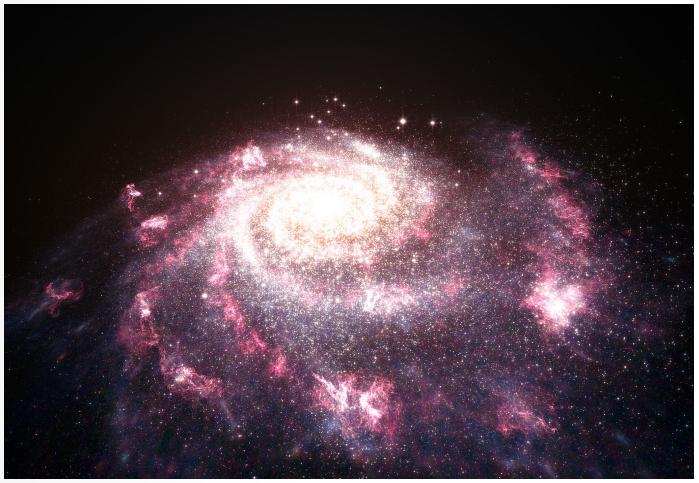
Black hole trumps star formation

PAH excitation within the central 200 pc around AGN

Jens Juel Jensen, Dark Cosmology Centre, Niels Bohr Institute

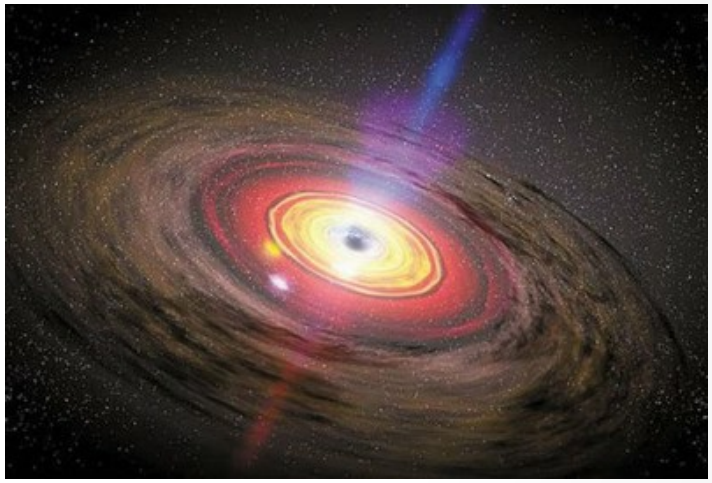
With S.F. Hönig, S. Rakshit, A. Alonso-Herrero, D. Asmus, P. Gandhi, M. Kishimoto, A. Smette, K.R.W. Tristram.

AGN activity and star formation



Star formation

vs.

