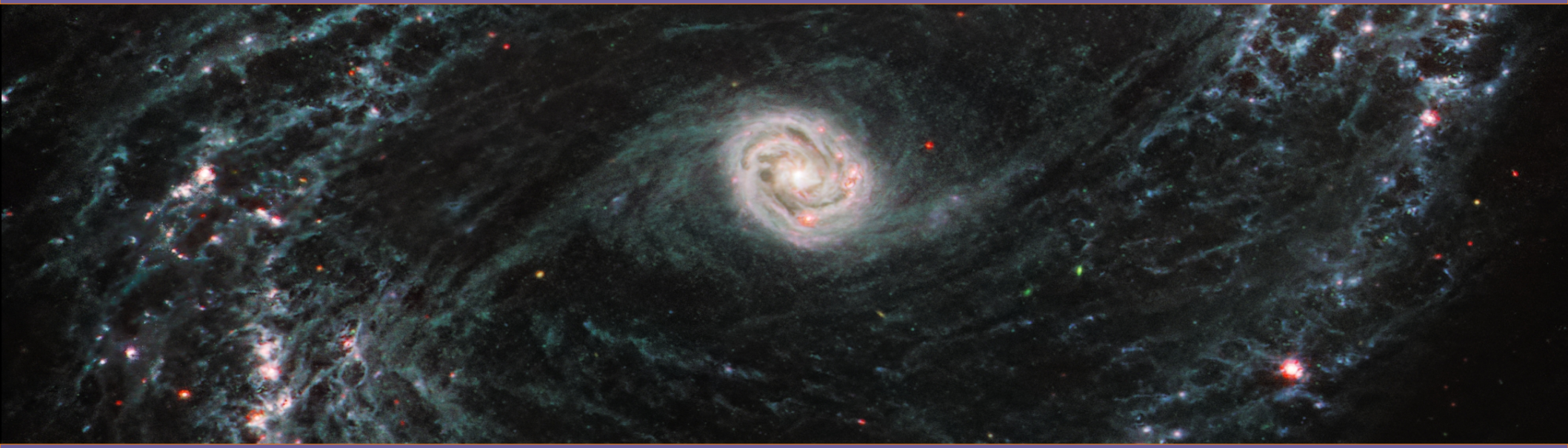
Real Life, or Just Fantasy: Determining the Source of Extended MIR Emission Around AGN in Imaging from the GATOS Survey

Dr Steph Campbell (they/them)
with
David Rosario, Houda Haidar,
and the GATOS Collaboration



Wednesday 9th July
National Astronomy Meeting 2025
Durham

Real Life, or Just Fantasy: Detailed Assessment and Treatment of Emission Line Contamination in JWST/MIRI Images of Nearby Seyfert Galaxies

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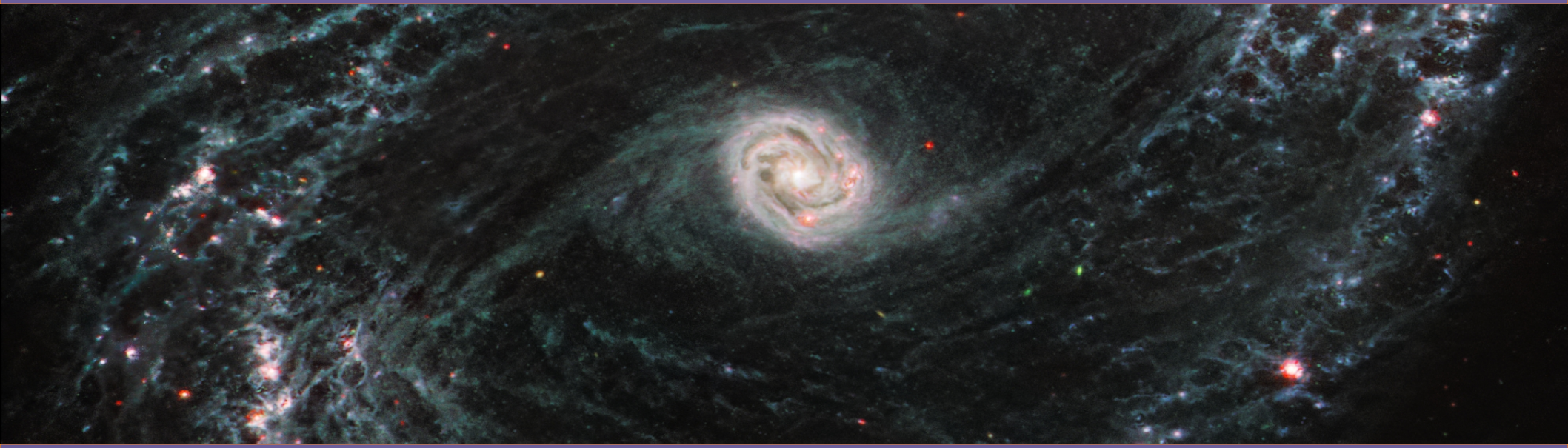

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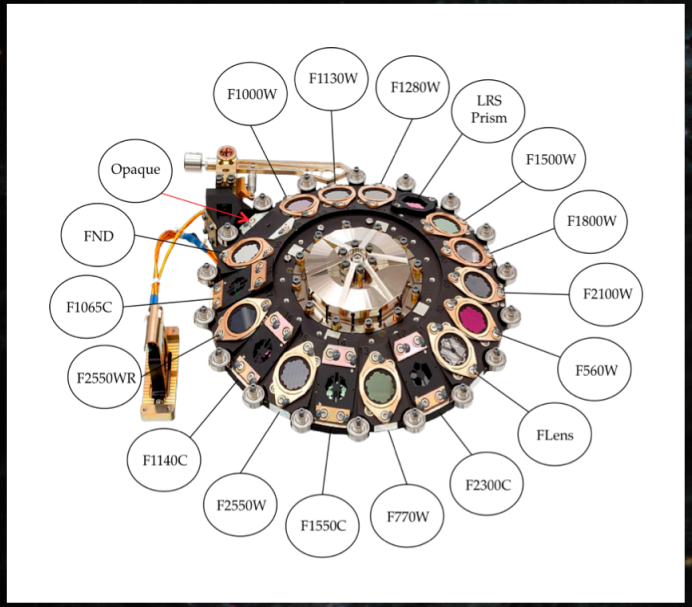
Emission line contamination...



Broadband filters include flux from continuum AND flux from emission lines

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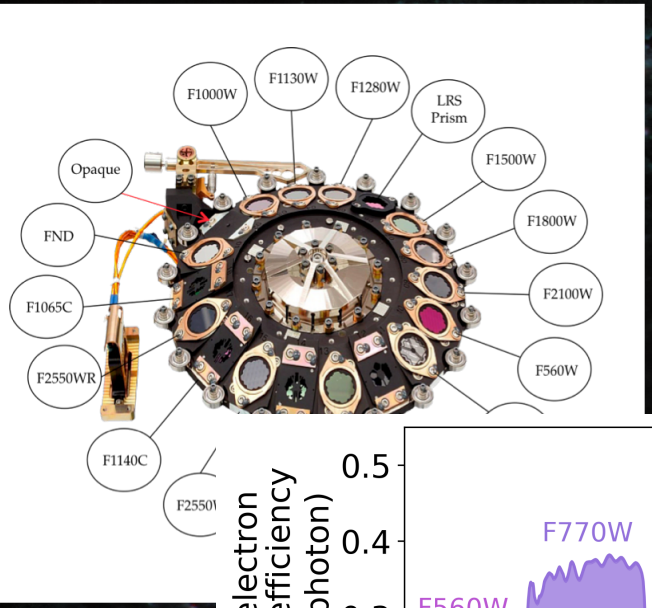

