Not All AGNs are Created Equal: How Galaxies Feed and Obscure Their SMBHs

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A Paradigm for SMBH Activity

- What ignites the AGN phase?
  - Galaxy mergers? (Sanders+88, Hopkins+06)
  - Isolated disks? (Hopkins & Hernquist 06, Bournaud+11)

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- Why do AGN look so different?
  - Broad / narrow lines, luminosity, SED vary widely
  - Caused by different obscuration, or accretion physics?
  - Governed by host?

Is there a Unified Model to describe different active galaxies???

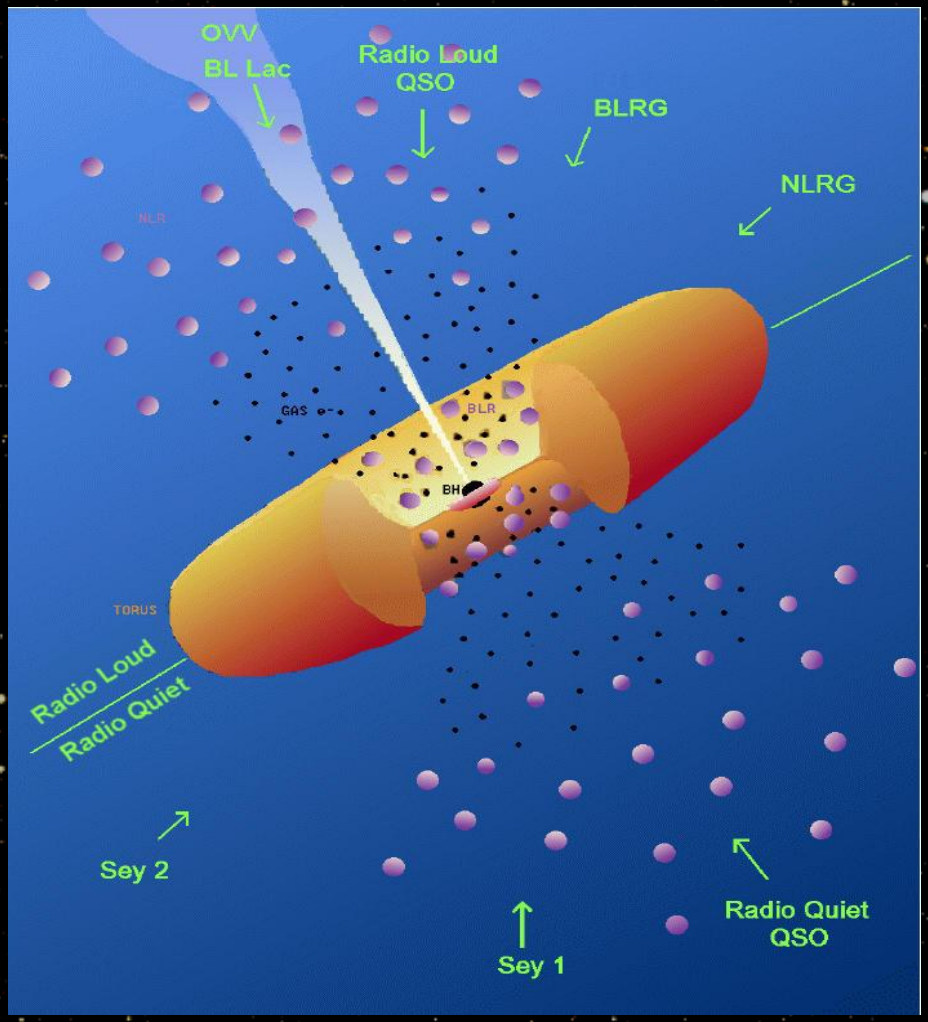
The Historical AGN "Unified Model" (Antonnucci 93)

Orientation explains:

- Luminous / Faint
- Obscuration
- Type 1 (BL) / 2 (NL)
- Reflected BLR in spectropolarimetry

But many objects don't fit!

