

PAHs in NGC 628 **with JWST**

with
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Polycyclic Aromatic Hydrocarbons: Why do we care?

🔥 Heating & energy balance of ISM

📝 Potential tracers for key science (dust, gas mass, star formation)

🧪 Influence chemical reaction rates

→ **Charge** and **size** of PAHs matter!

Mid-IR emission from vibrational modes depends on **charge & size**

- How convenient!
- Use ratios of emission in different bands to deduce physical state of PAHs

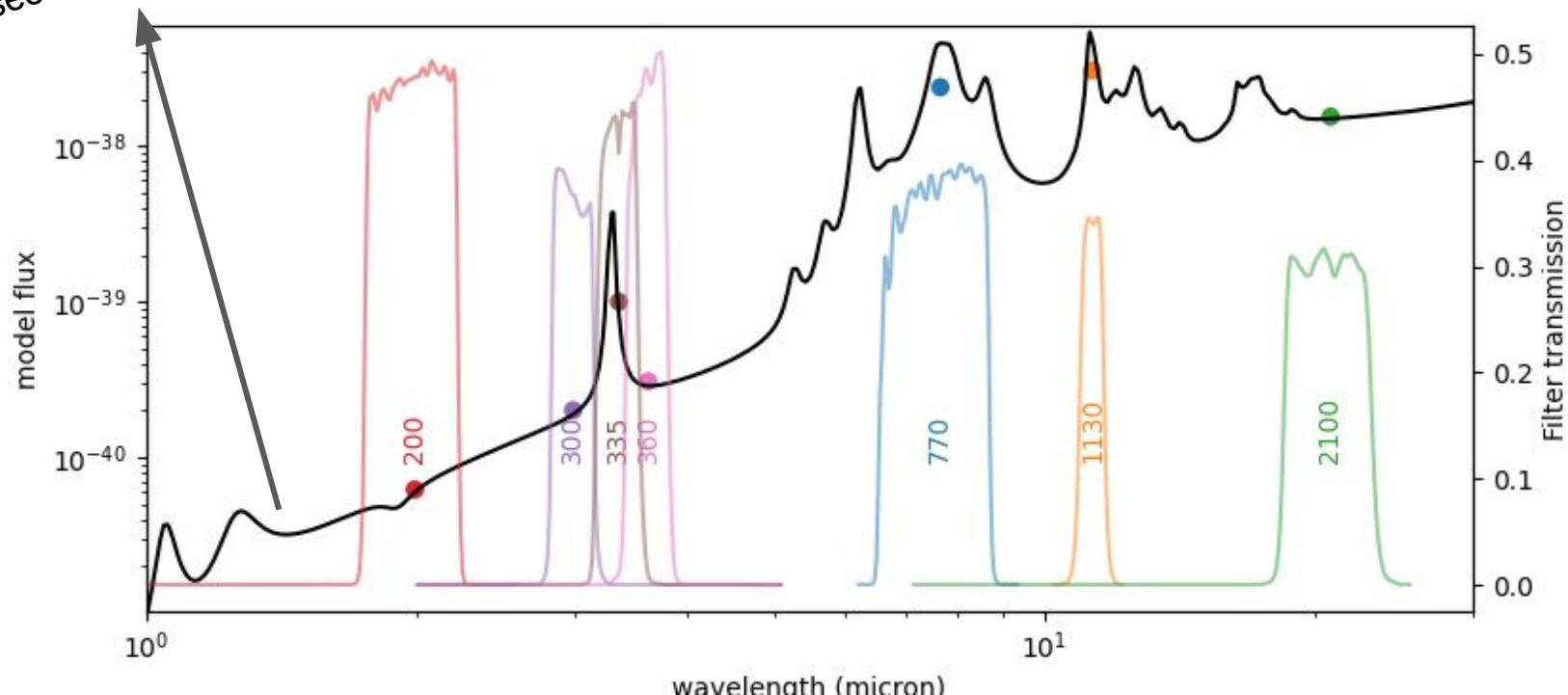


PAH feature photometry with JWST

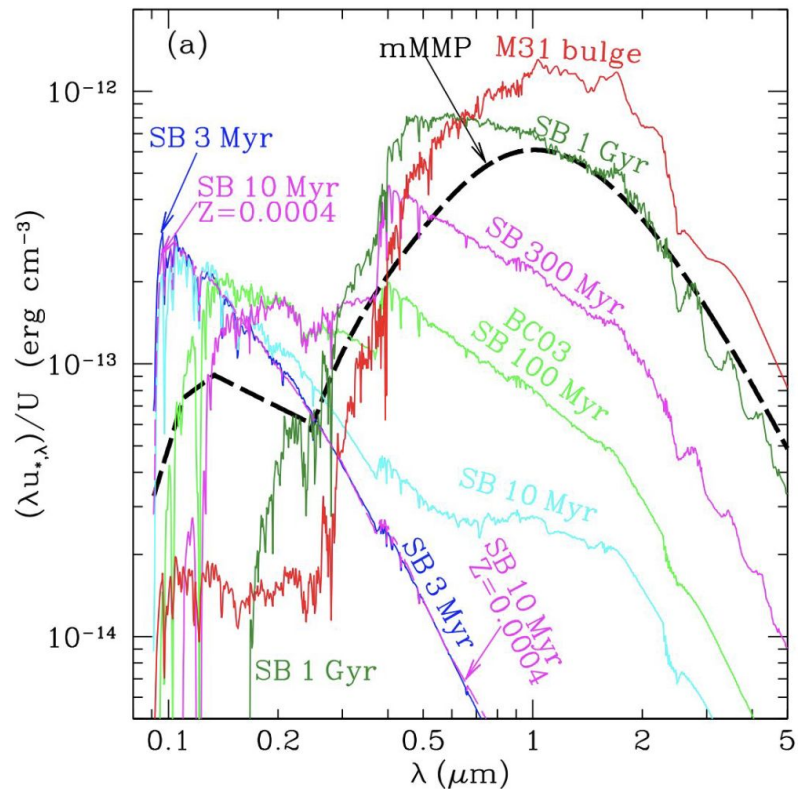
Curve from Draine
PAH model
(see next slide)