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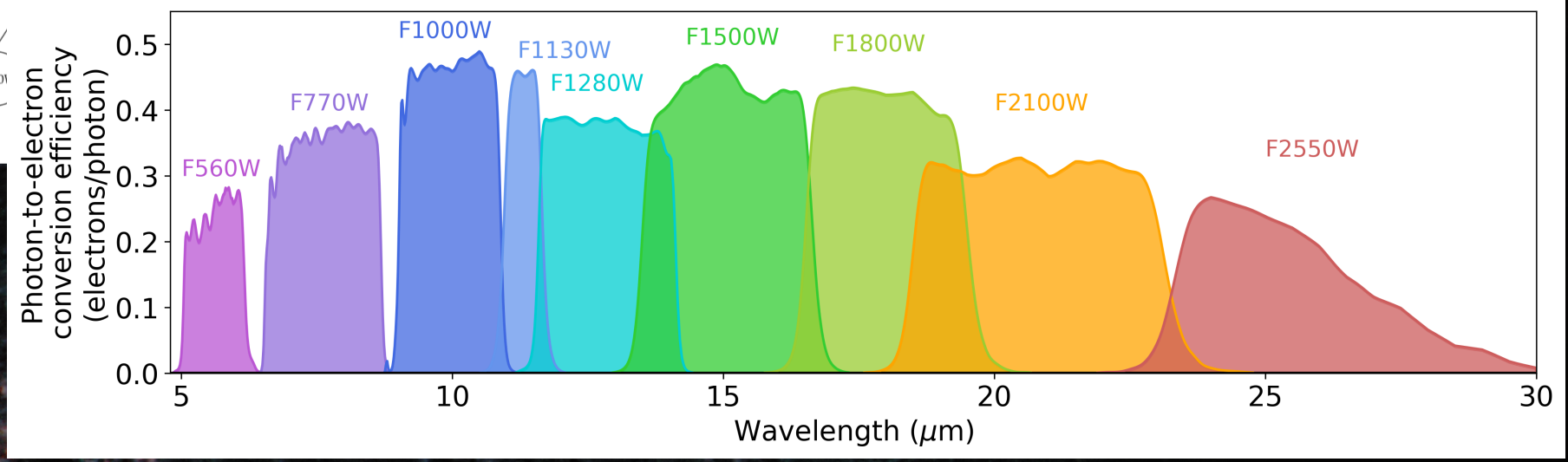

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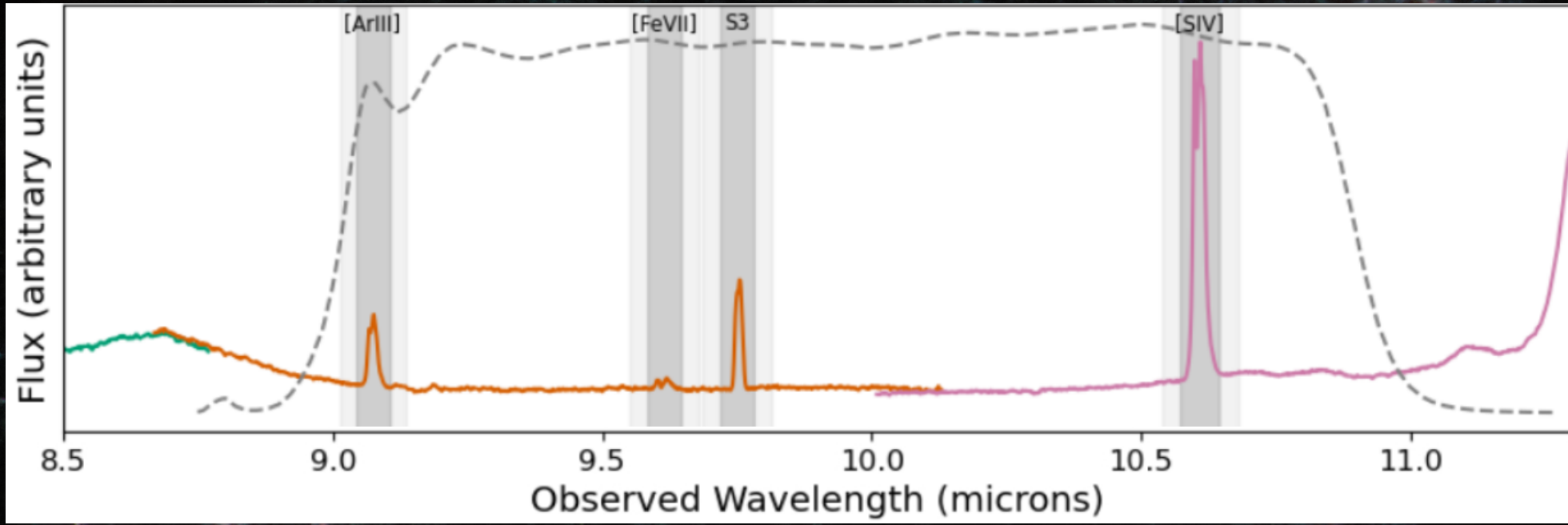

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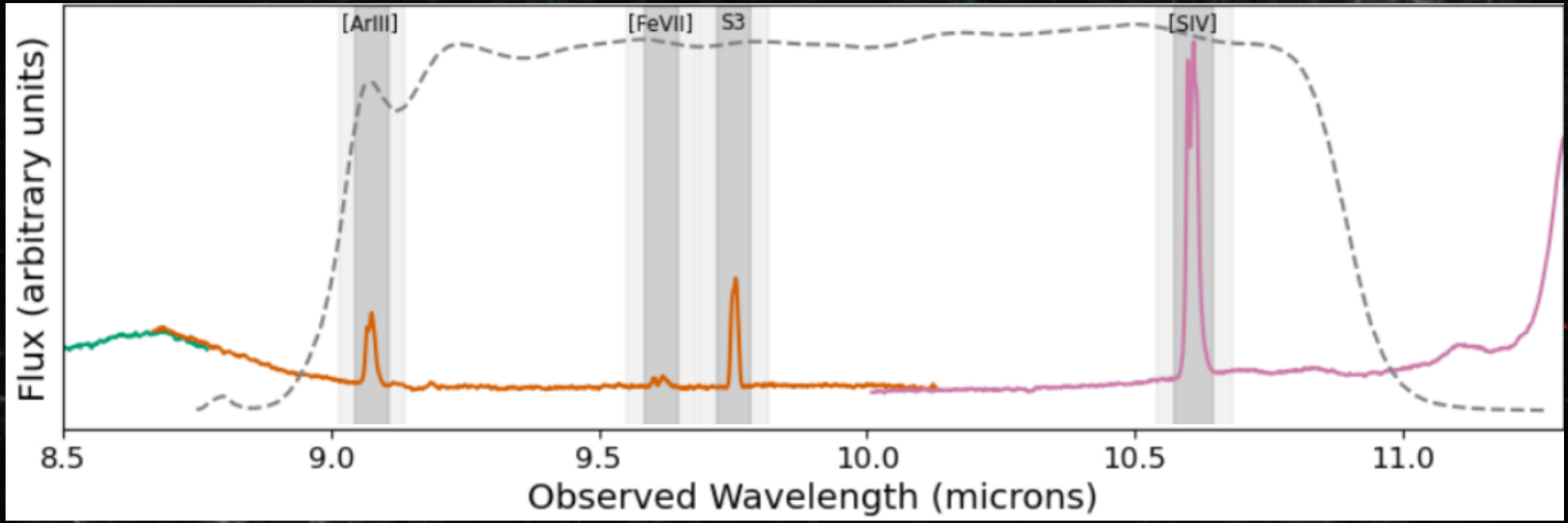
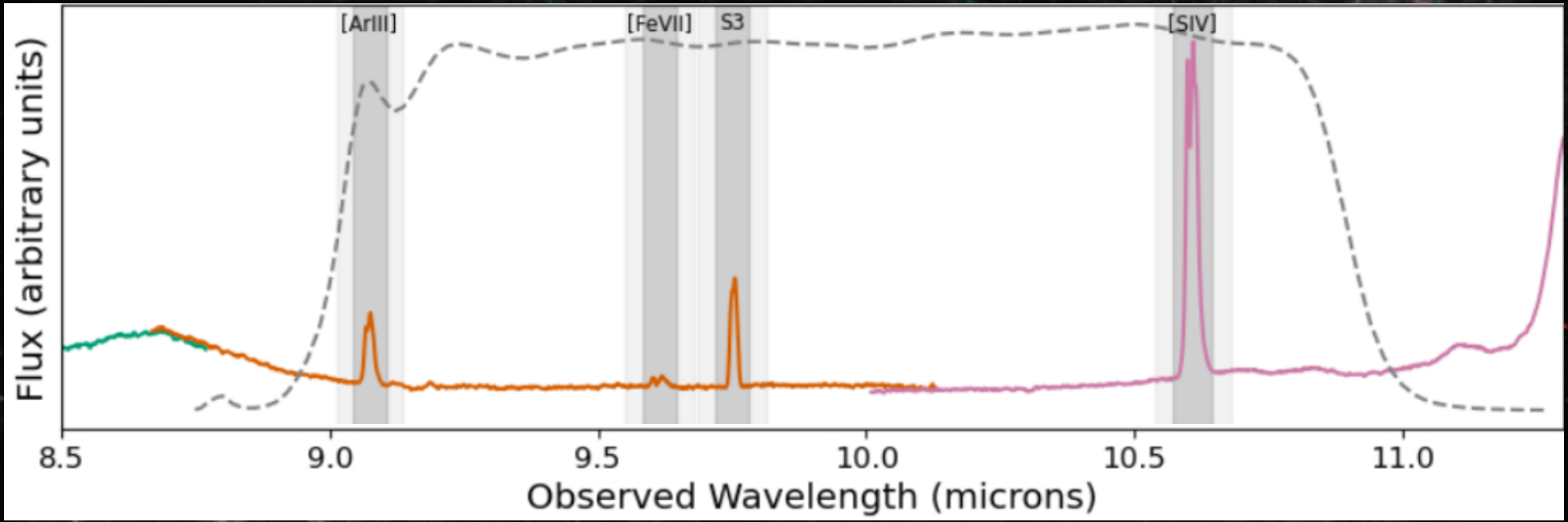