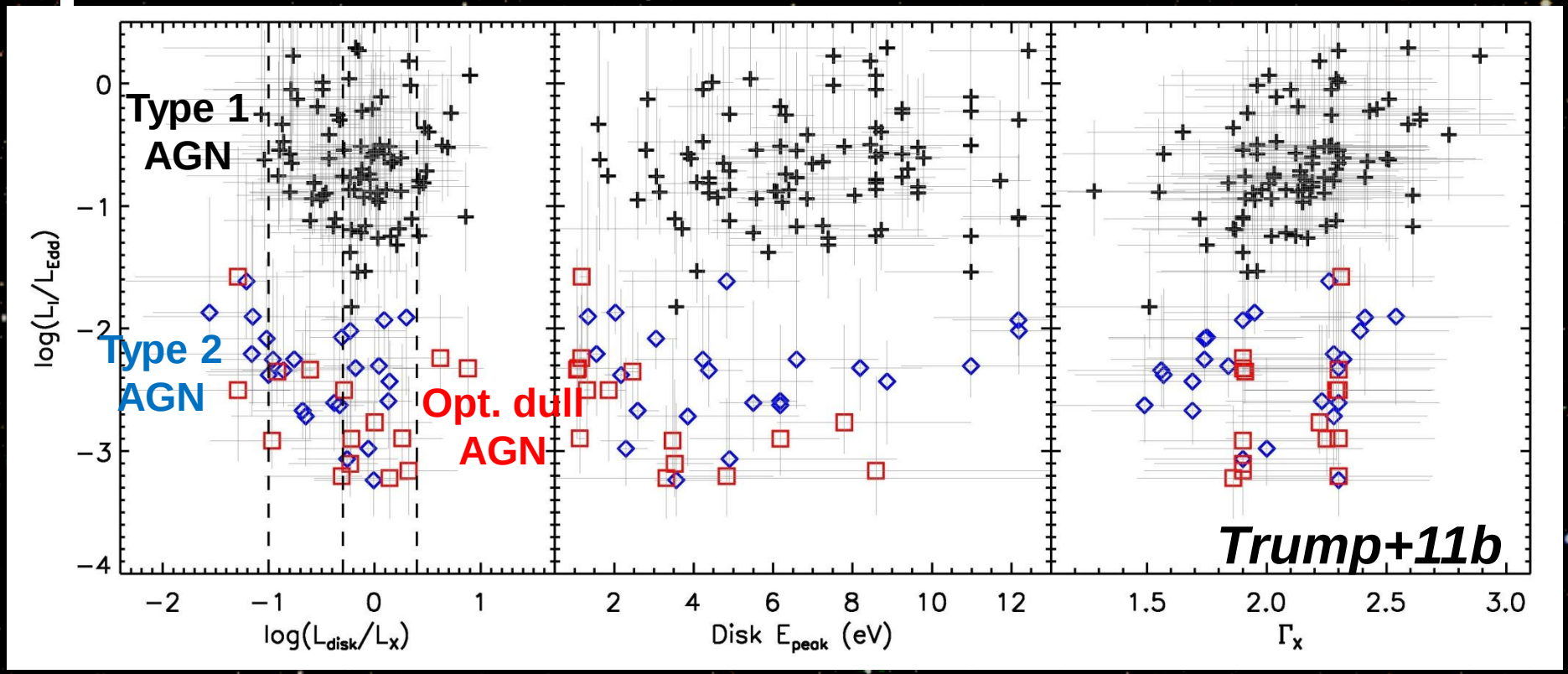
Many Type 2's have little X-ray absorption (Trouille+09), no IR torus (Trump+09c,11b) & no reflected BLR (Tran 01,03)



