

AGN, hosts, fuelling and obscuration

- Background
- HATLAS-GAMA AGN
- Multi-stage fuelling
- AGN covering factor



Background

activity vs stellar mass

see Heckman and Best 2014 review and refs therein

- $M_H \propto M_*$
- $\text{Prob}(\text{AGN}) \propto M_*$

activity vs star formation

see Heckman and Best 2014 review and refs therein

- activity linked to SF but...
- slow dependence
- clearer near the middle than globally
- better connected to *recent* SF rather than *current* SF

SF/activity vs dynamical disturbance

see Heckman and Best 2014 review and refs therein

- interactions linked to SF
- but no additional link to activity
- ditto mergers

- only 10% of star formation linked to mergers
- most by "cosmic web" accretion
- likewise most activity driven by "secular" processes

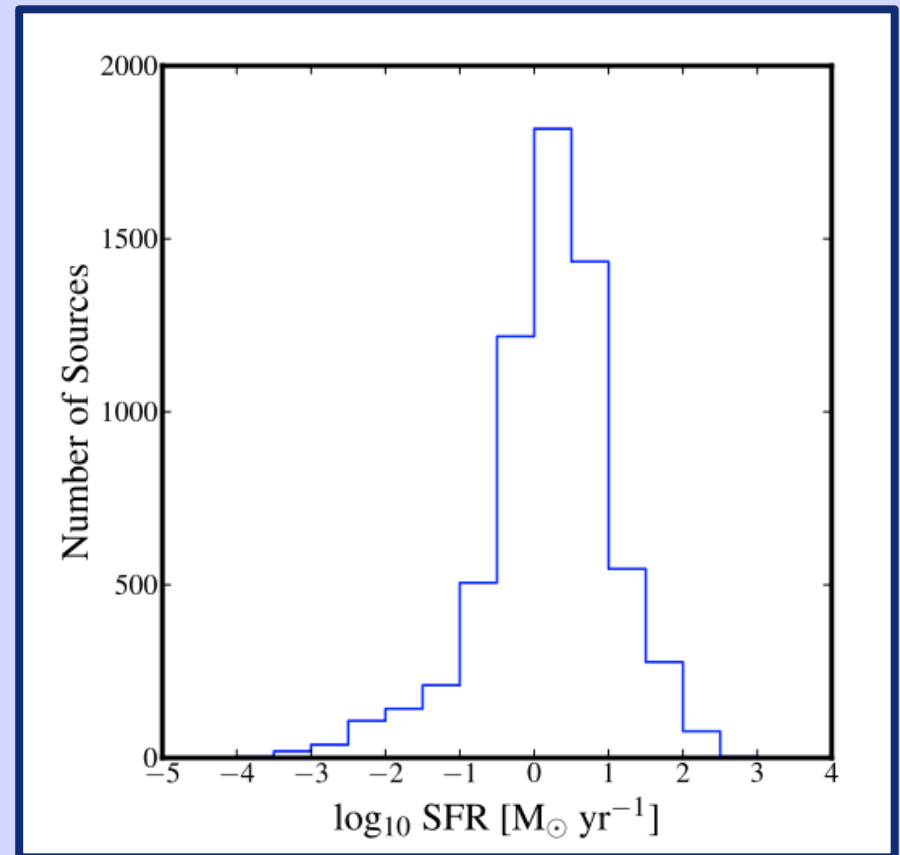
An astronomical image showing a galaxy with a bright central region and a diffuse, reddish-orange glow extending across the frame. The background is dark with numerous small, bright stars. A blue rectangular box is overlaid on the image, containing the text "HATLAS-GAMA AGN" in yellow, bold, uppercase letters.

