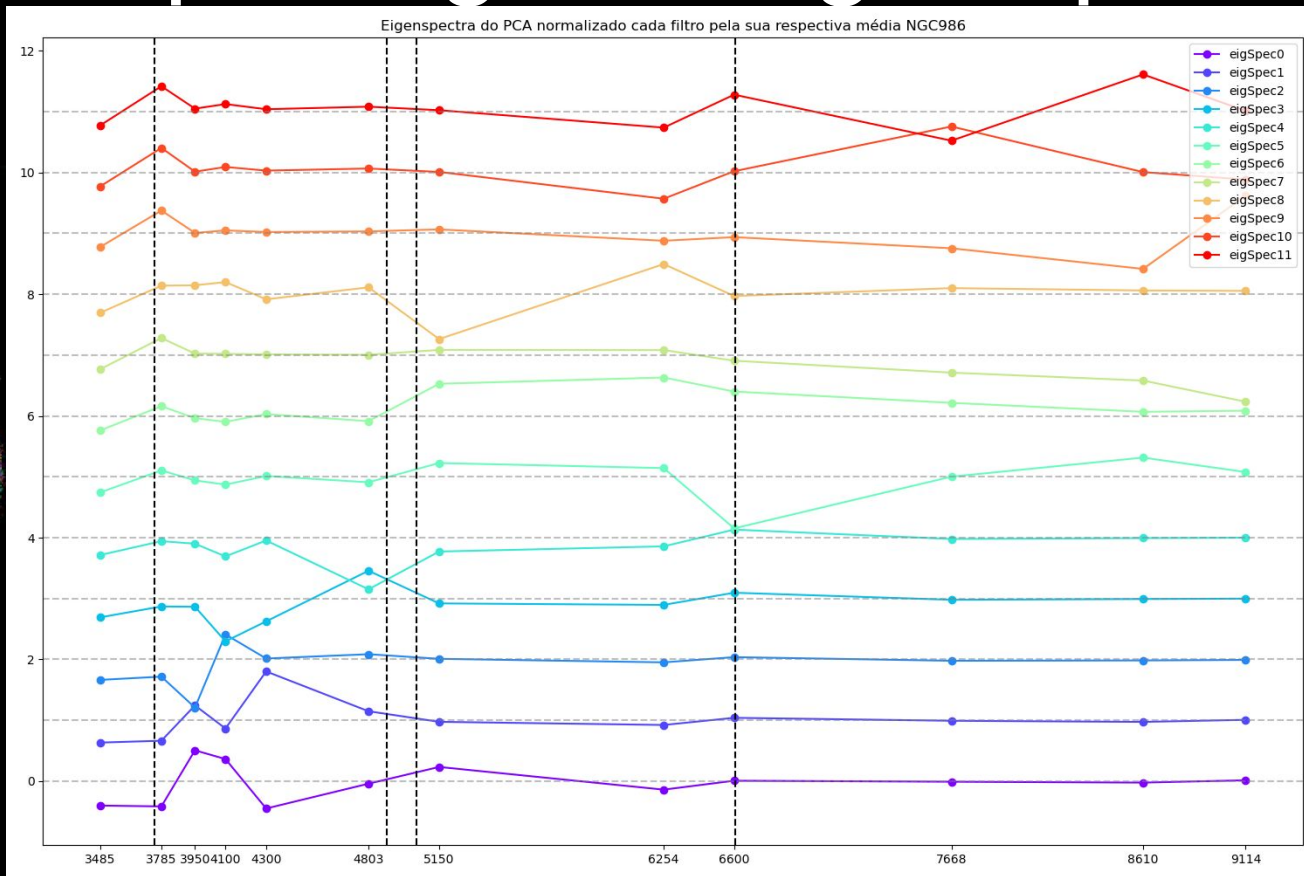
PCA normalizado pelo filtro rSDSS NGC986



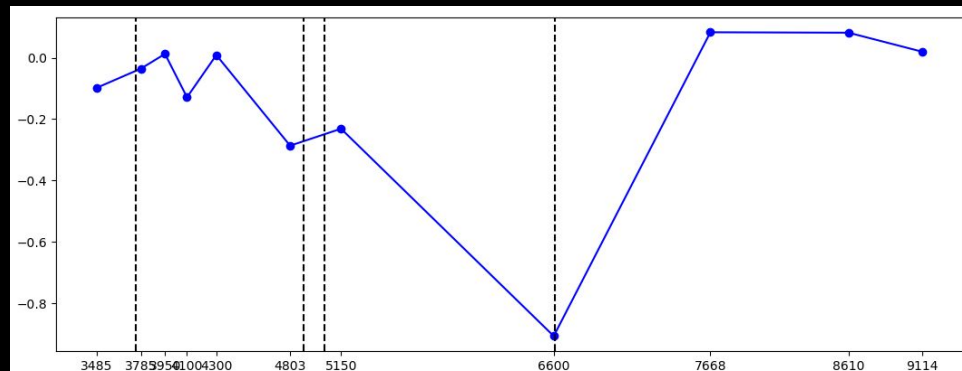
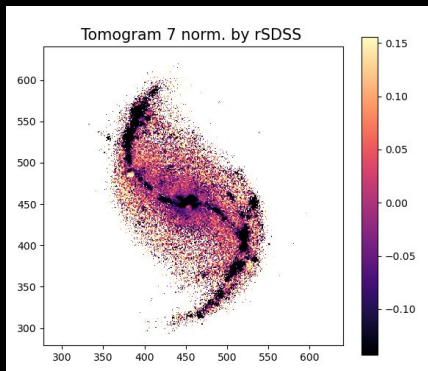
Eigenspectra