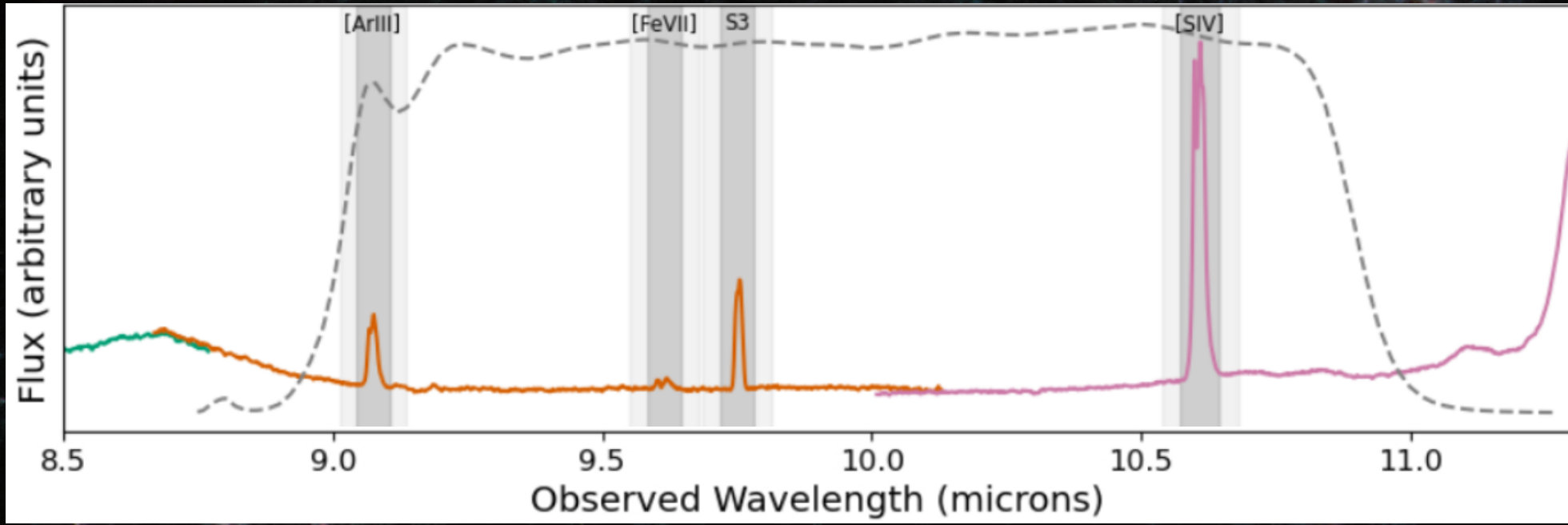
How do we fix this?

Emission line contamination...



Option 1: Integral field spectroscopy to measure directly

Emission line contamination...



Option 1: Integral field spectroscopy to measure directly

Option 2: Estimation methods using proxies from other IFS data

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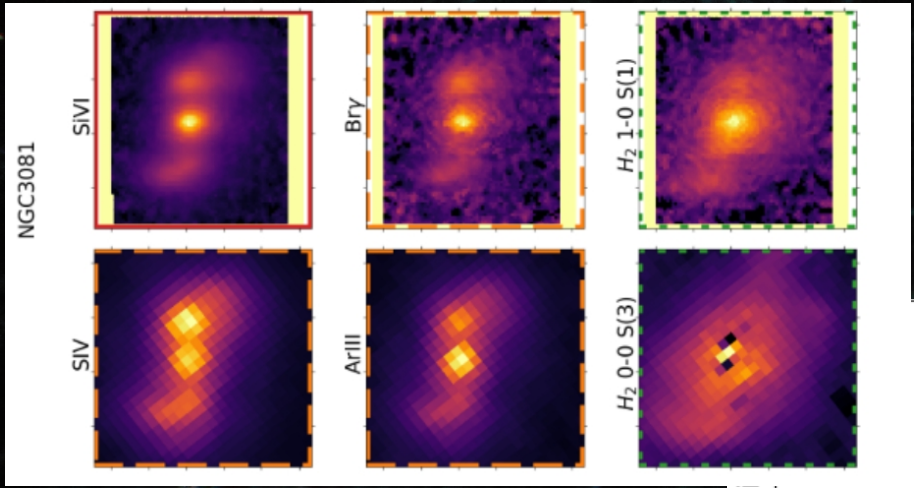