HATLAS-GAMA AGN

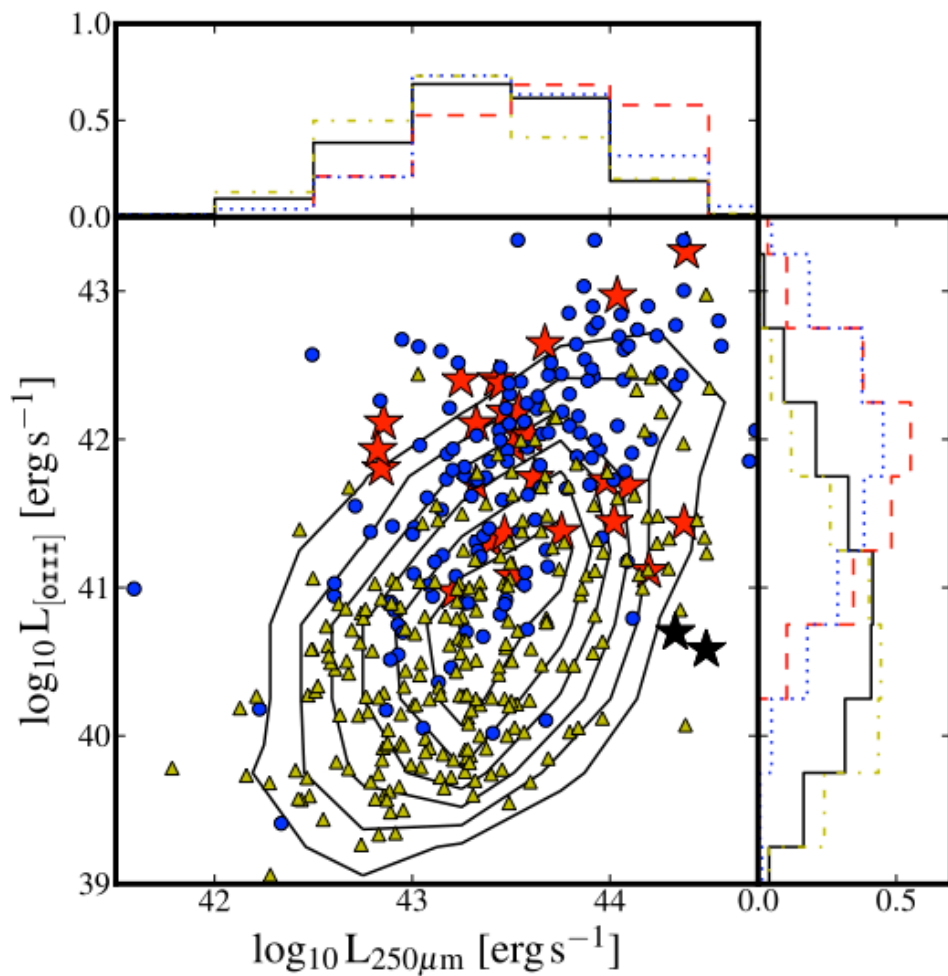
- Herschel ATLAS FIR
+GAMA/SDSS spectra
+UKIDSS/SDSS phot
- $z < 0.38$ 7433 galaxies

GANDALF \implies
line fluxes, BPT classification

MagPhys \implies SED modelling
 M^* , age, SFR



Normal galaxies not LIRGs
FIR mixture of cirrus and SF



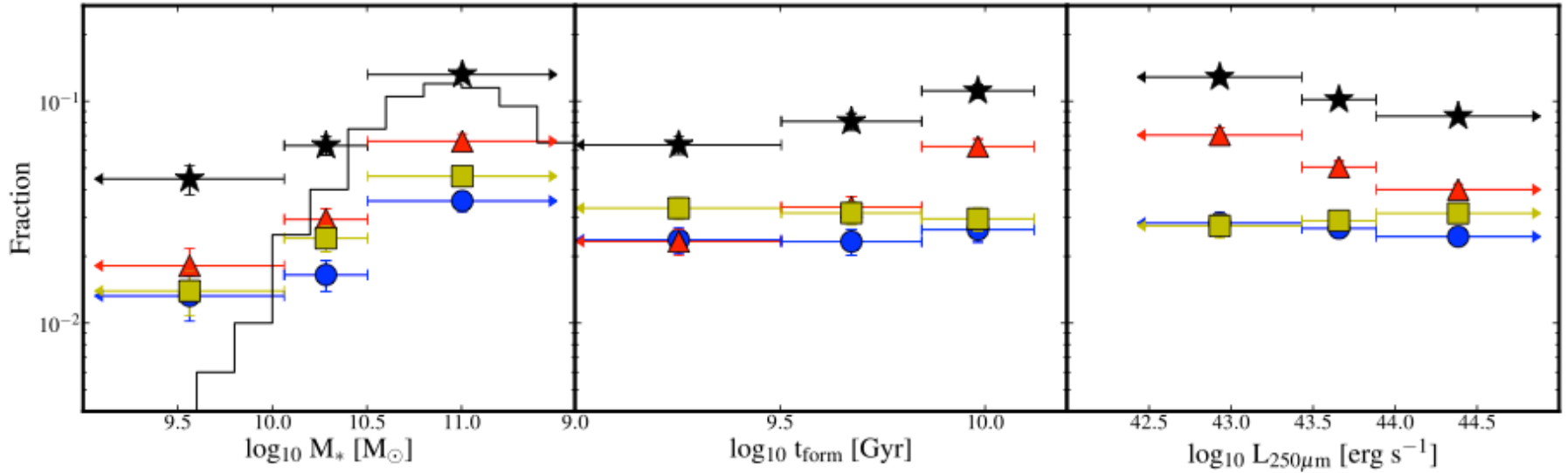
2560 em.line gals

2090 SF
normal range, not LIRGs

178 S1+S2
preferentially high SF
OIII dominated by AGN

234 LINER
preferentially weak SF

black=all blue=S12 red=LINER green=S12+ highlum LINER



AGN
preferentially
in bigger gals

LINERS
in older gals

LINERS
in lower
SF gals

A long, thin, reddish-orange galaxy filament stretching across a starry night sky. The filament is composed of numerous small, bright stars and is surrounded by a diffuse glow of light. The background is a dark, deep blue-black space filled with many small, bright white and blue stars of varying sizes and colors. The filament itself has a warm, orange-red hue, suggesting it might be a star-forming region or a filament of gas and dust.