NIRCam medium bands
3.3 feature + stellar continuum

MIRI wide bands
7.7 and 11.3 features
21 micron dust continuum

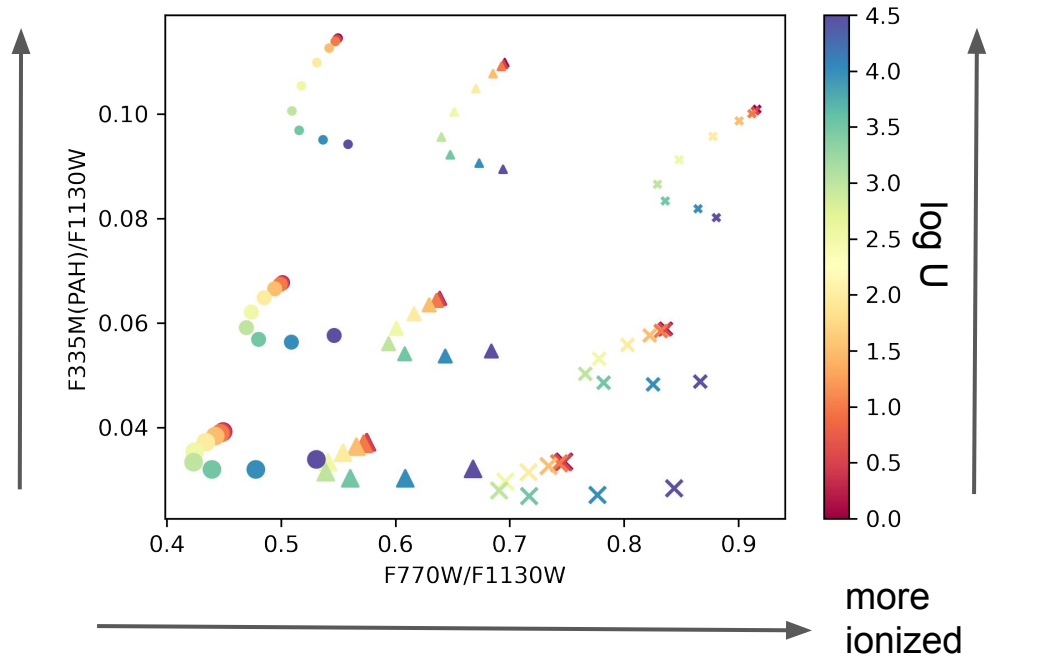


Predictions from Draine+2021 models

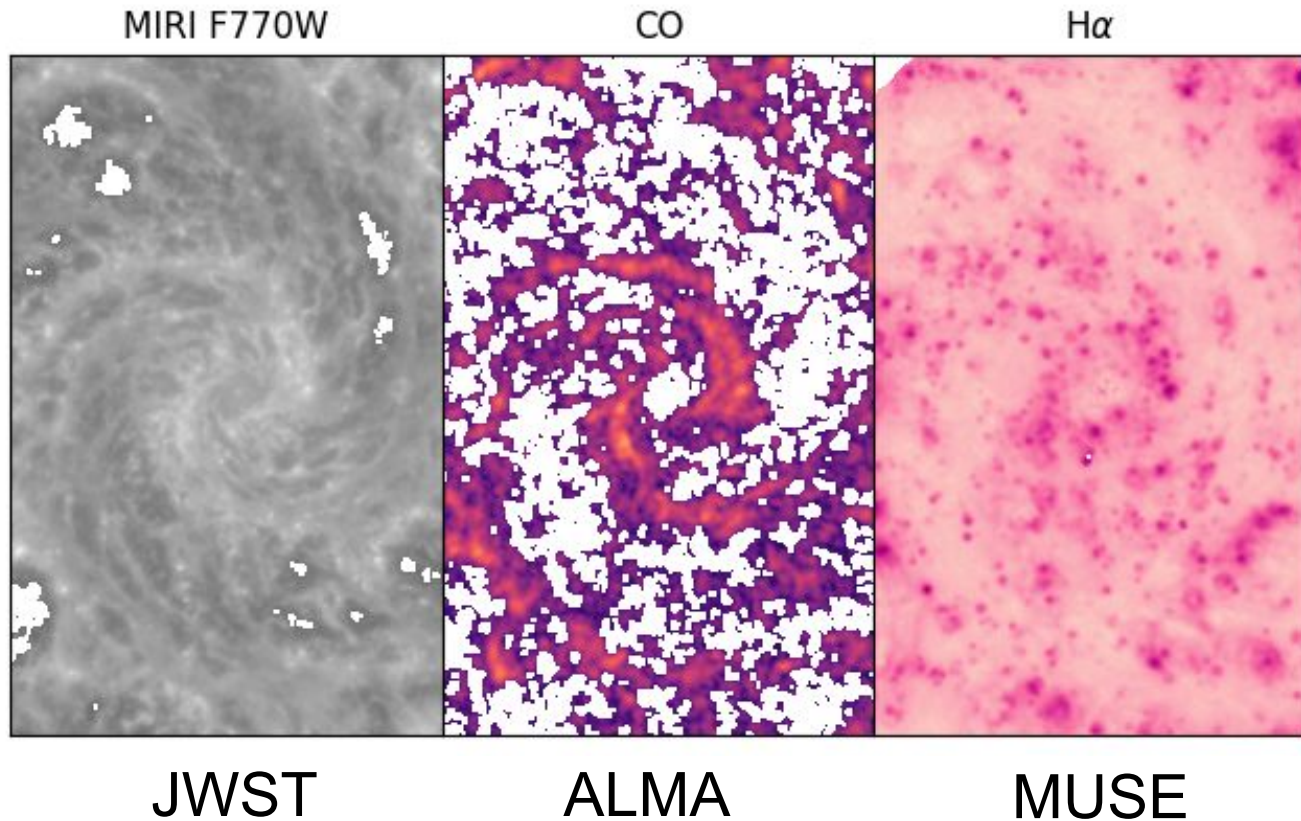


smaller
sizes

mMMP radiation field (Draine+2011)