Interpreting the EigenSpectra



Interpreting the EigenSpectra



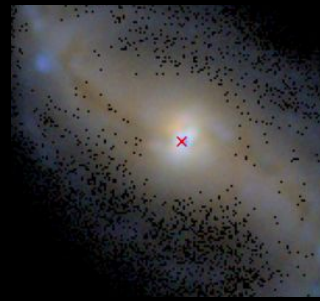
H α



Fits and Maps from AIStar

- Fit spectra
- Fit photometry
- Fit (recombination) emission lines: [OII] 3727, H β , [OIII], H α , [NII], [SII] 6716+6731
- Map of Mass
- Map of ages
- Map of dust depth
- ...

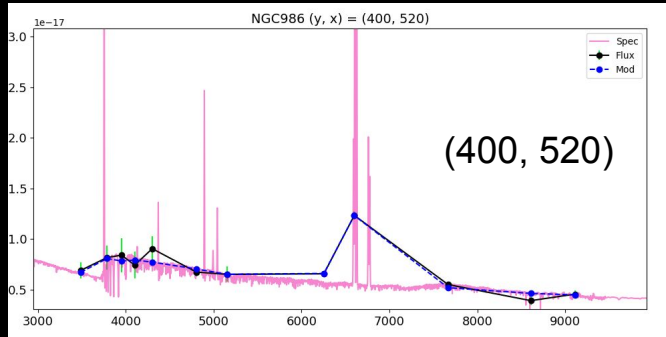
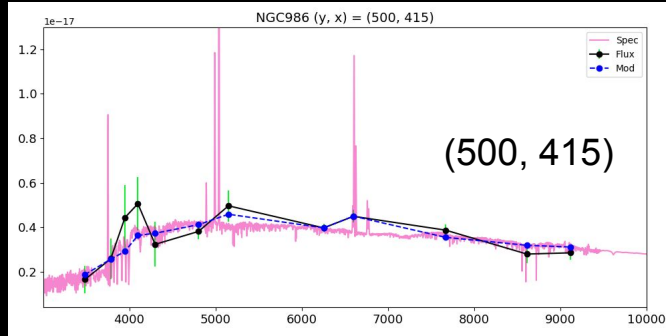
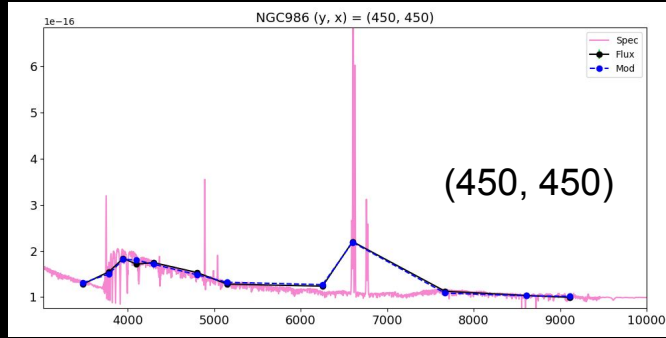
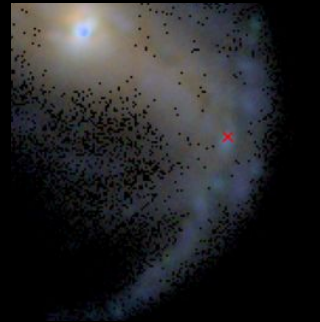
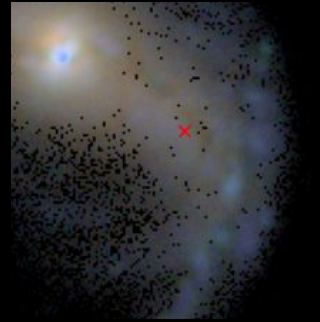
Fitting AIStar



NGC986

Comparison:

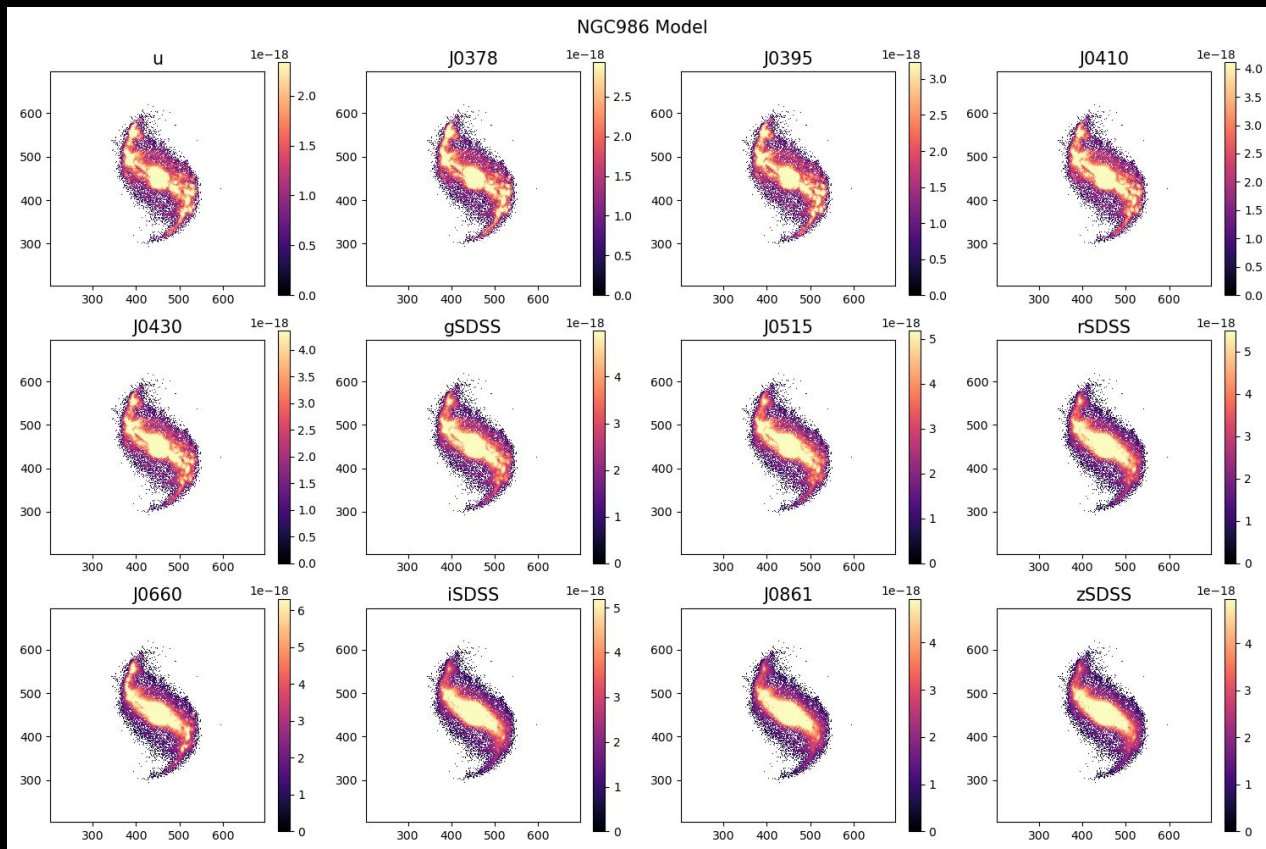
Real data
X
Model



F_{λ} [$\text{erg s}^{-1} \text{cm}^{-2} \text{\AA}^{-1}$]

λ [\AA]