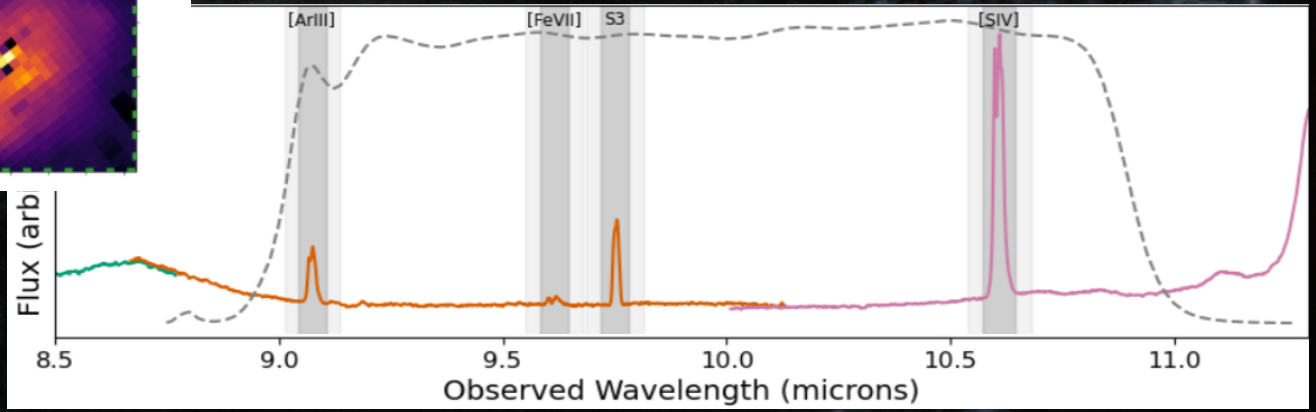

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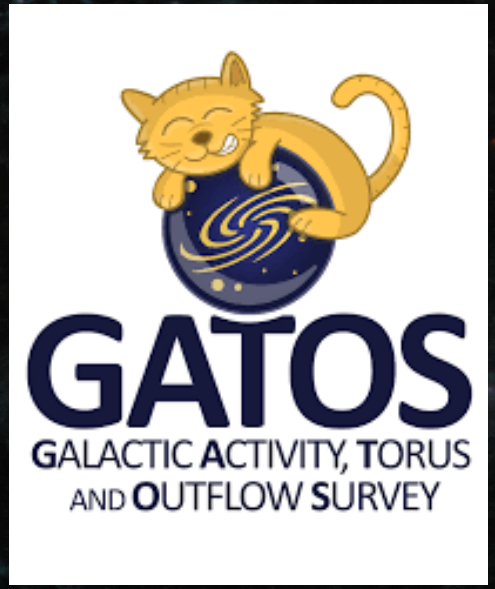
Introducing GATOS...



International collaboration of observers and modellers aiming to understand processes taking place in the nuclear regions of AGN

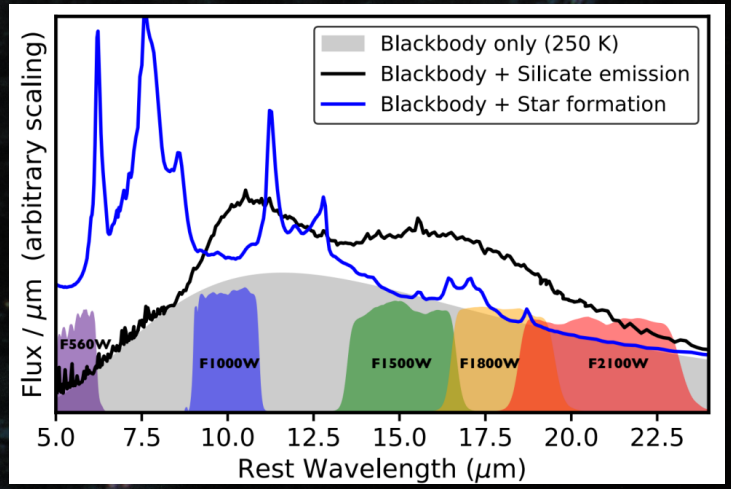
Introducing GATOS...

GATOS
GALACTIC ACTIVITY, TORUS AND OUTFLOW SURVEY

Now have data from successful observations with JWST, ALMA, SOFIA, MEGARA, and combining these with archive data from HST, SINFONI, VLA, etc

Our imaging program:

- Cycle 1 Proposal with JWST mid-infrared instrument (MIRI) (ID #2064, PI: David Rosario)
- Observed 8 Seyfert galaxies in 5 broadband filters (5, 10, 15, 18 and 21 microns)



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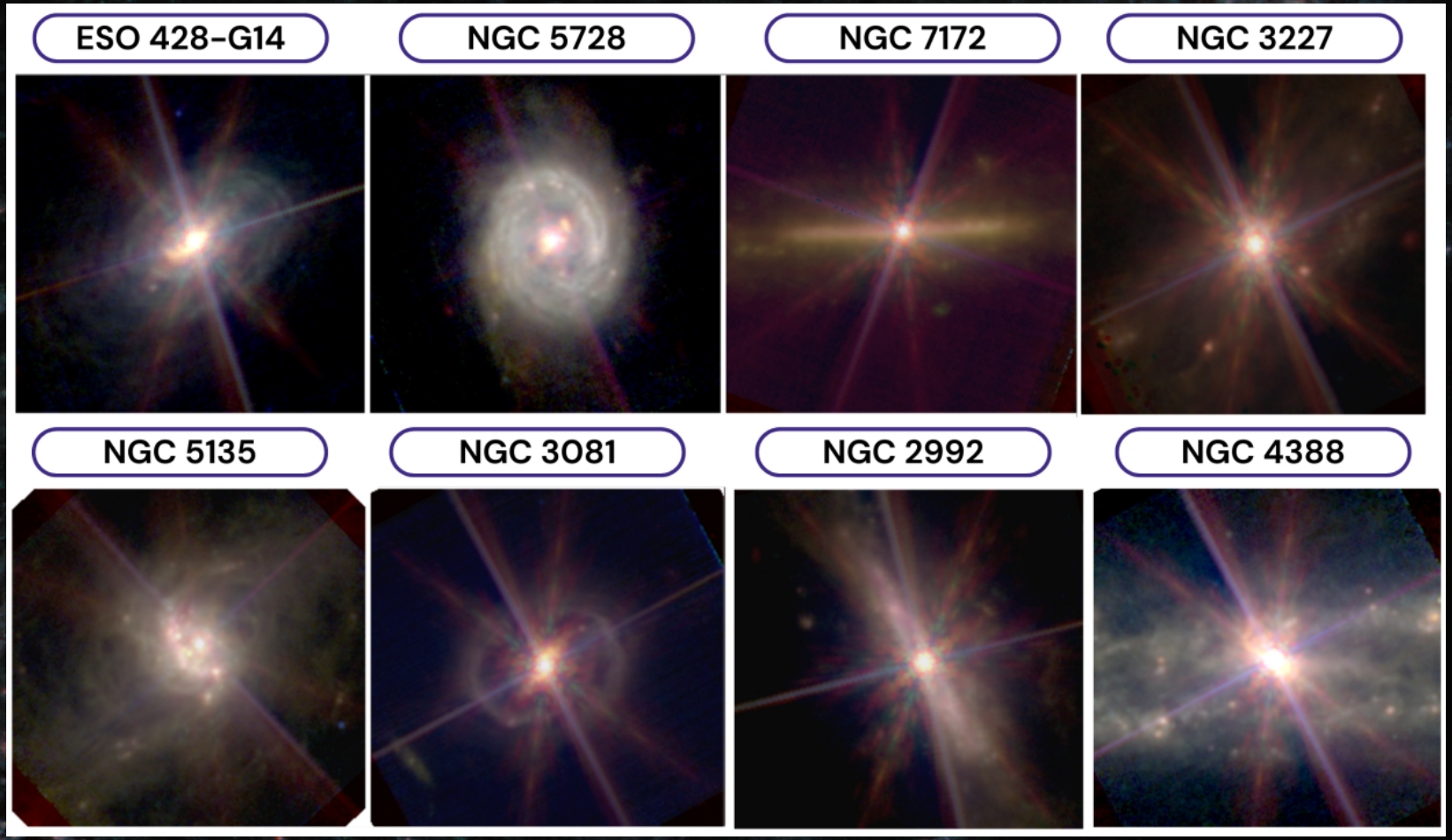
Presenting our galaxies...