NGC 628 Data: PHANGS JWST + Ancillary



All data
reprojected on
the same grid



Compare PAH
property tracers
with environment

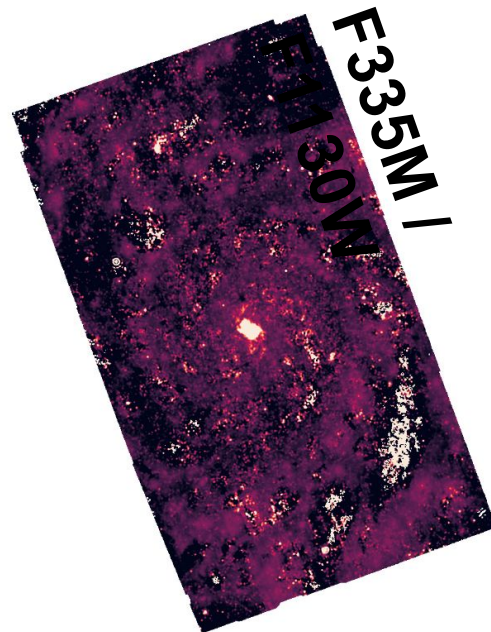
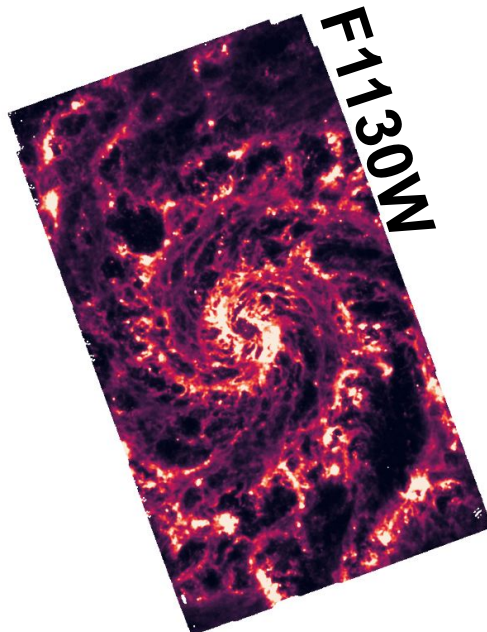
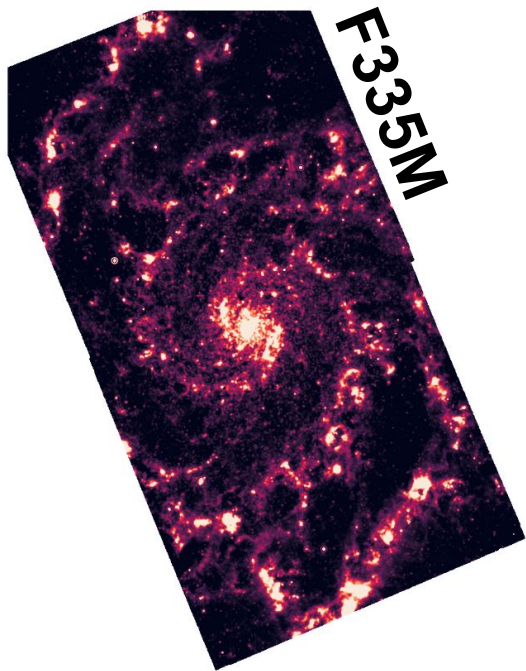


Projects!