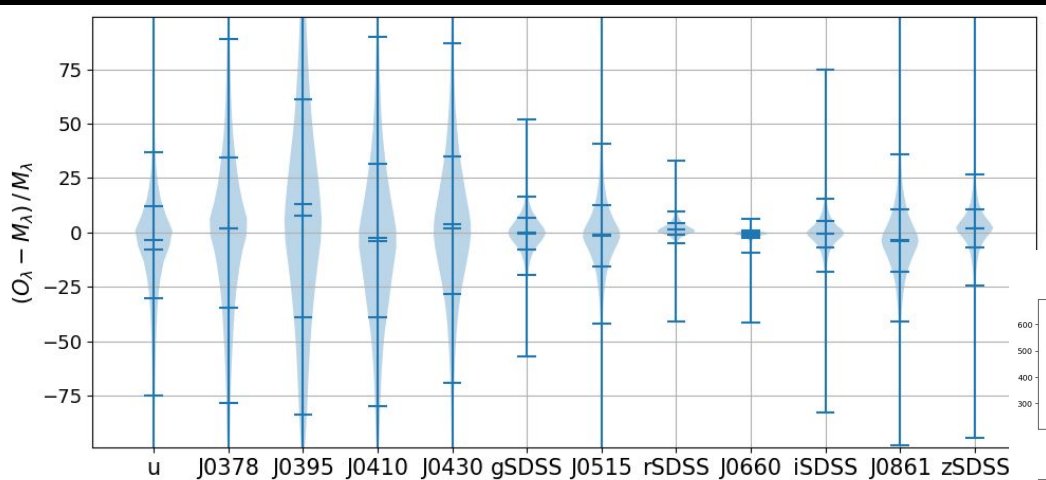
Model from AIStar NGC986



Percentage deviation between data and model

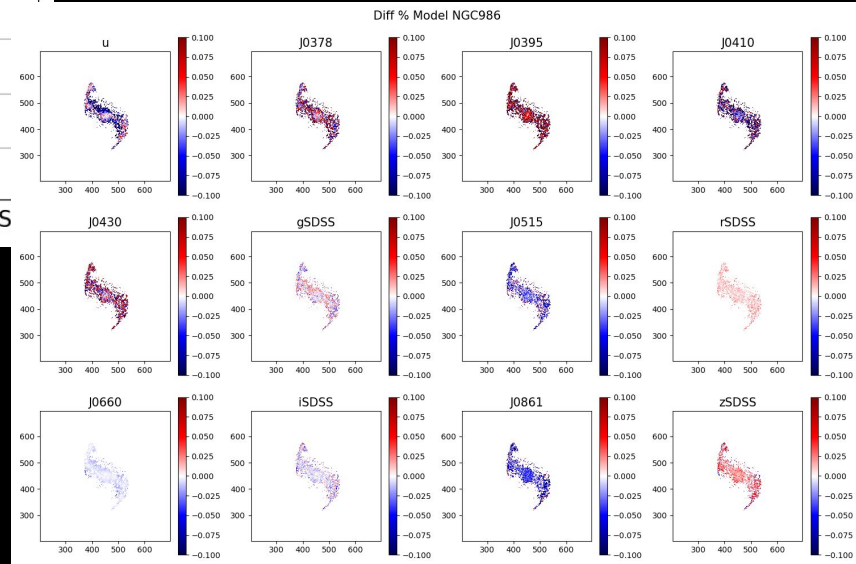


NGC986



$$\frac{(O_\lambda - M_\lambda)}{M_\lambda}$$

M_λ



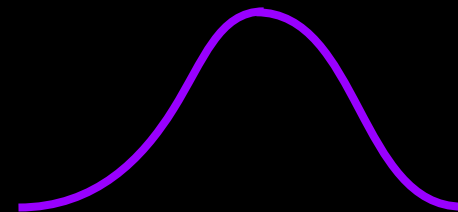
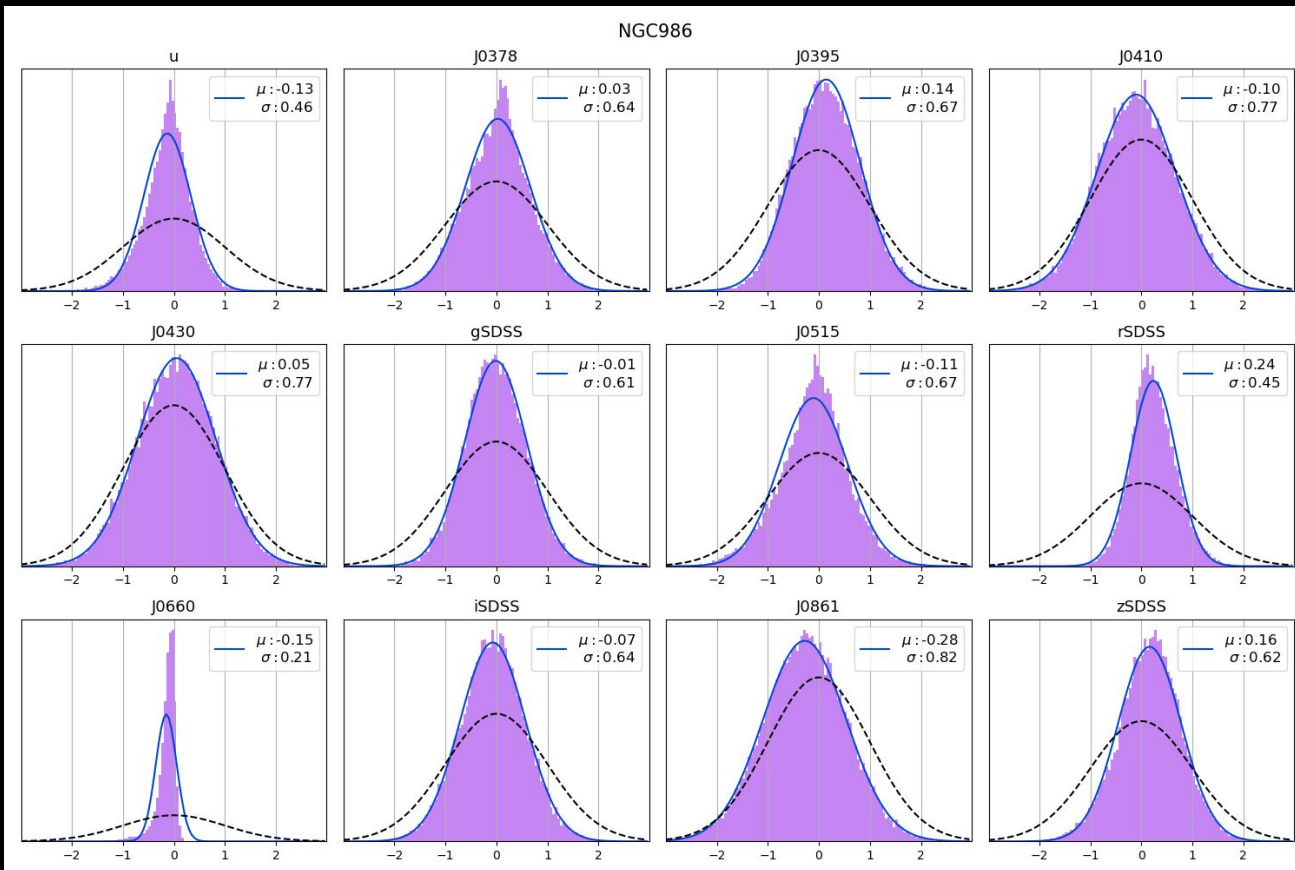
Testing the photometric errors