GATOS
GALACTIC ACTIVITY, TORUS AND OUTFLOW SURVEY

Details of the observations in imaging sample paper, Rosario+ (in prep)

RGB composites
R: 15um
G: 10 um
B: 5.6 um



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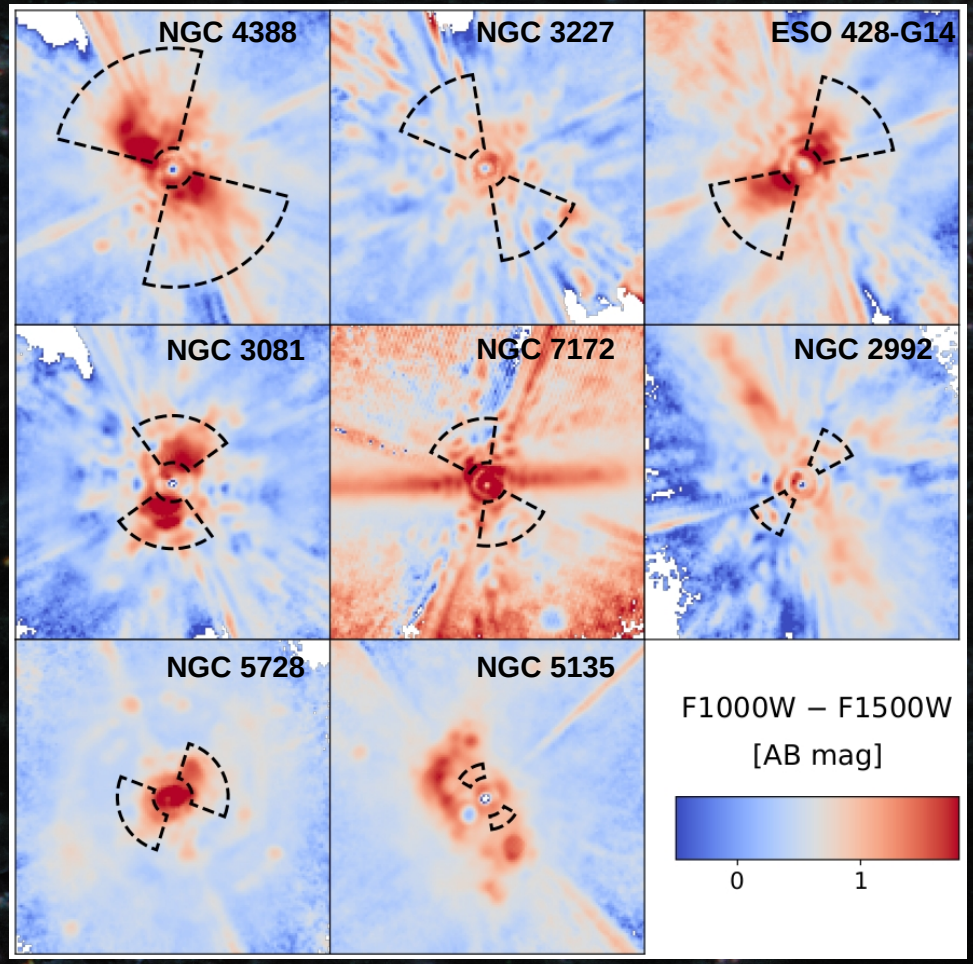
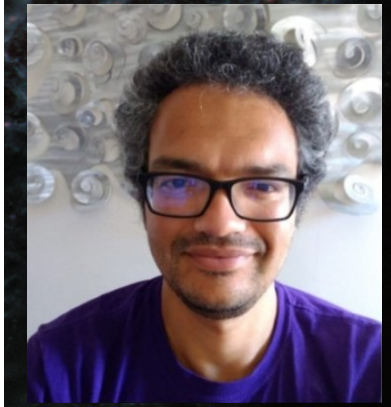
Extended MIR Emission...

Extended emission is red, and in direction of known ionisation cones



Colour plots from sample paper: Rosario+ in prep



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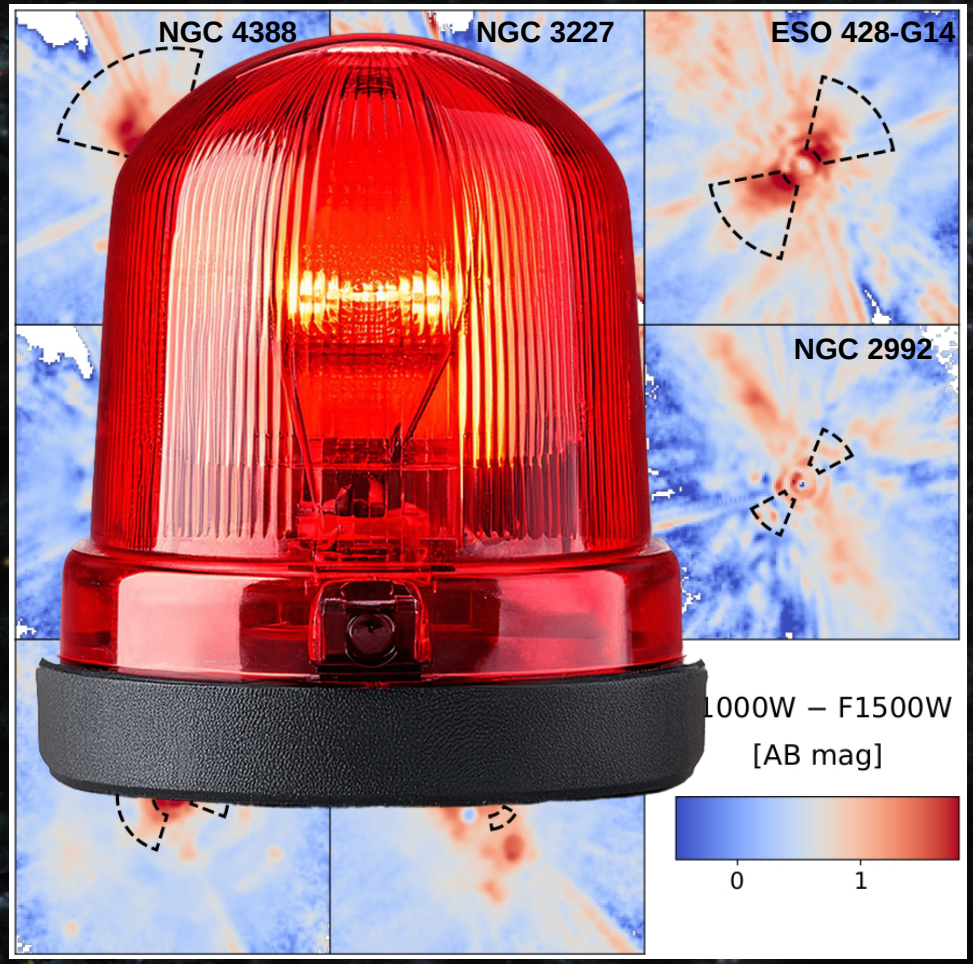

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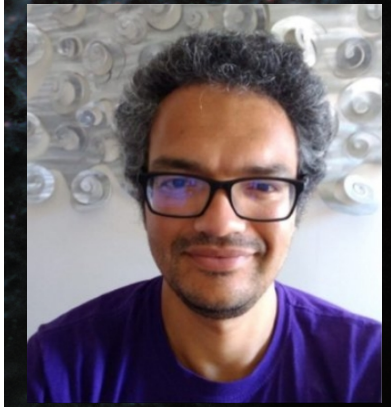


The case of ESO 428-G14...