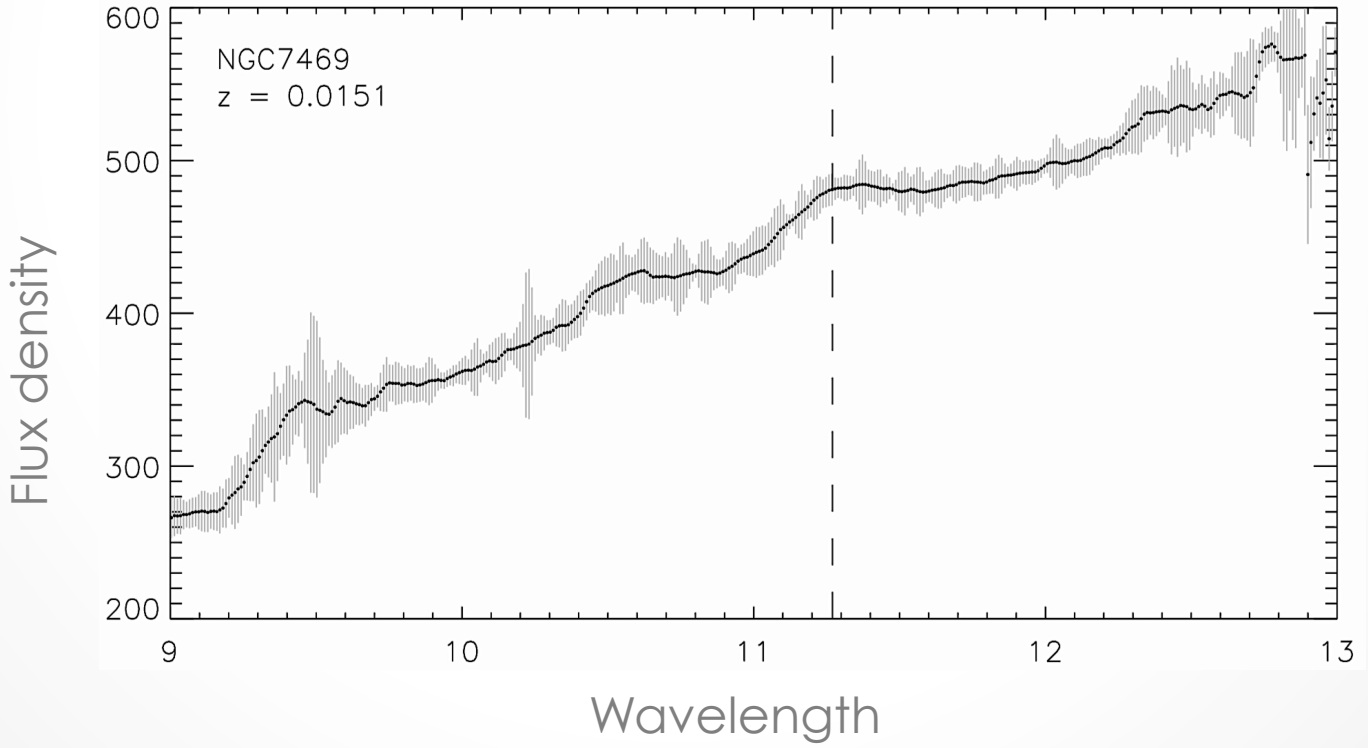


Active Galactic Nuclei

- Mid-IR PAH features as star formation tracers in AGN?