NGC986

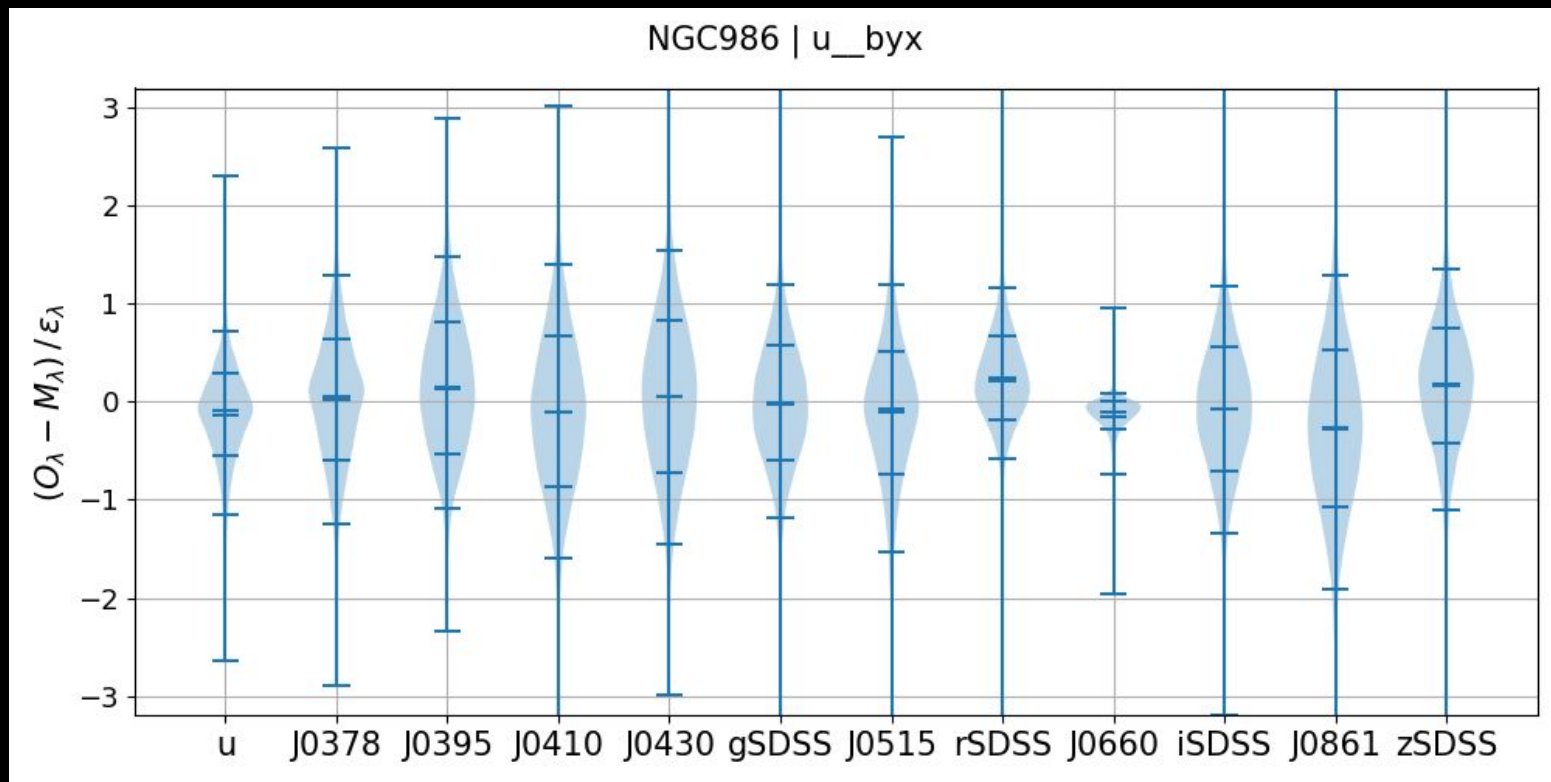
Statistics of the Residuals

$$\frac{(O_\lambda - M_\lambda)}{\epsilon_\lambda}$$

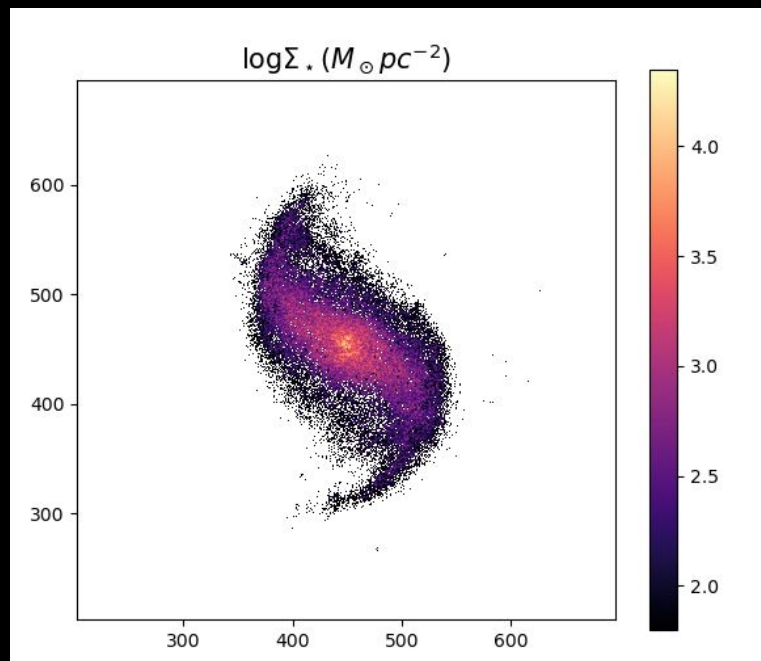