First in-depth study of an object in the sample

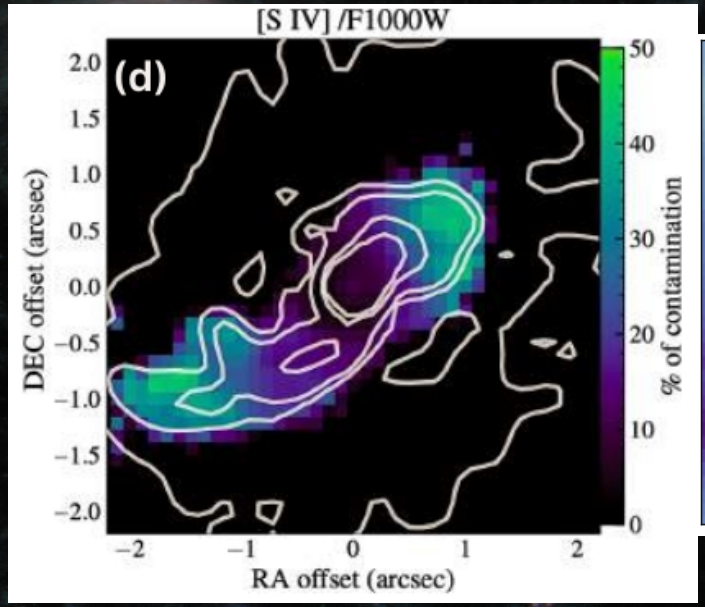
Haidar+ 2024 [arxiv:2404.16100]

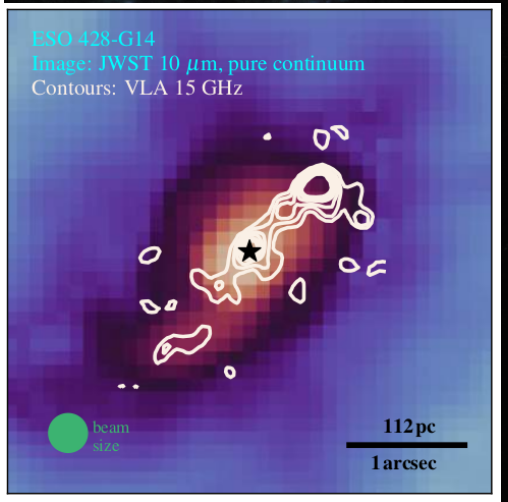
Houda Haidar, PhD student, Newcastle

Imaging doesn't allow direct quantification of emission line flux

Estimated using a mock map generated from SINFONI + Spitzer data

- [SIV] is main contaminant
- SINFONI gives spatial distribution of BrGa (similar ionisation potential to [SIV])
- Use it to trace, but scale to flux from [SIV] Spitzer



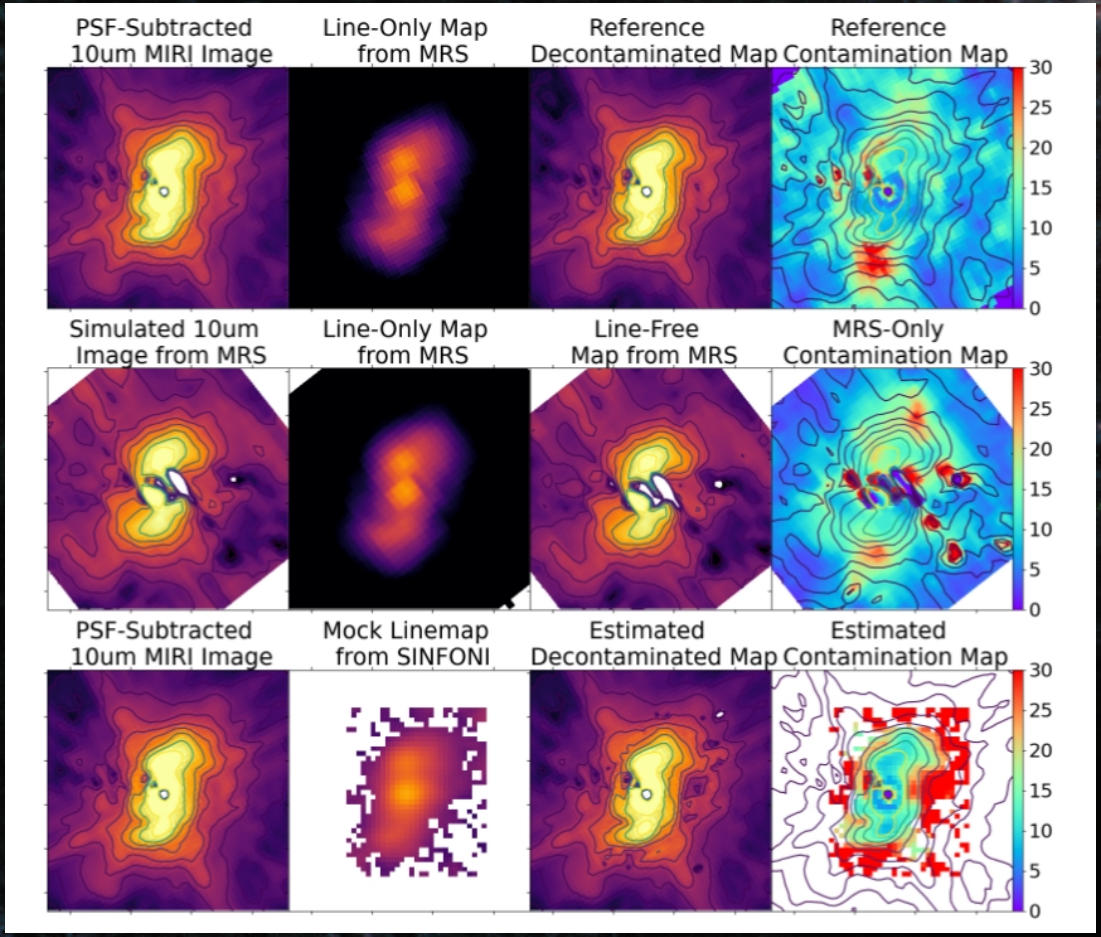


Testing methods to mitigate...

Combining JWST imaging and JWST IFU data

Using JWST IFU data only

Estimating using proxies from other wavelengths



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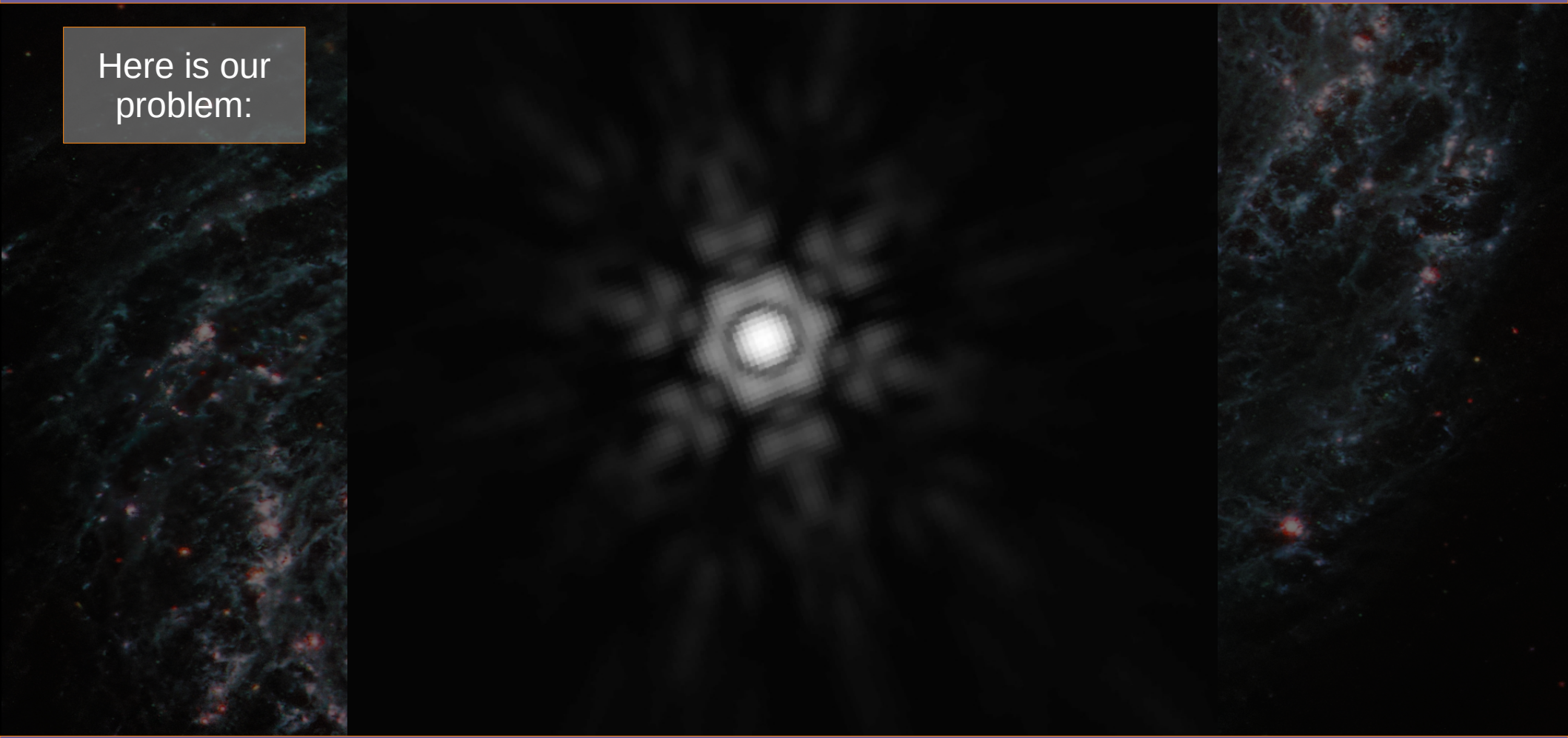
Dealing with the PSF...