from Urry & Padovani 1995

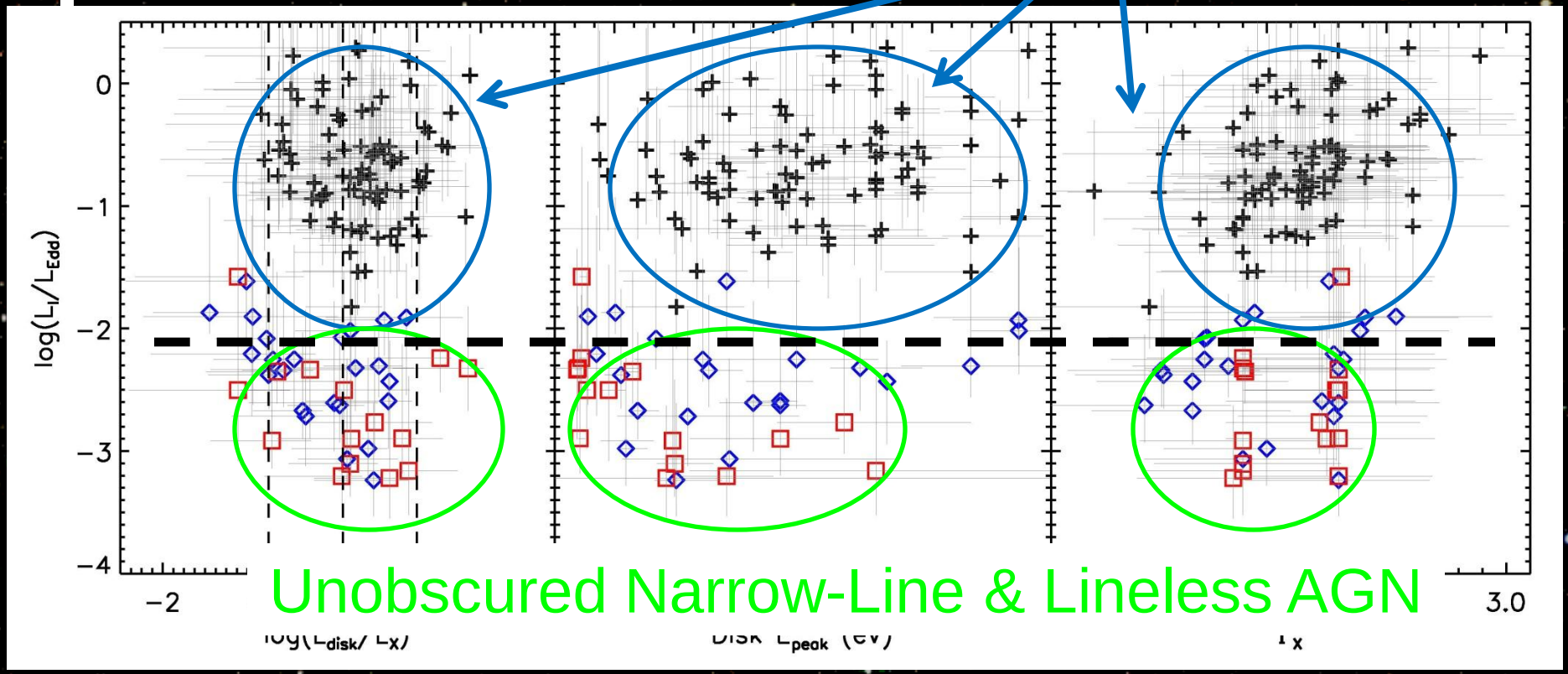
AGN Fueling (unobscured only: $N_H<10^{22}$ cm^2)

- L_{int}/L_{Edd}: accretion rate
- With L_{disk}/L_X, E_{peak} of disk, X-ray slope