multi-stage fuelling

- 1Mpc \rightarrow 10kpc
- 10kpc \rightarrow 100pc
- 100pc \rightarrow 1pc
- 1pc \rightarrow 10^{12} m

mergers/cosmic web accretion
bars, interactions, instabilities
turbulence/radial shreds
viscosity

- 1Mpc \rightarrow 10kpc
- 10kpc \rightarrow 100pc
- 100pc \rightarrow 1pc
- 1pc \rightarrow 10^{12} m

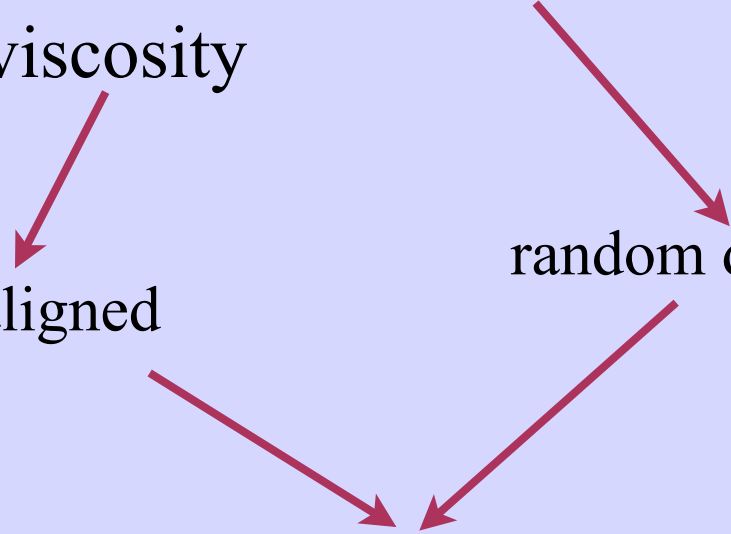
mergers/cosmic web accretion
bars, interactions, instabilities
turbulence/radial shreds
viscosity

BH aligned

random directions

*this is the
obscuring torus*

expect pc scale
warp transition



(aside on submm galaxies)

- warped disc makes it easier for AGN to heat distant gas
- revives idea that most submm galaxies may be obscured AGN?

A photograph of a galaxy with a bright central active galactic nucleus (AGN). The galaxy is oriented horizontally, with the AGN at the center. The AGN is a bright, yellowish-white point source. The galaxy's structure is visible as a diffuse, reddish-orange glow. The background is a dark field of stars, with several bright, blue-white stars scattered throughout. A blue rectangular box with a white border is overlaid on the image, containing the text "AGN covering factor" in yellow. The box is positioned in the lower-middle part of the image, overlapping the galaxy's structure.