ϵ_λ



Testing the photometric errors



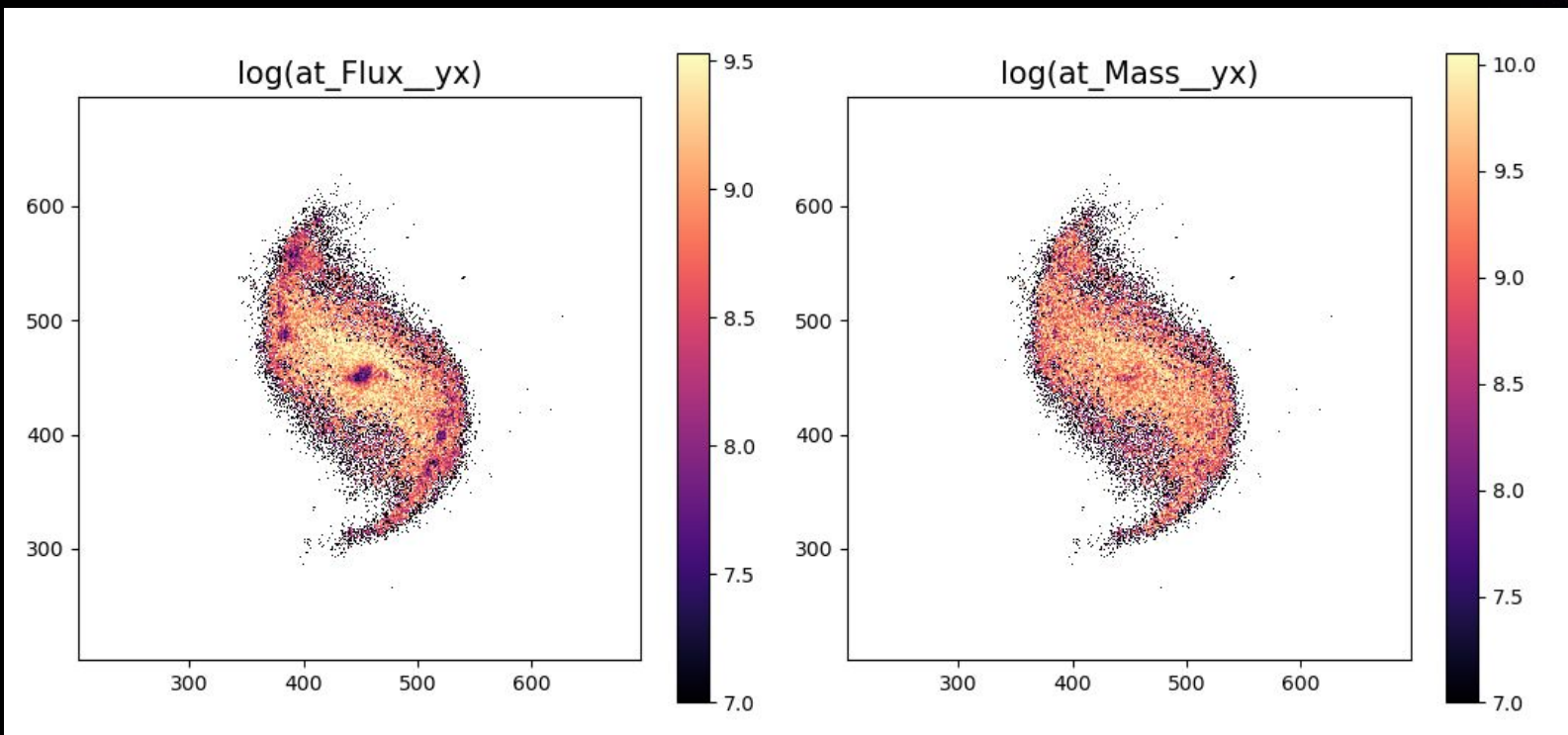
Maps from A1Star NGC986



stellar mass surface density