Here is our problem:



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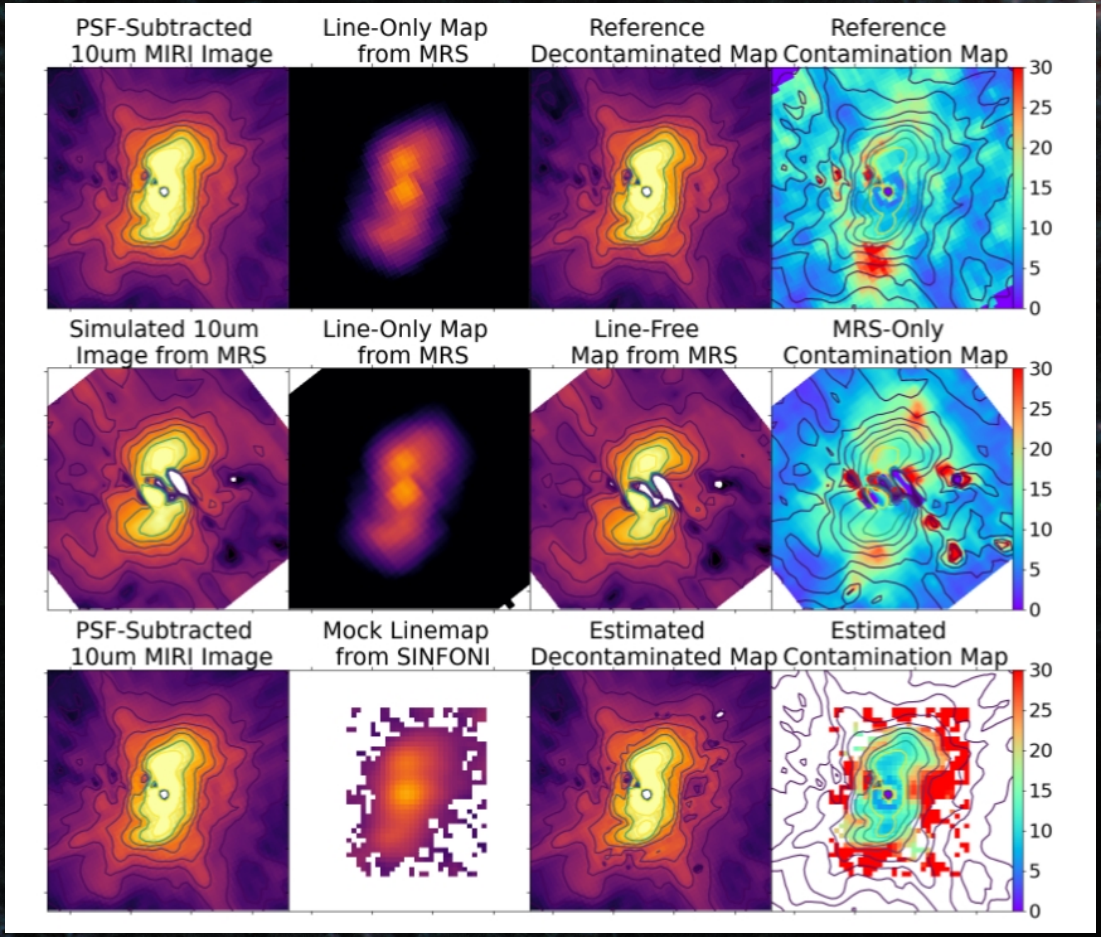

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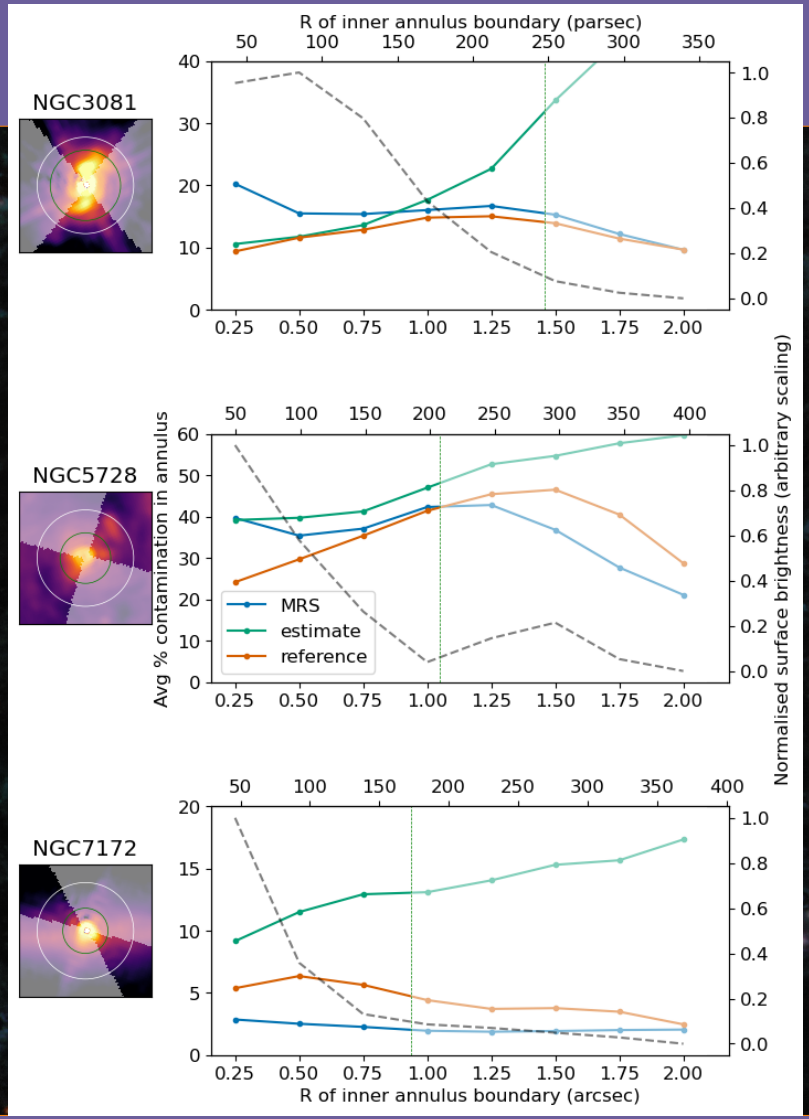
Testing methods to mitigate...