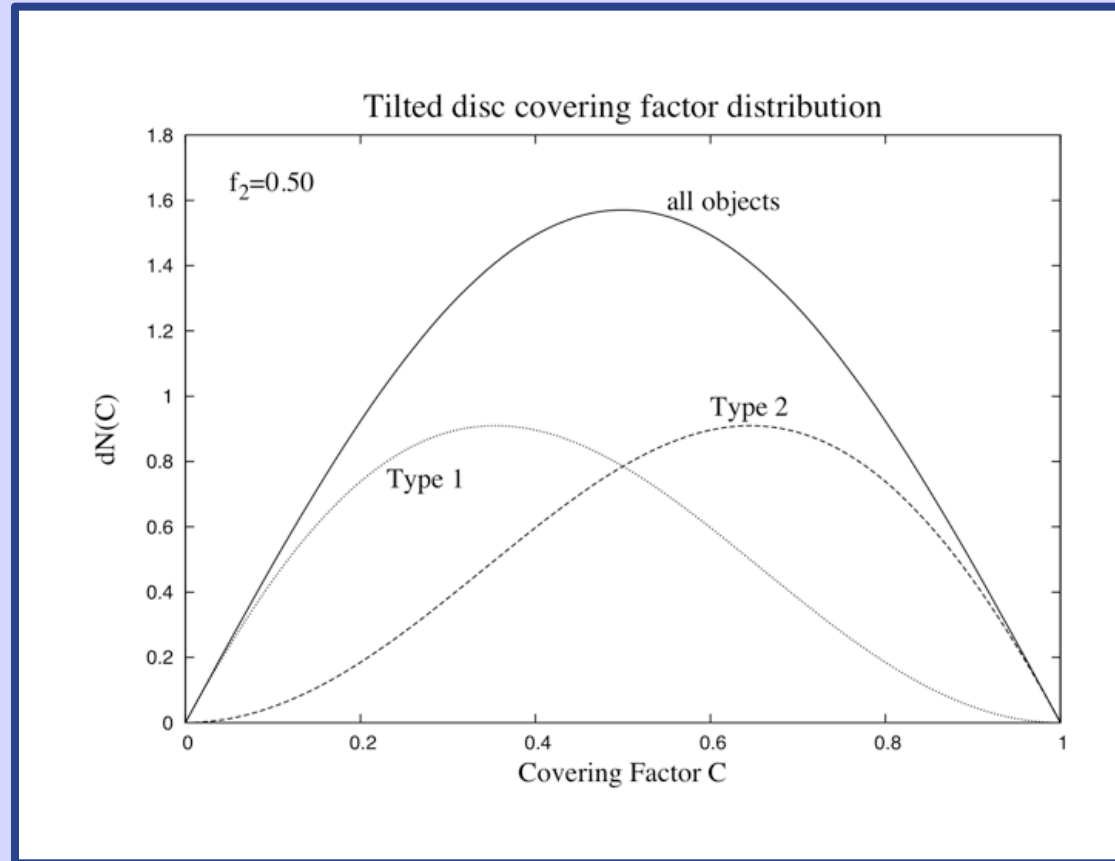
AGN covering factor

Lawrence and Elvis 2010

Warped disc **predicts**

overall covering factor
=0.5

quasar covering factor
=0.35



WISE+UKIDSS+SDSS

SEDs for 9,112 quasars

Fit three components

BBB=fixed template

hot dust=single BB