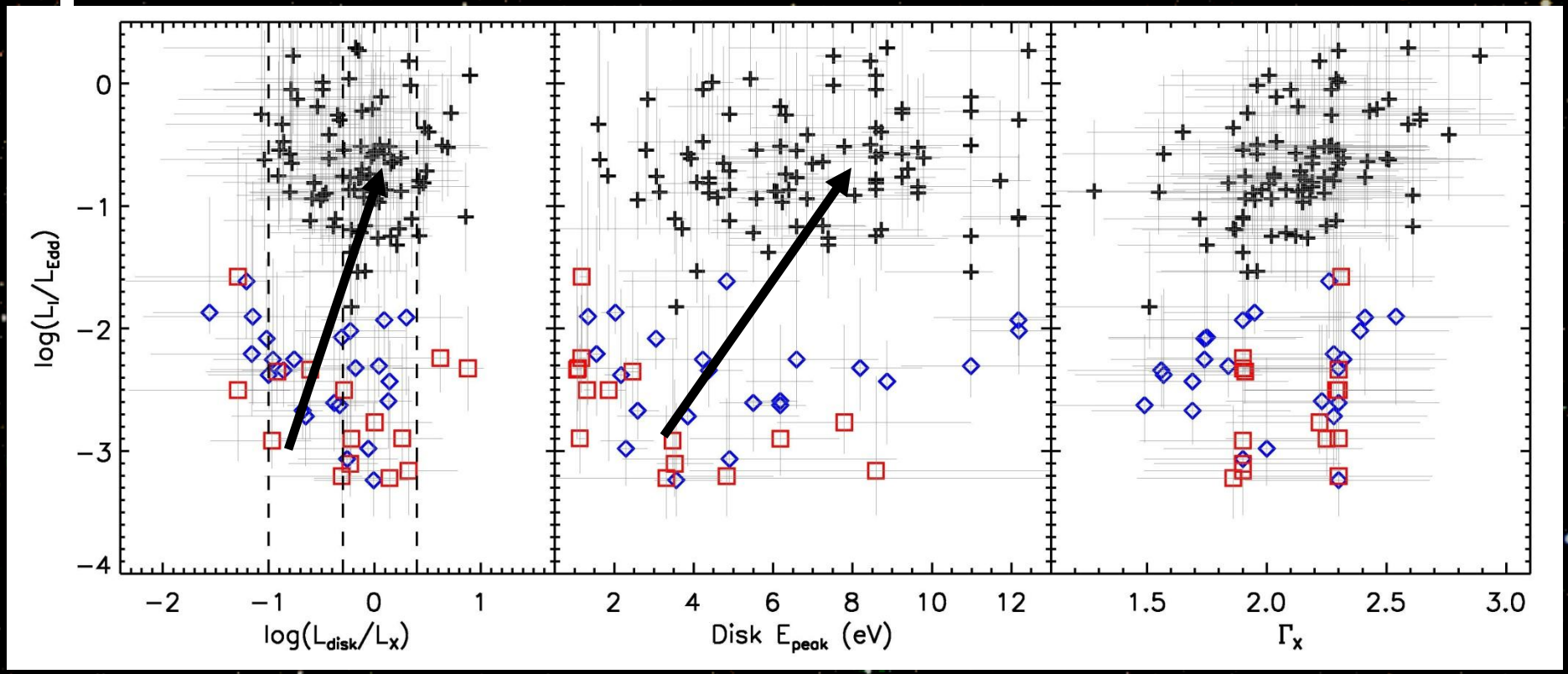
AGN Fueling

Different L_{int}/L_{Edd} for unobscured Type 1/2



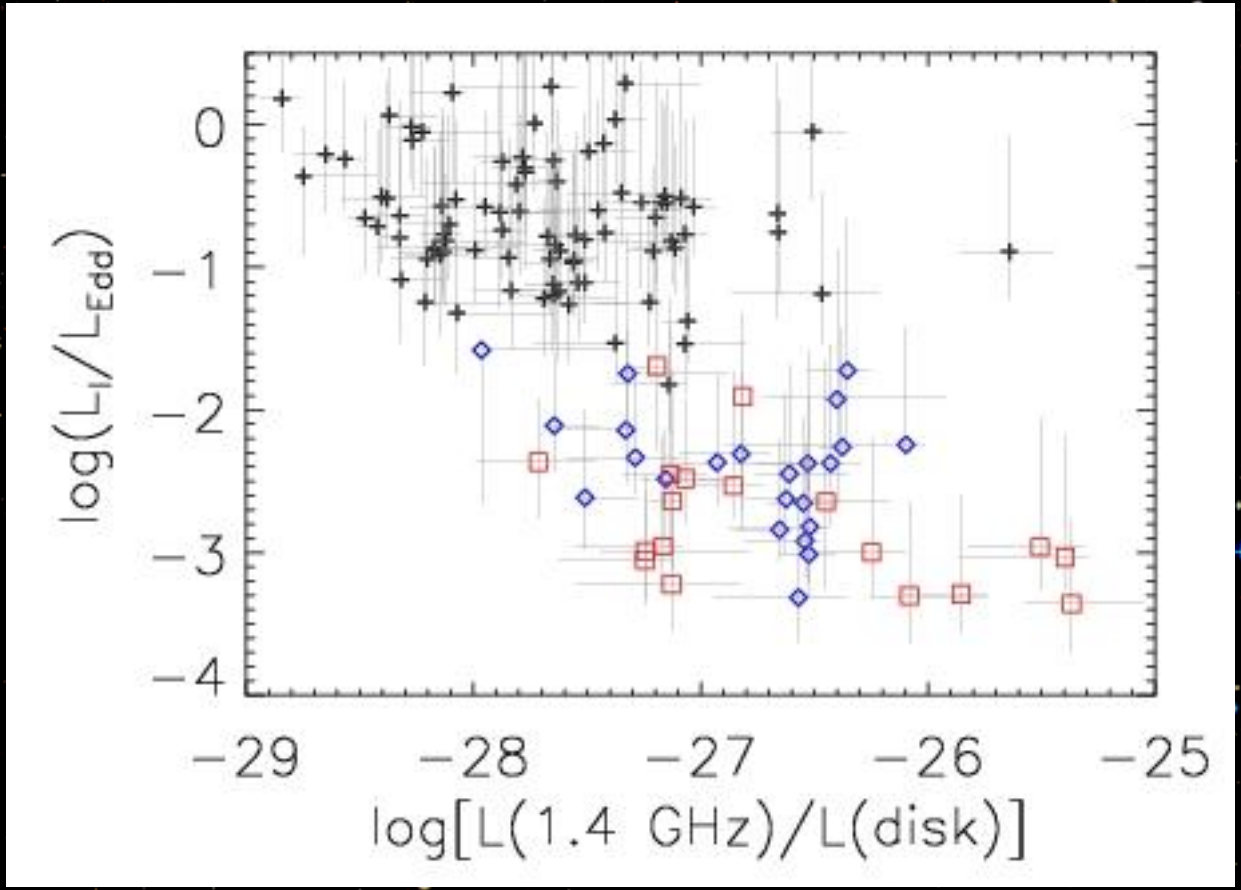
AGN Fueling

- Disk gets brighter & hotter as accretion rate increases (difference is >3σ)