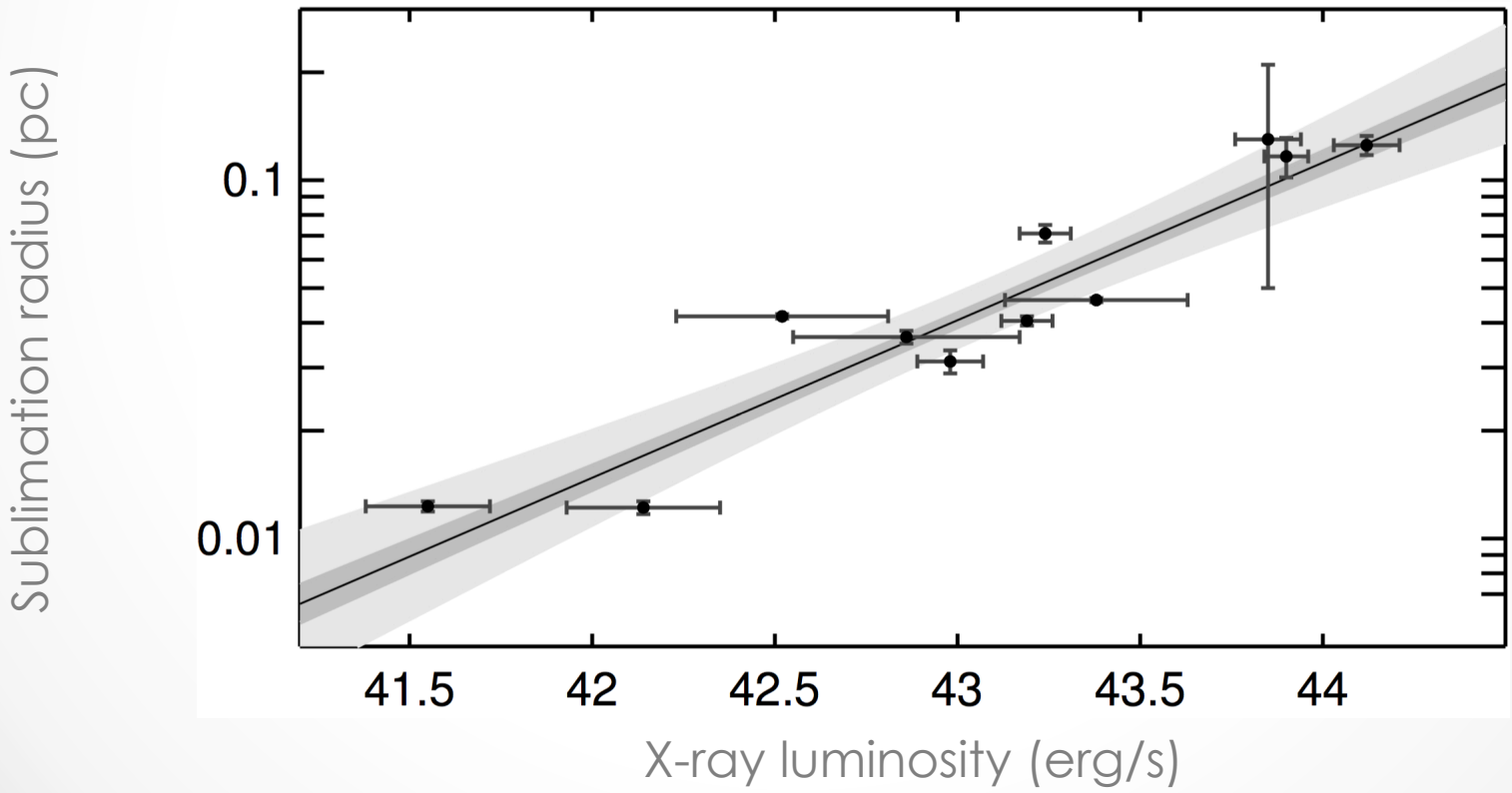
Tracing PAH features in nearby AGN

- Mid-IR spectra of 28 nearby AGN
- Extract 11.3 micron PAH feature as function of radius