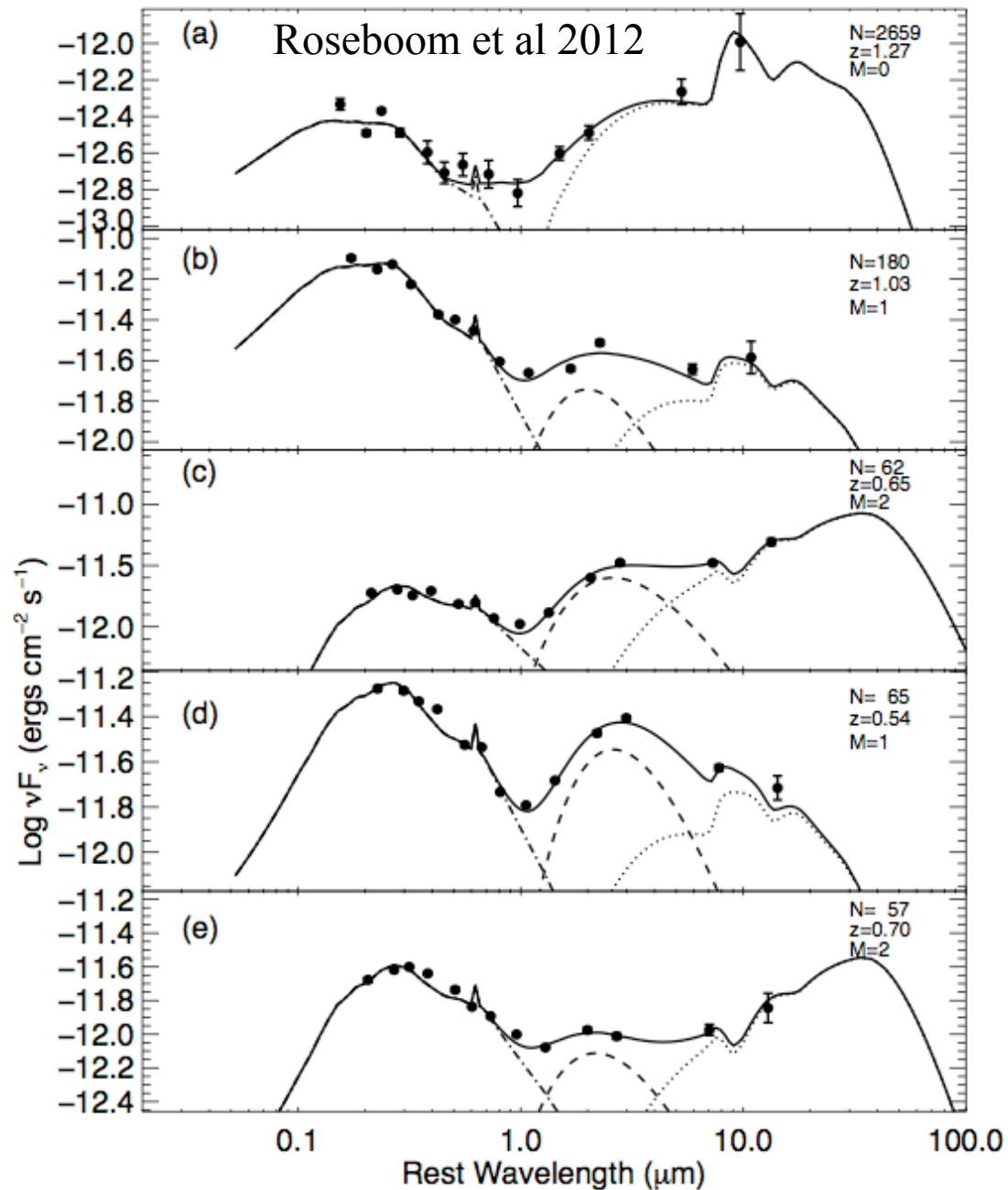
torus=Nenkova08 models

wide variety of SEDs

hot/cool dust varies

as well as

IR/opt-UV

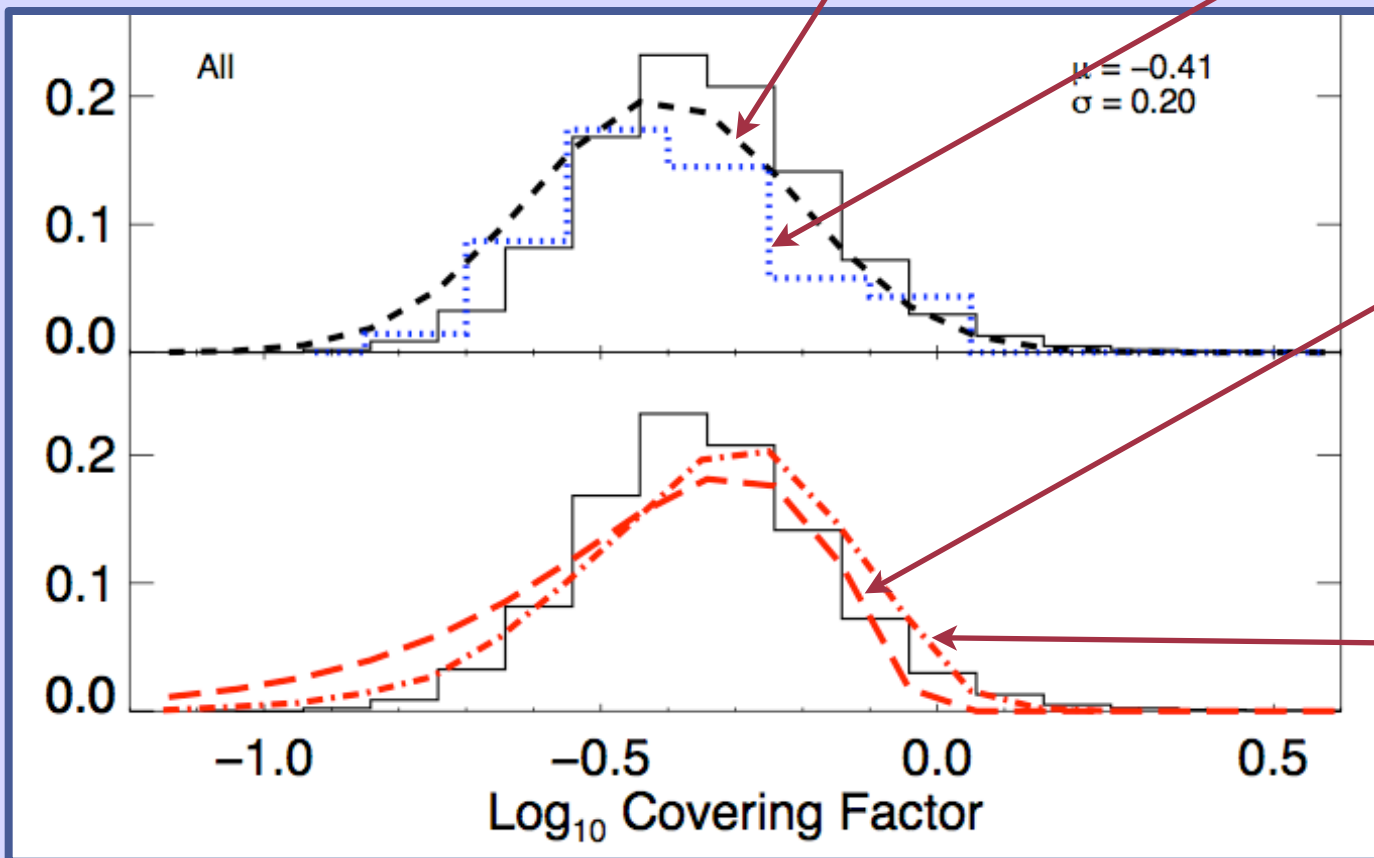


covering factor distribution

log Gaussian

Richards (2006)
Spitzer sample

Roseboom et al 2012



tilted disc
prediction
(LE10)