Tracing PAH Grain Growth/Destruction

Christina Lindberg + Elias Oakes

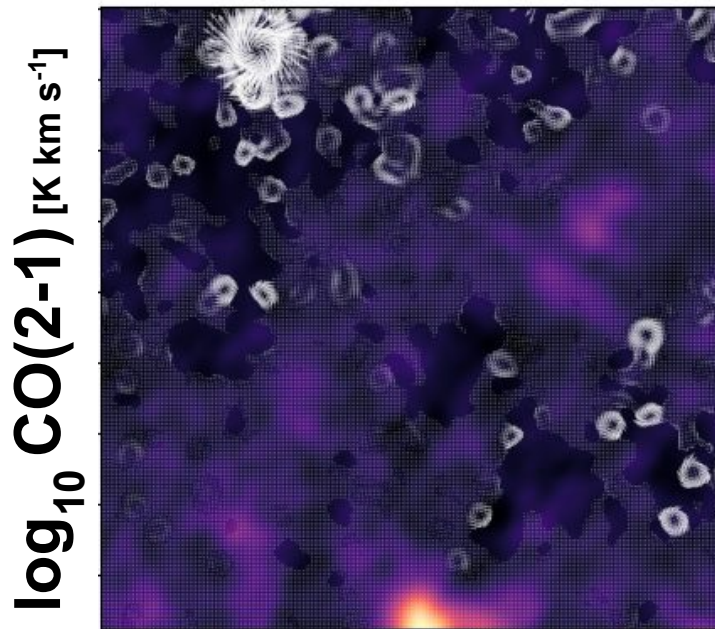
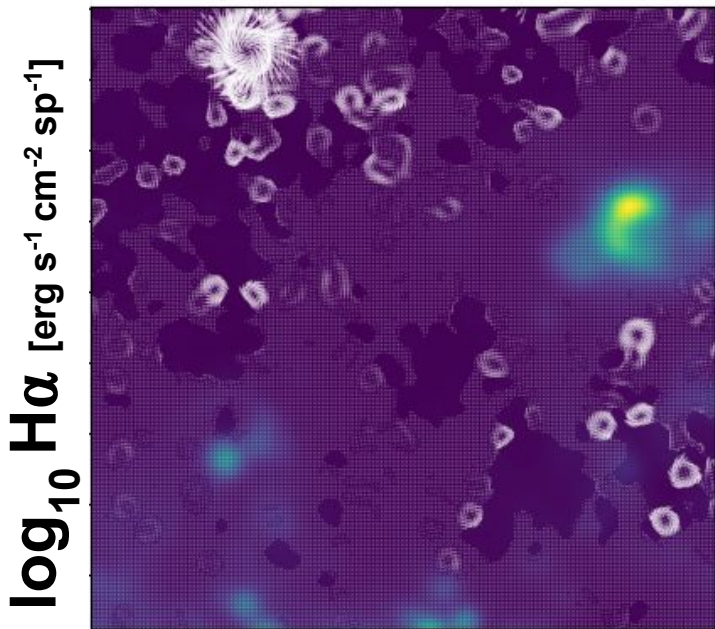


In a constant ISRF, F335M/F1130W measures grain size.



Tracing PAH Grain Growth/Destruction

Christina Lindberg + Elias Oakes

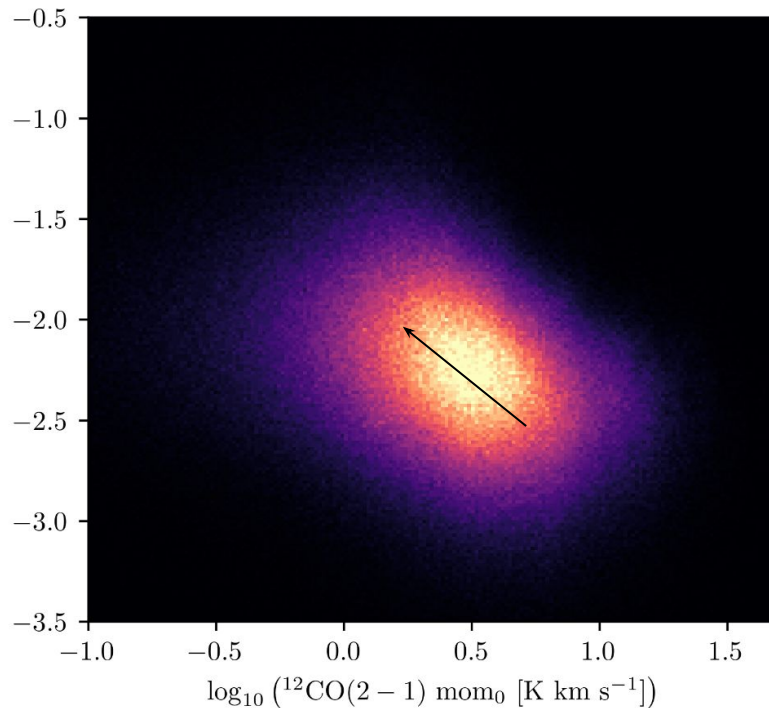
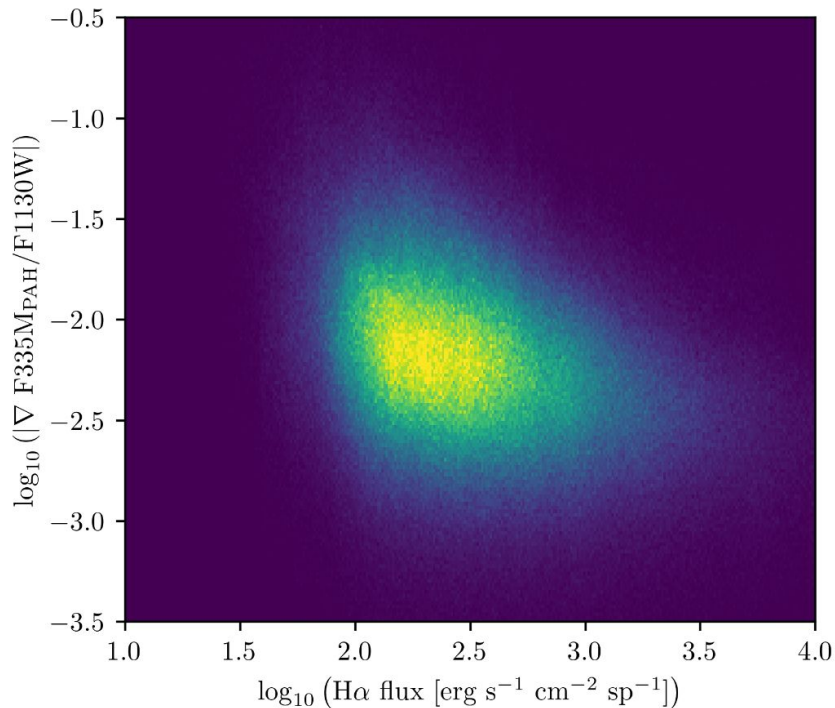