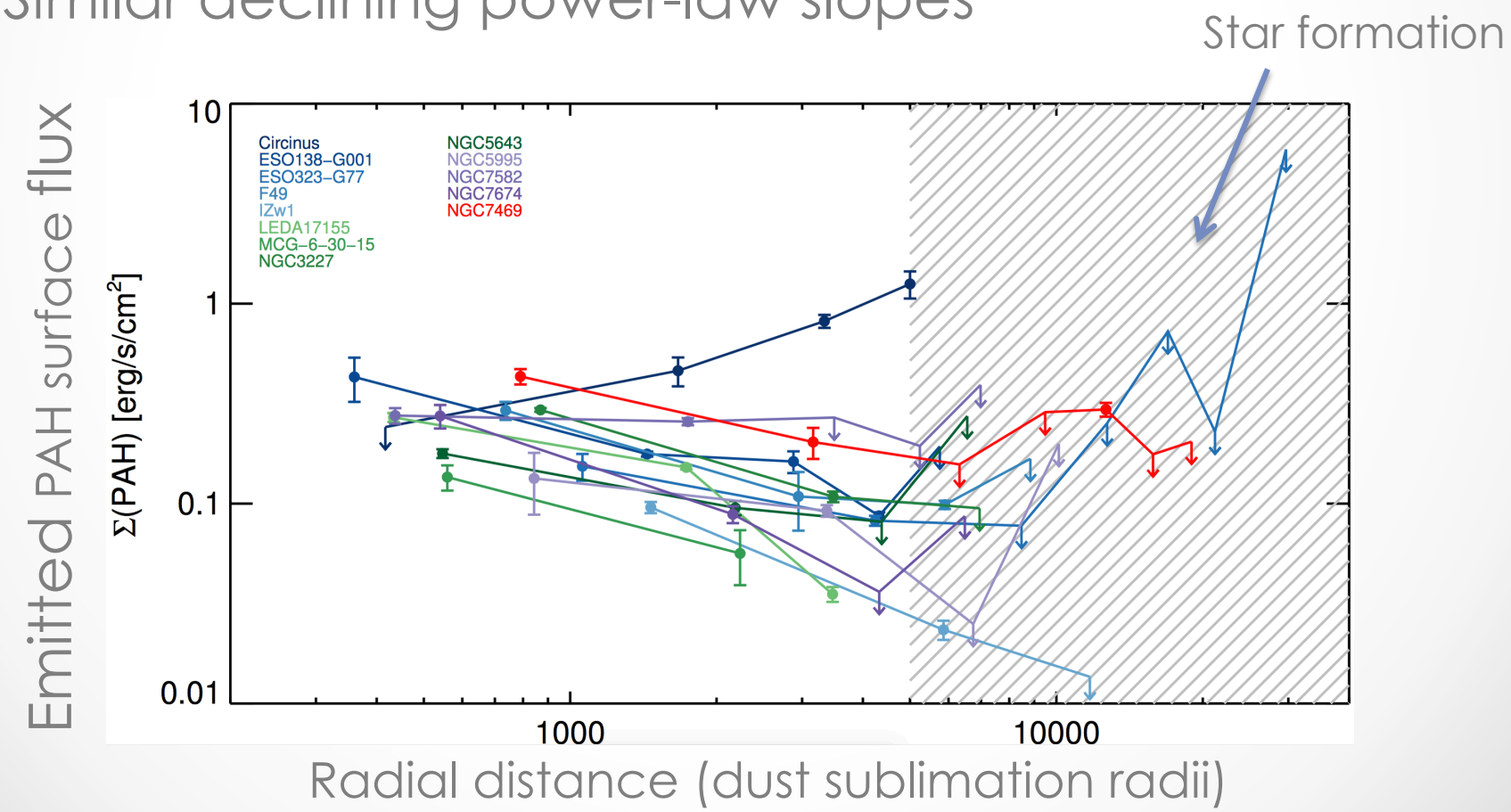
Normalizing the observations

Goal: Compare ratio of PAH to incident AGN emission



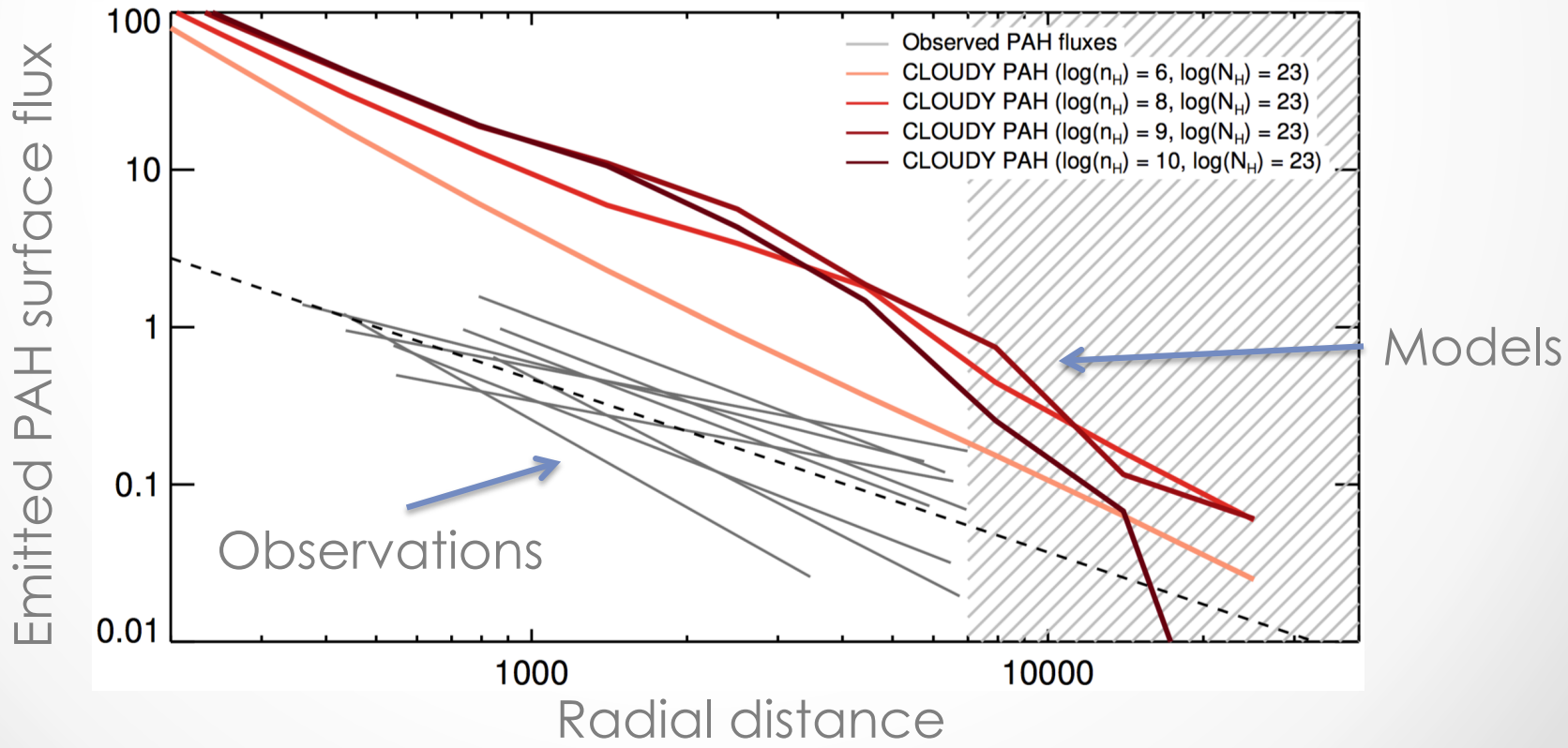
Radial dependence of PAH features in AGN