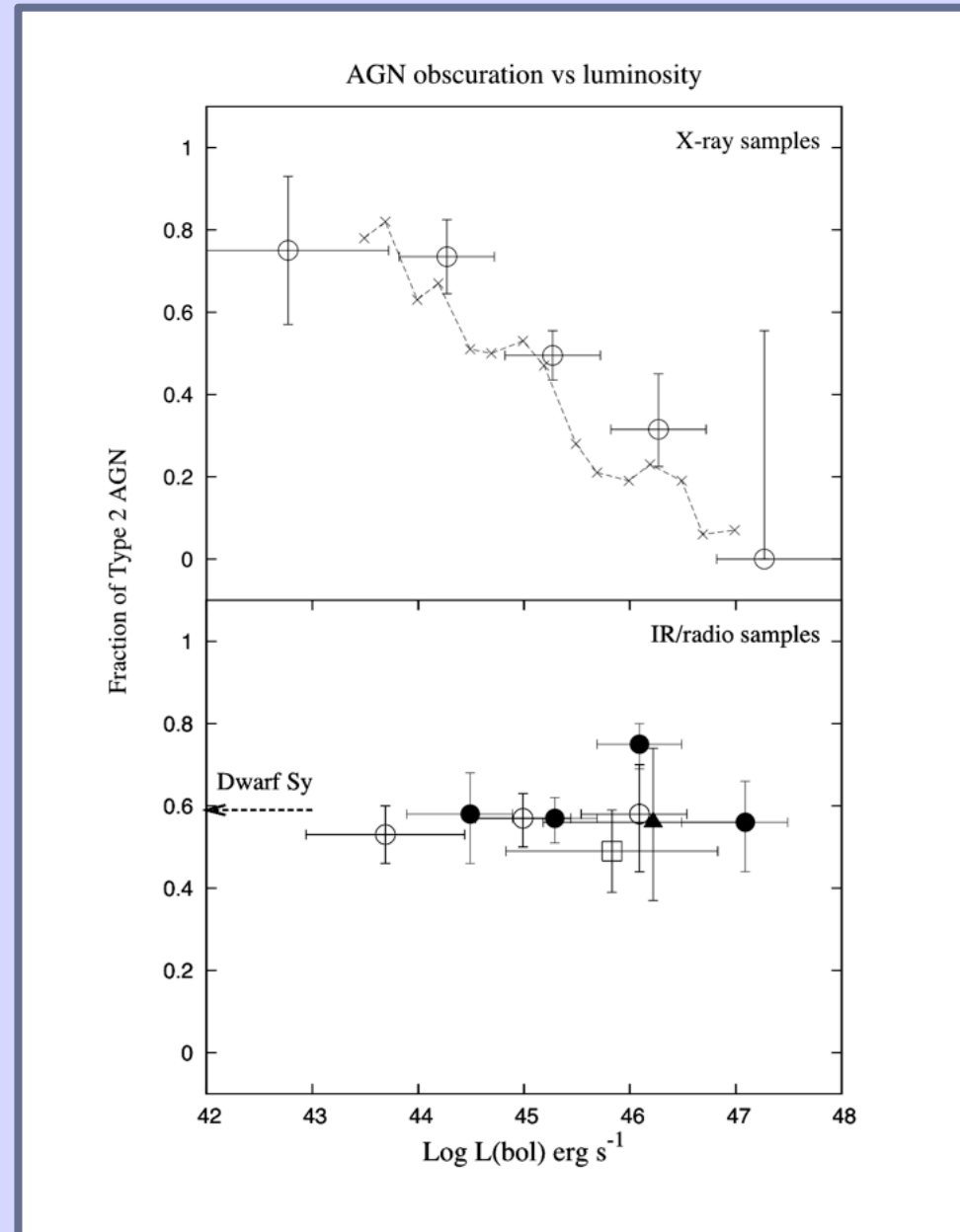
with
selection
limit
correction

luminosity dependence

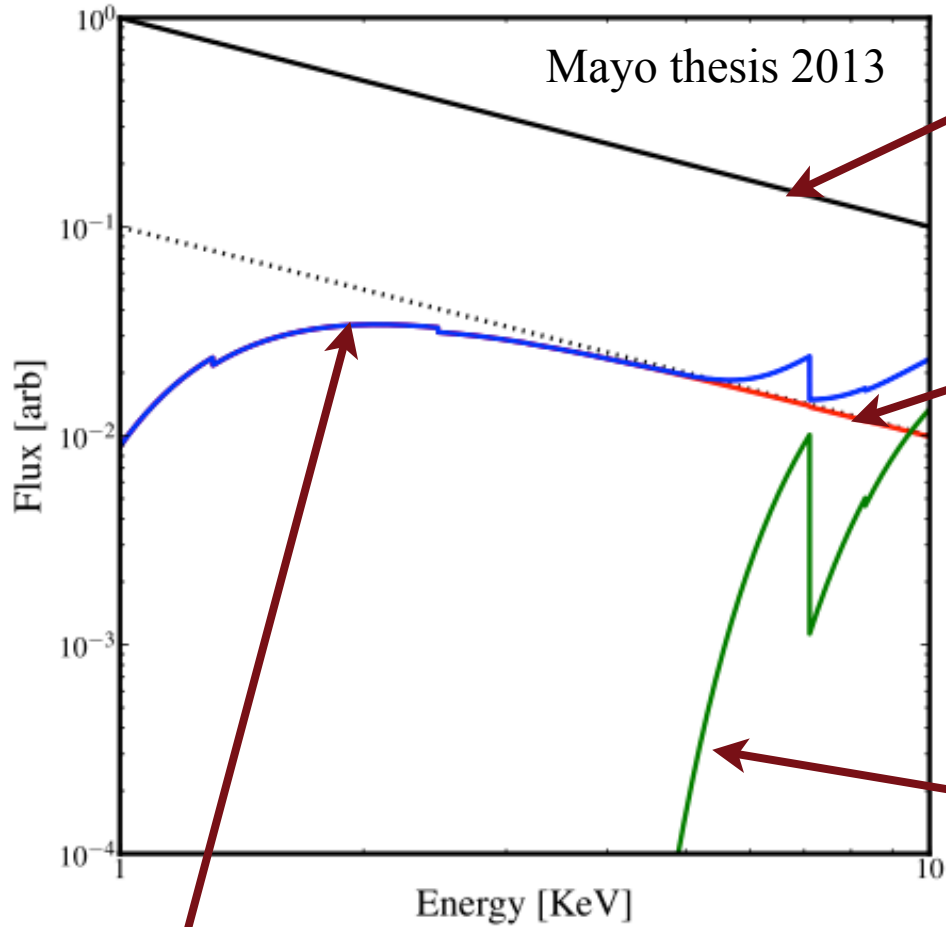
warped disc predicts
covering factor
independent of
luminosity

opt/IR/radio : yes
X-ray : no

why are they different?