Can calculate gradient of F335M/F1130W across galaxy.



Tracing PAH Grain Growth/Destruction

Christina Lindberg + Elias Oakes



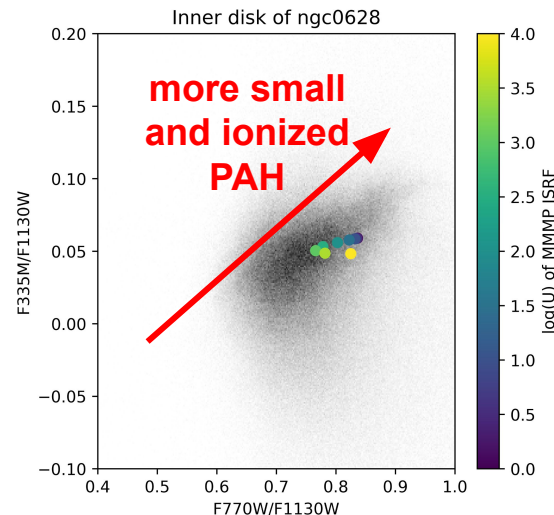
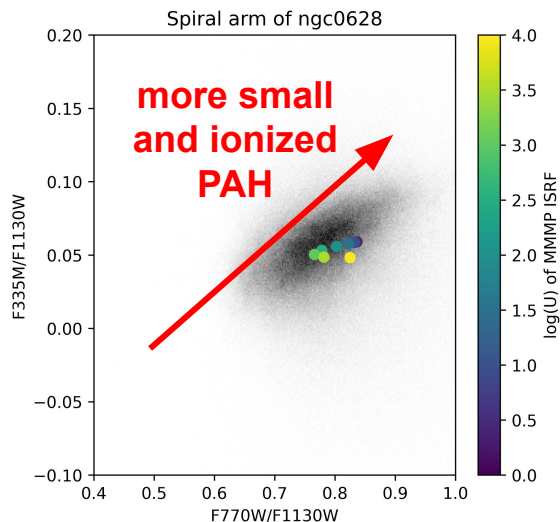
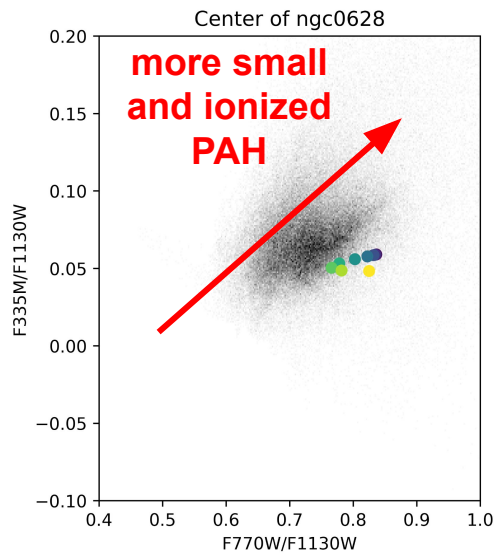
Seems to be some sort of variation with H α and CO...