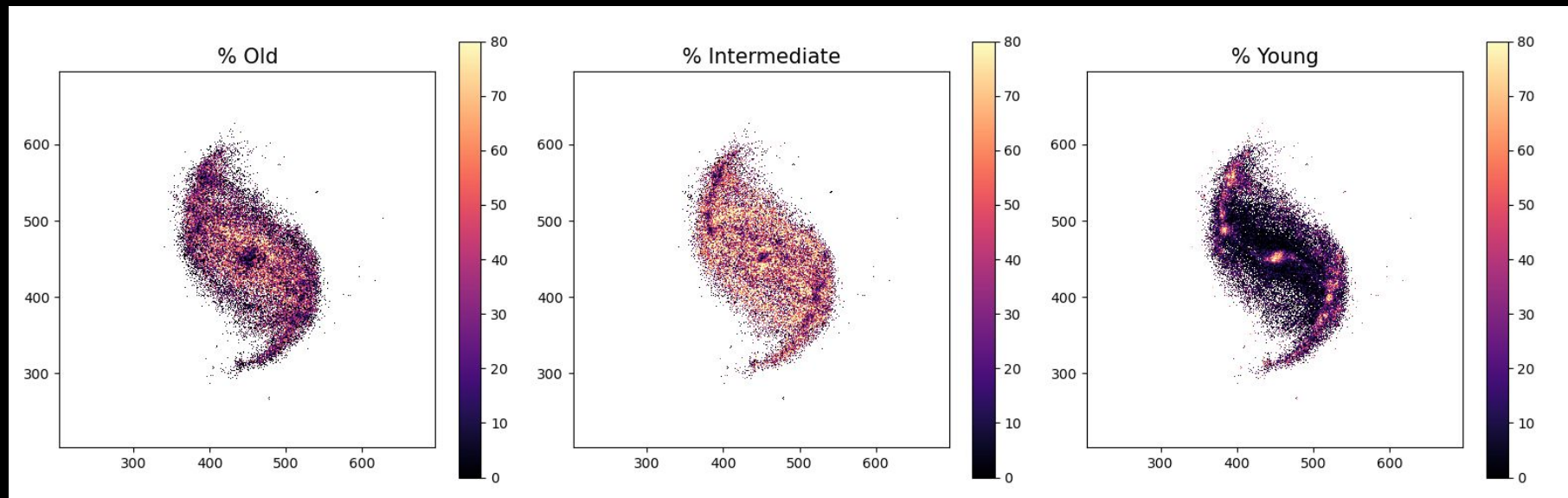


Maps from AIStar NGC986



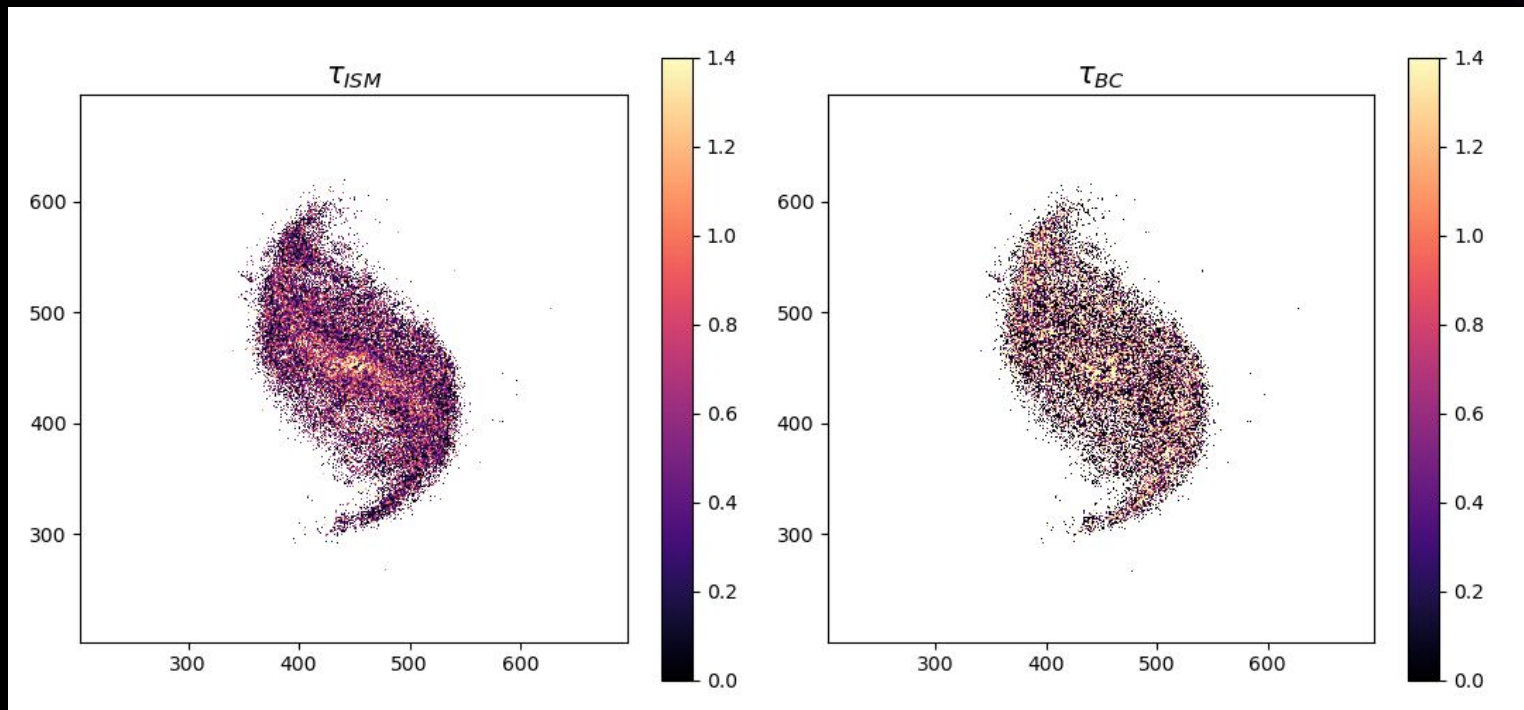
log of the average age weighted by the flux and the mass