Partial covering



intrinsic

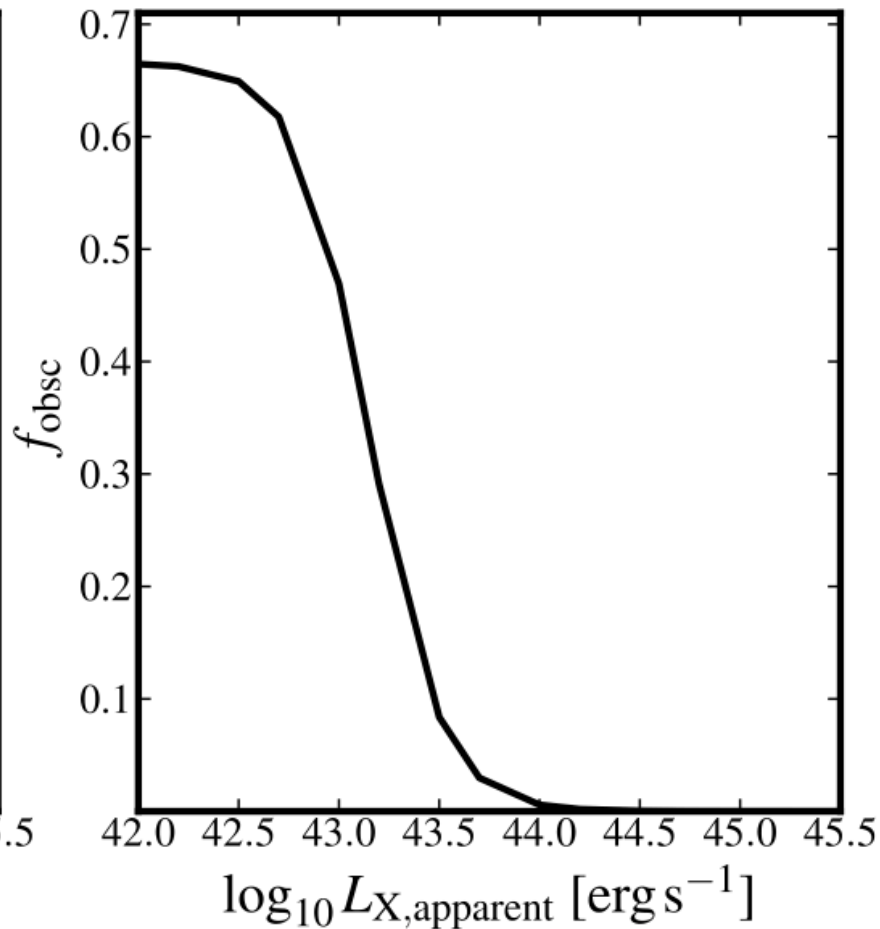
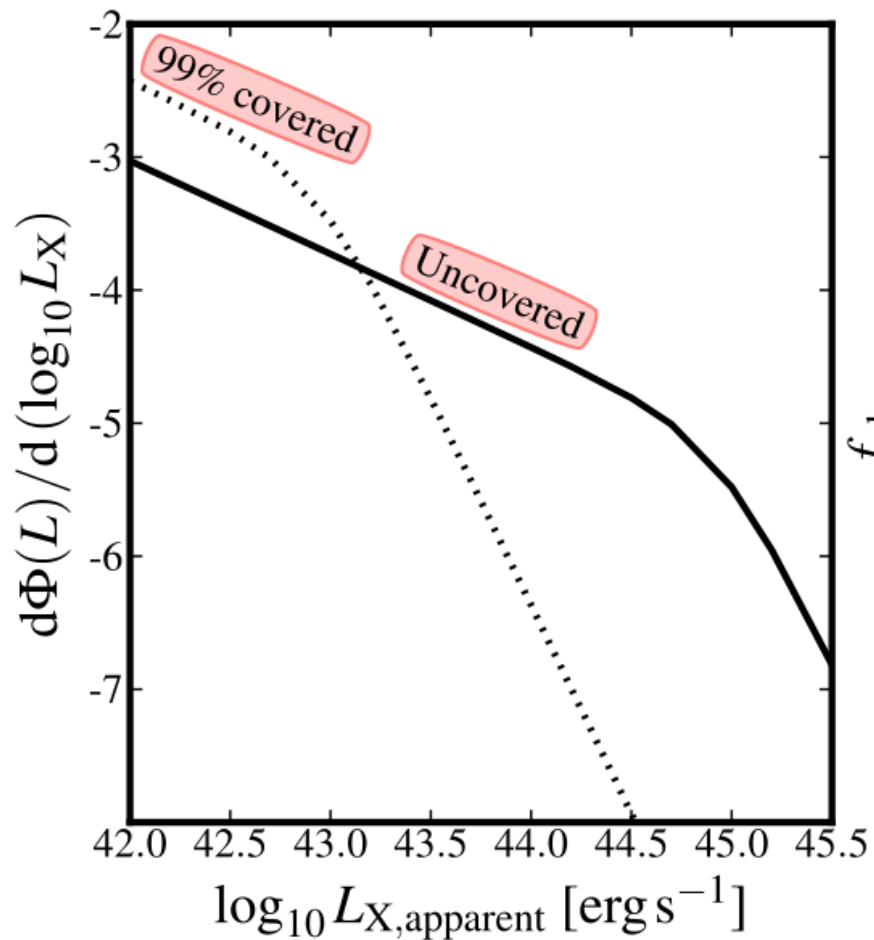
5% covered
 $N_H = 1 \times 10^{22}$