PAH size vs PAH ionization vs Draine21 model

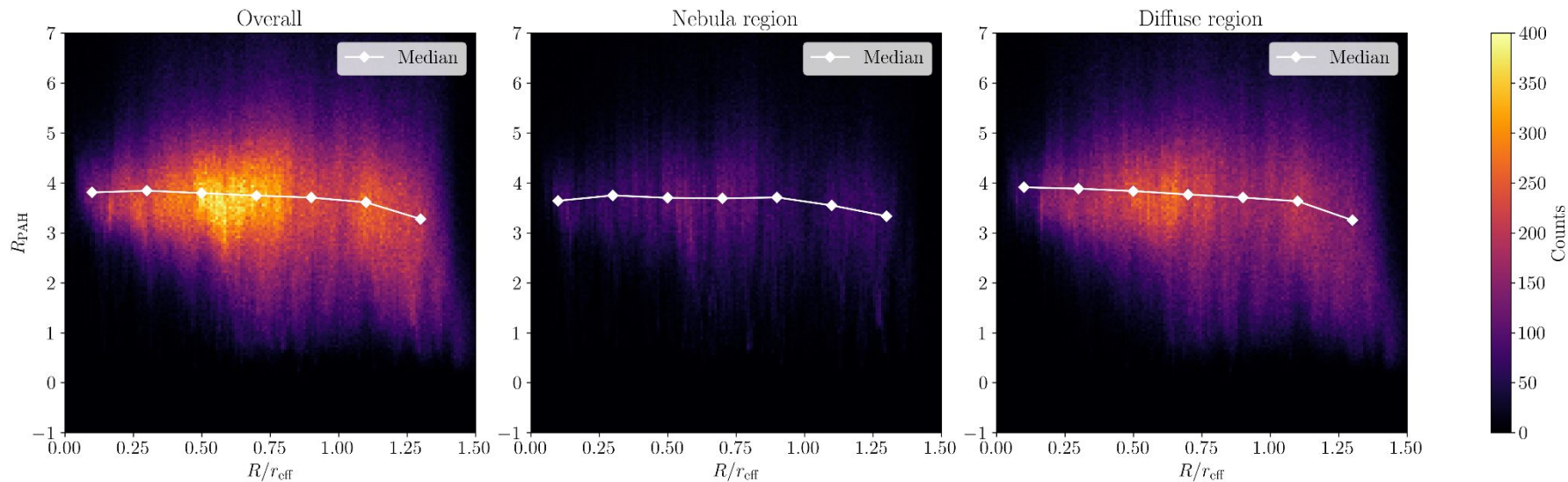
Raphael Maris

- PAH size distribution = $F335M/F1130W$ and PAH ionization fraction = $F770W/F1130W$
- Small PAH look more ionized in ngc0628, when intensity of ISRF increase...



PAH Fraction

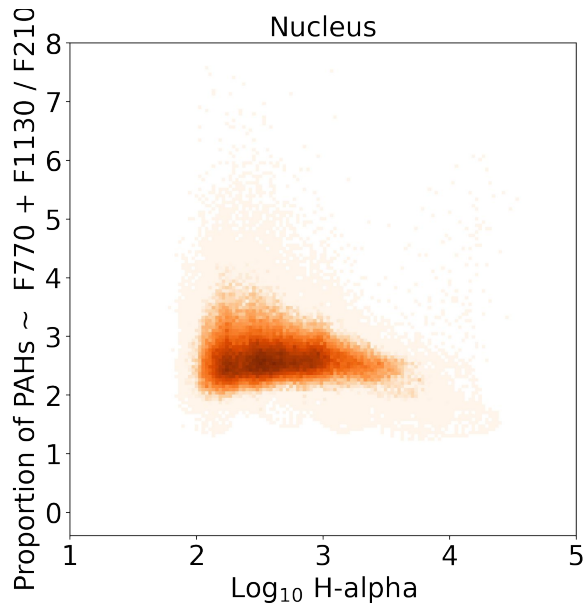
Proxy for PAH fraction: $R_{\text{PAH}} = (F770W + F1130W)/F2100W$



Overall constant PAH fraction across the galaxy.

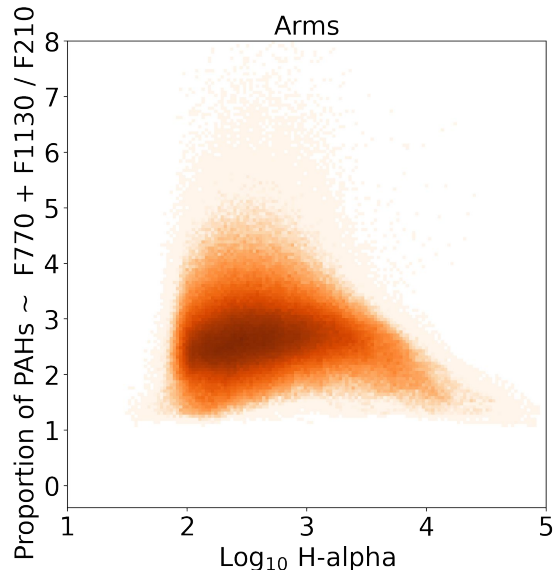
Proportion of PAHs with H α in Different Regions

Tanita Ramburuth-Hurt



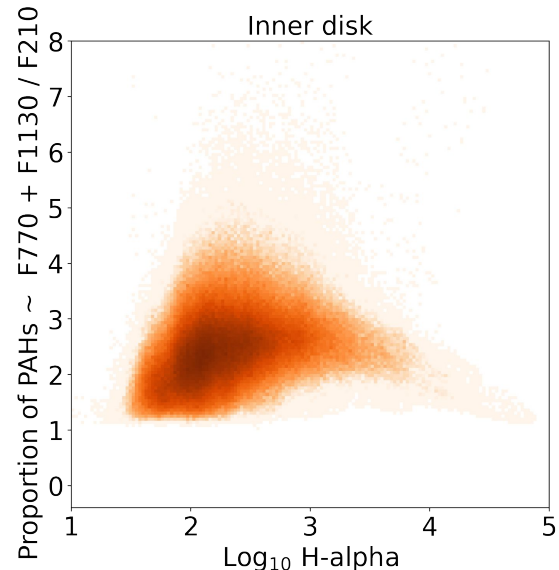
Flat

- Homogeneous and stable



U shape (maybe?)