Maps from A1Star NGC986



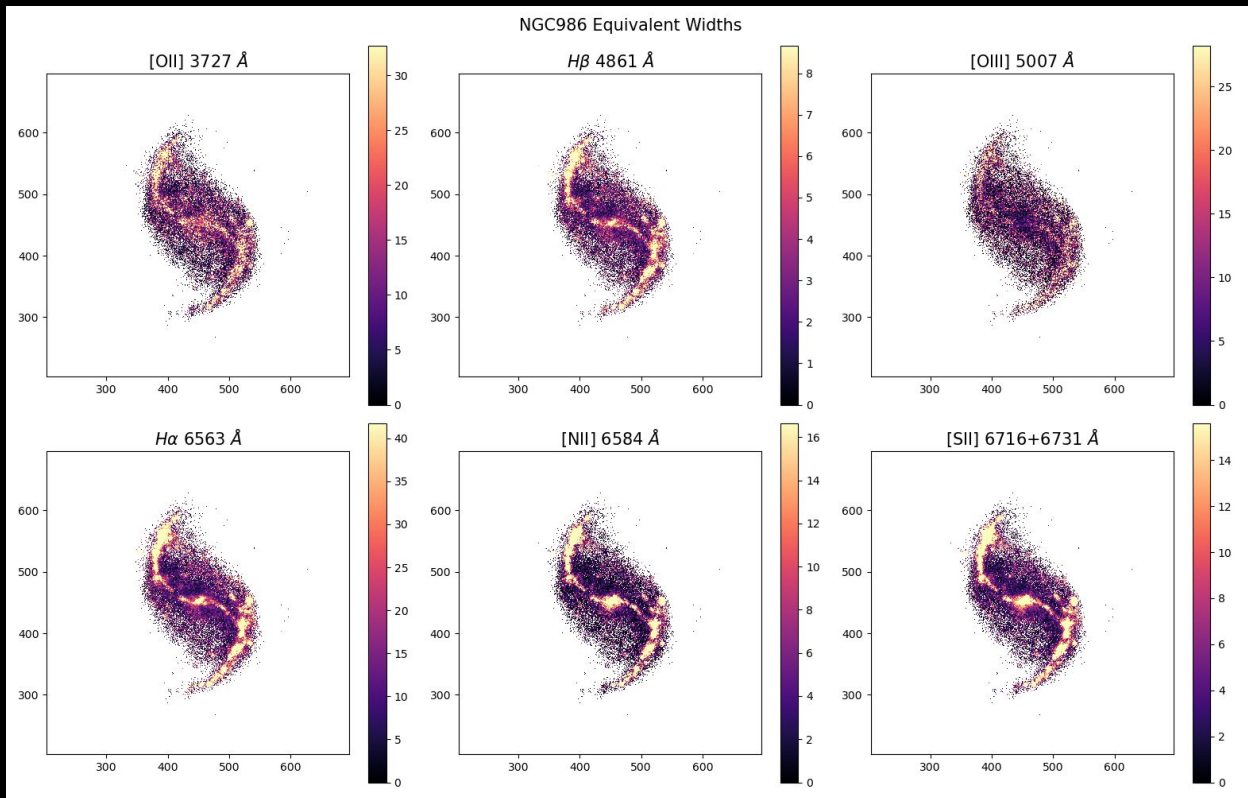
Percentage of stellar populations

Maps from A1Star NGC986



Dust optical depth

Maps from A1Star NGC986



Emission lines equivalent widths

Thank you