95% covered
 $N_H = 2 \times 10^{24}$

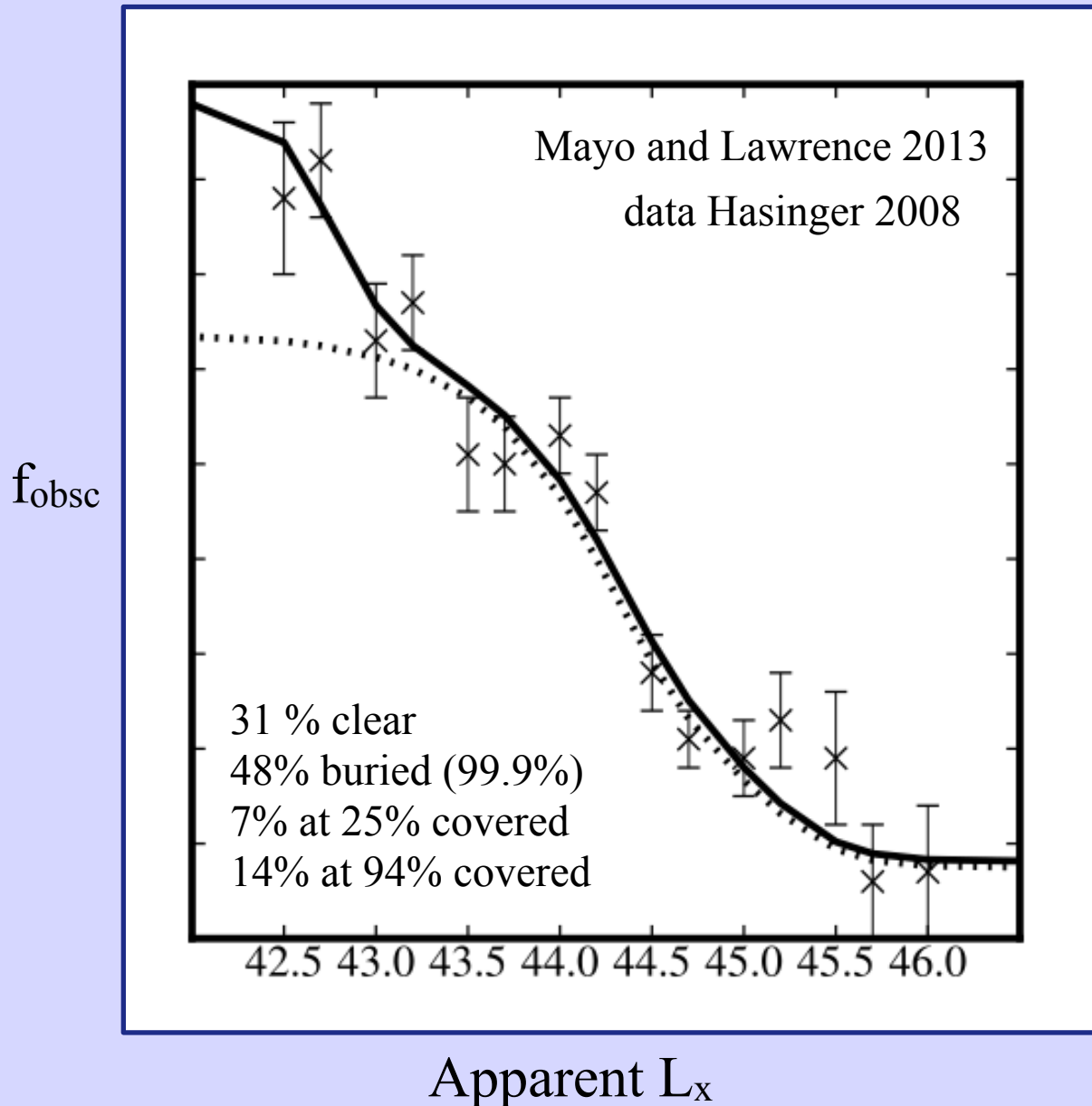
net spectrum
looks Compton thin!

effect on lum.fn and obscured fraction

Mayo and Lawrence 2013



four population model



Always roughly:

- 1/3 clear
- 1/3 buried
- 1/3 partially covered



FIN