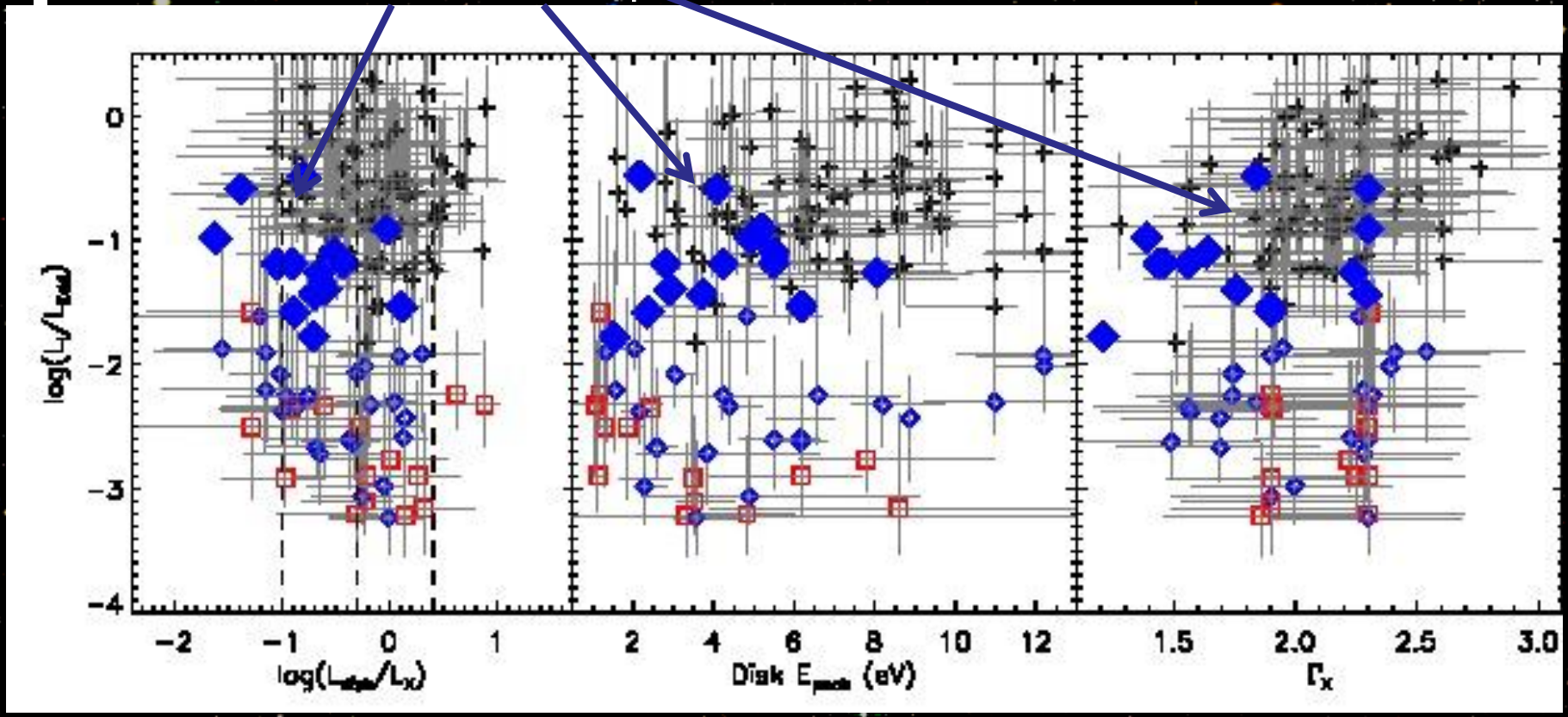
Accretion Rate and Radio Jets

- Weakly accreting AGN are more radio-loud!
- Weak AGN may be more important for radio-mode feedback (e.g. heating cluster cores, IGM enrichment)