- At higher H- α , there could be some PAH destruction

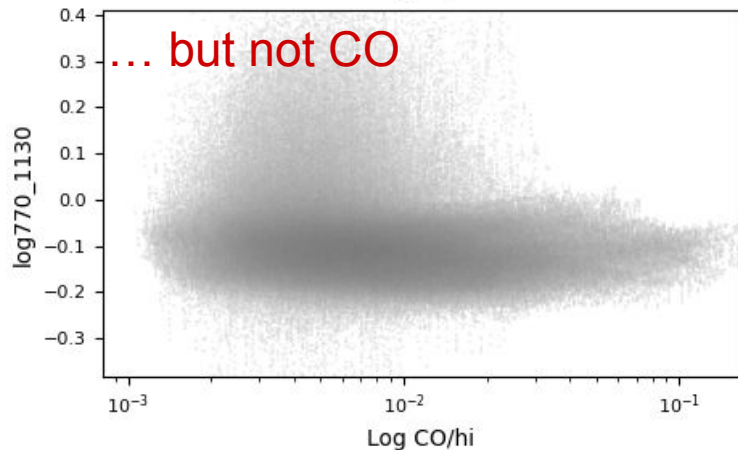
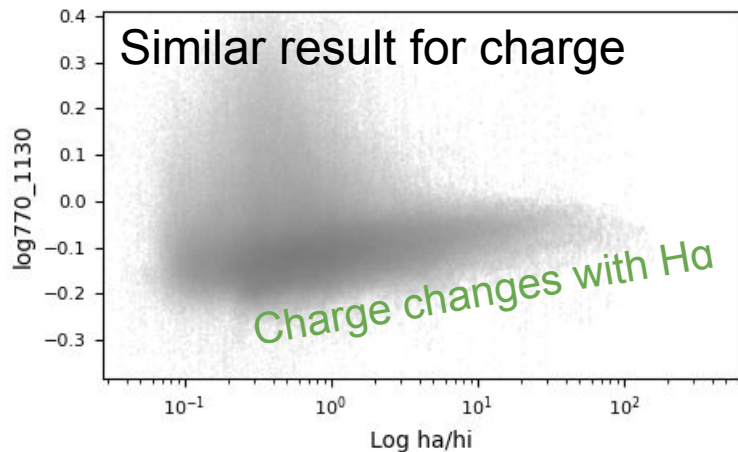


No tail

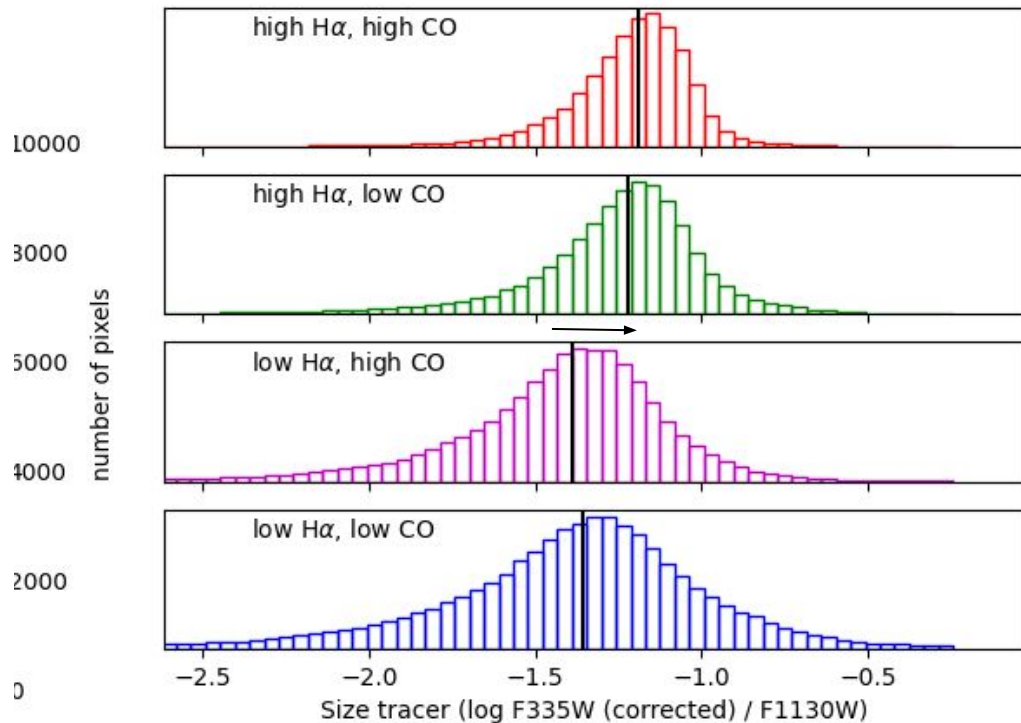
- At low H- α , there could be more diffuse gas
- In the absence of star formation, more gas => more PAH emission