Combining JWST imaging and JWST IFU data (orange)

Using JWST IFU data only (blue)

Estimating using proxies from other wavelengths (green)



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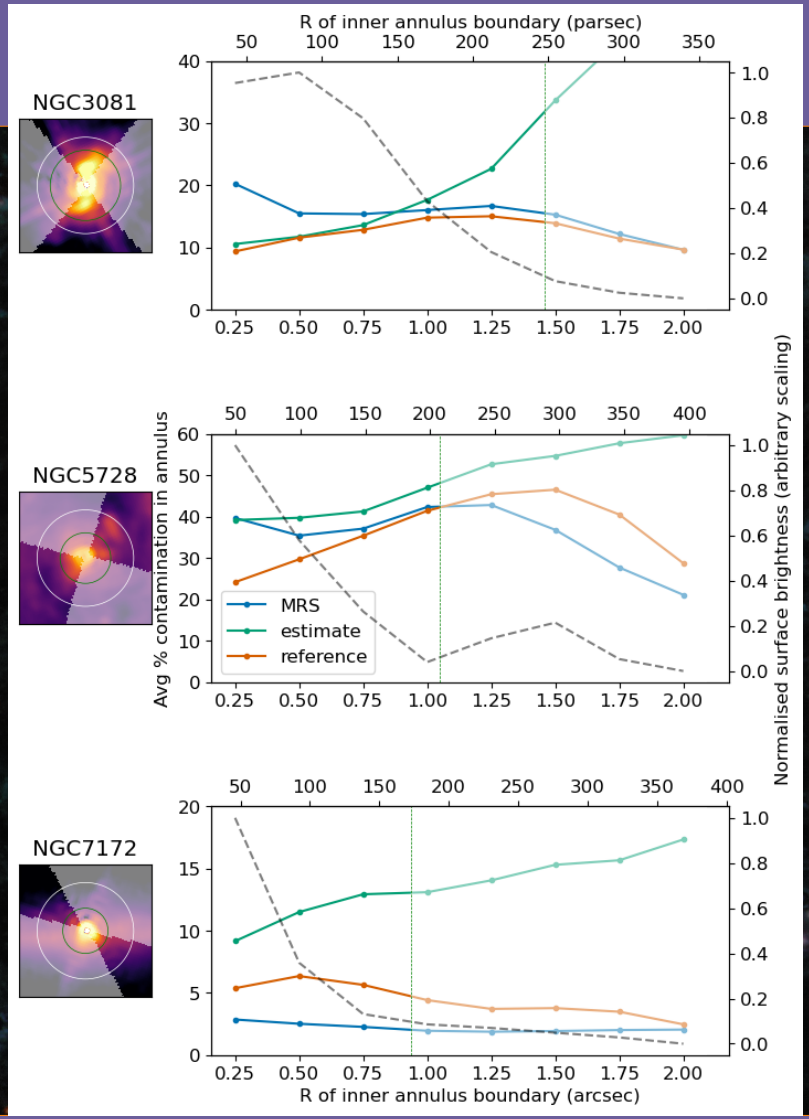

Contamination varies across objects and spatially within objects

Requires treatment case by case!

Combining imaging with spectroscopy is ideal for this

Can also use method to estimate for reasonably accurate results (5-10% overestimate

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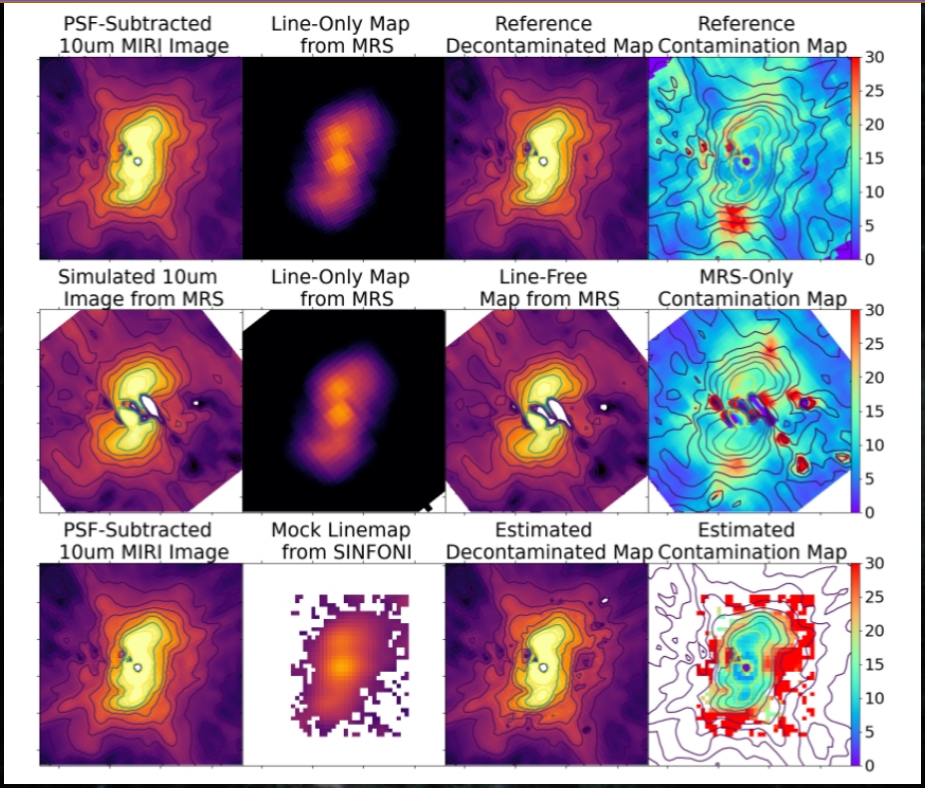
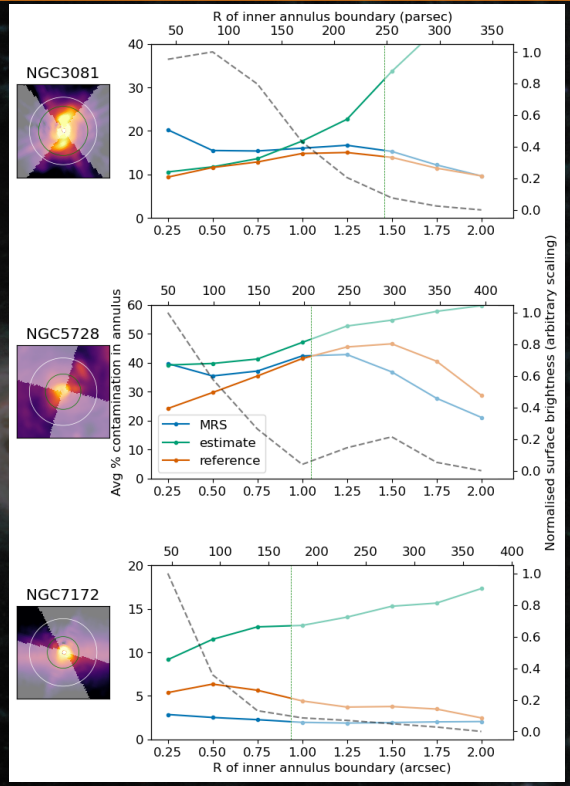
Summary





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Talk to me about AGN, dust, GATOS, JWST and emission line contamination in any broadband instrument

Steph Campbell (they/them)
steph.campbell@newcastle.ac.uk