- Similar emitted PAH fluxes
- Similar declining power-law slopes



Comparison with models

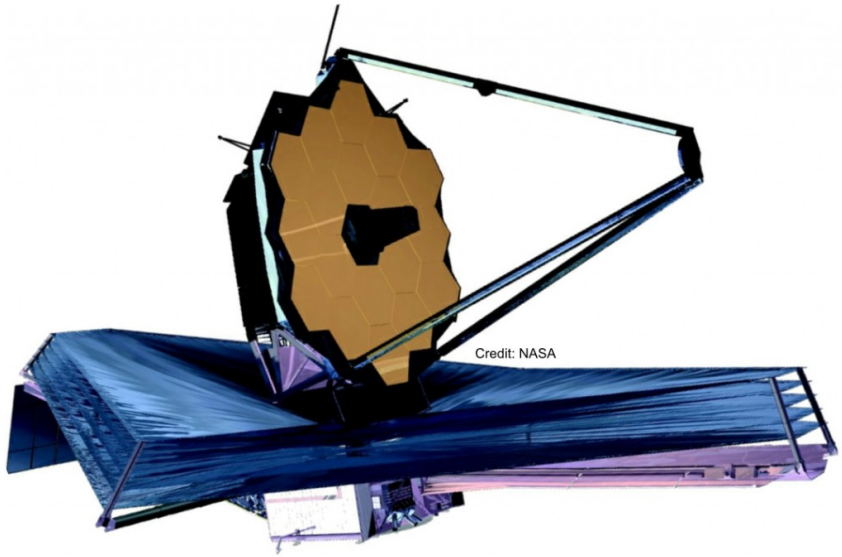
- Steeper slopes -> star formation?
- Stronger PAH emission -> covering factor?



Nuclear star clusters?

- NCS present in all AGN?
- NCS cannot account for total PAH emission

The future with JWST



- With JWST/MIRI we gain:
  - Better wavelength coverage -> more PAH features
  - Higher spectral resolution -> better extraction of PAH features
  - Higher sensitivity -> better data and exploration of non-detections

Conclusions

- Map the radial dependence of the 11.3 micron PAH feature in 28 nearby AGN. In those AGN where the feature is detected, we find:
  - Strength and radial decline of PAH feature generally agree within 5000 sublimation radii, pointing to a common origin of PAH excitation, most likely the AGN itself
  - Slope in AGN CLOUDY models roughly reproduces observations
  - Our results strongly indicate that the AGN contributes to excite the PAH features and thereby questions the usefulness of PAH features as tracers of star formation in the vicinity of AGN
  - JWST/MIRI will do much better!