Behavior of PAH tracers vs molecular gas

Dries Van De Putte



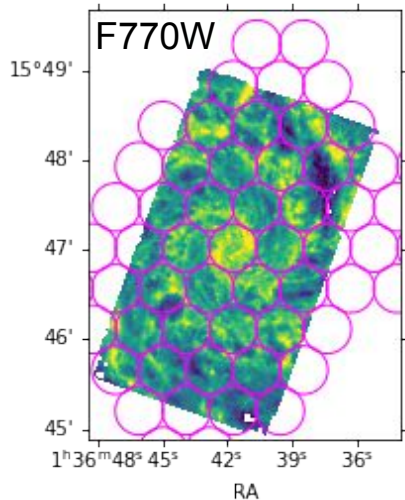
High H α \rightarrow ionizing radiation causes smaller or hotter PAHs according to tracer



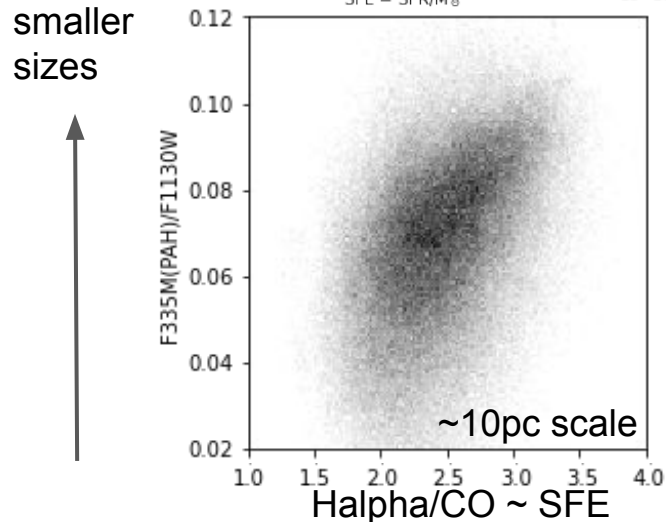
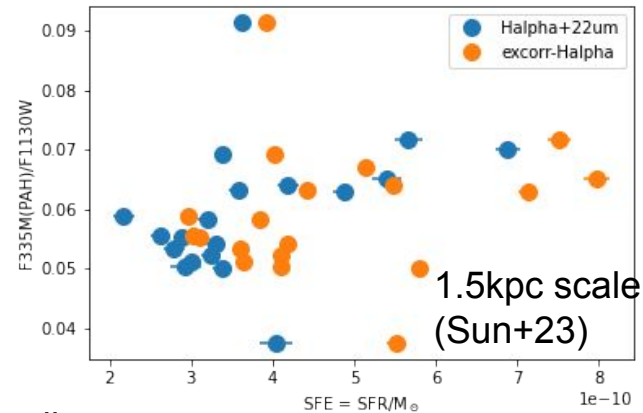
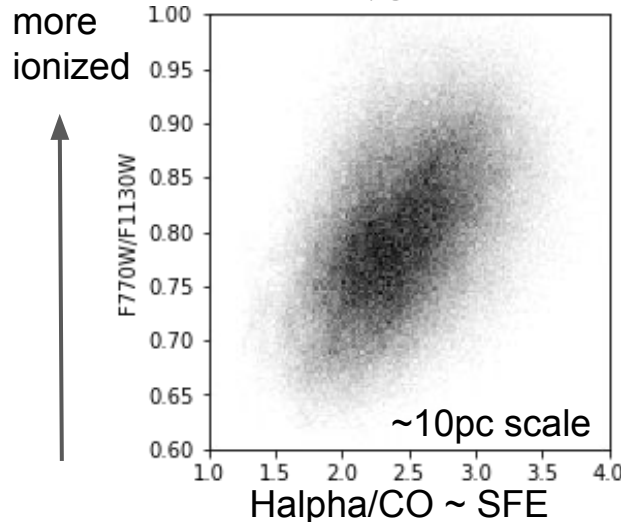
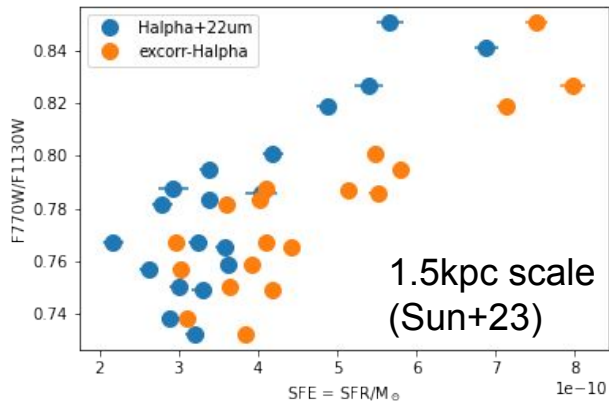
No meaningful changes as function of CO

Grain Property vs. Star Formation Efficiency

Yiqing Song



- More ionized grains in regions with higher SFE at both kpc and 10pc scales;
- More smaller grains in regions with higher SFE? Trend unclear.





**Thanks
Karin and
Jessica!**