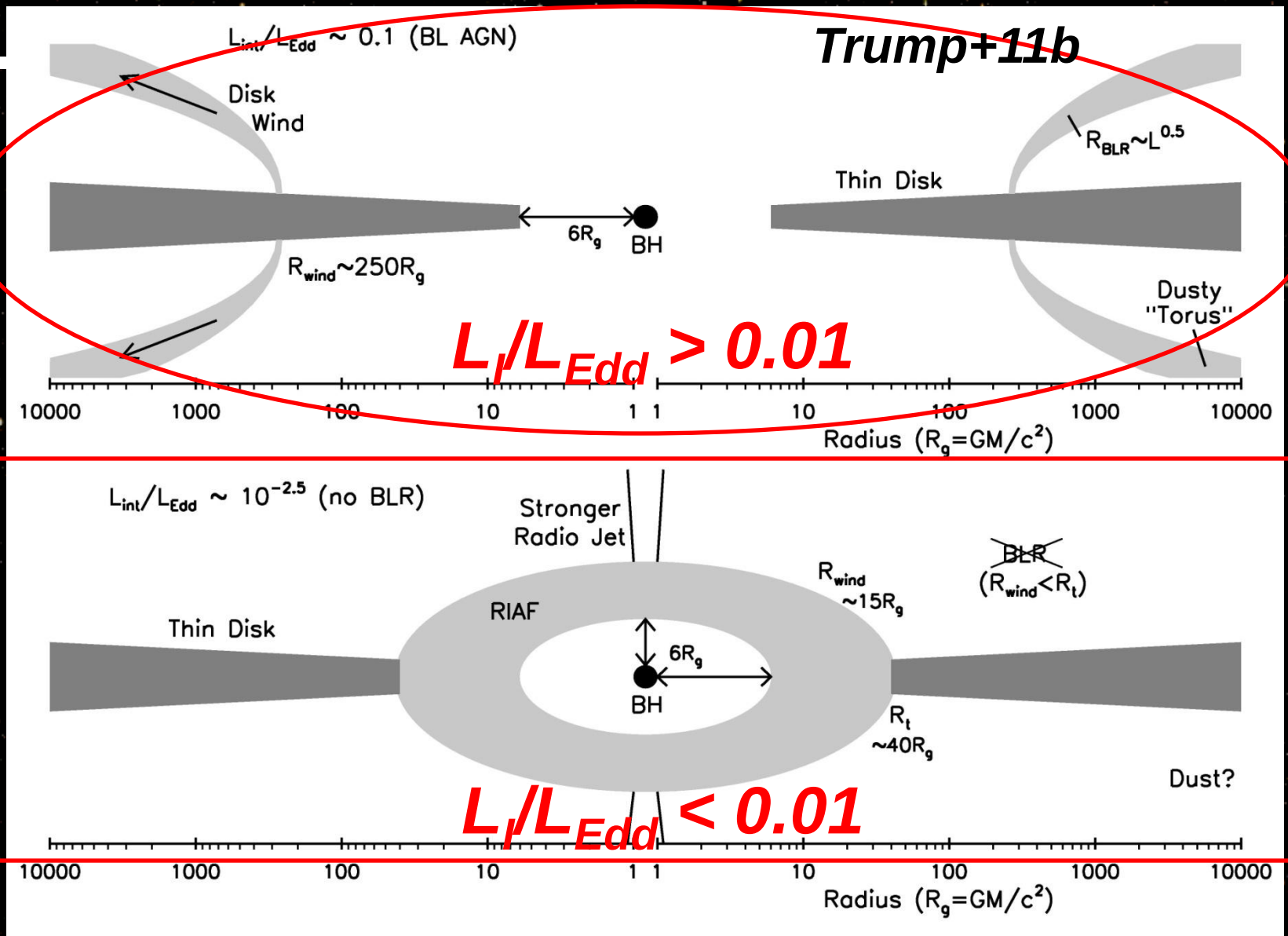


What about Obscured AGN?

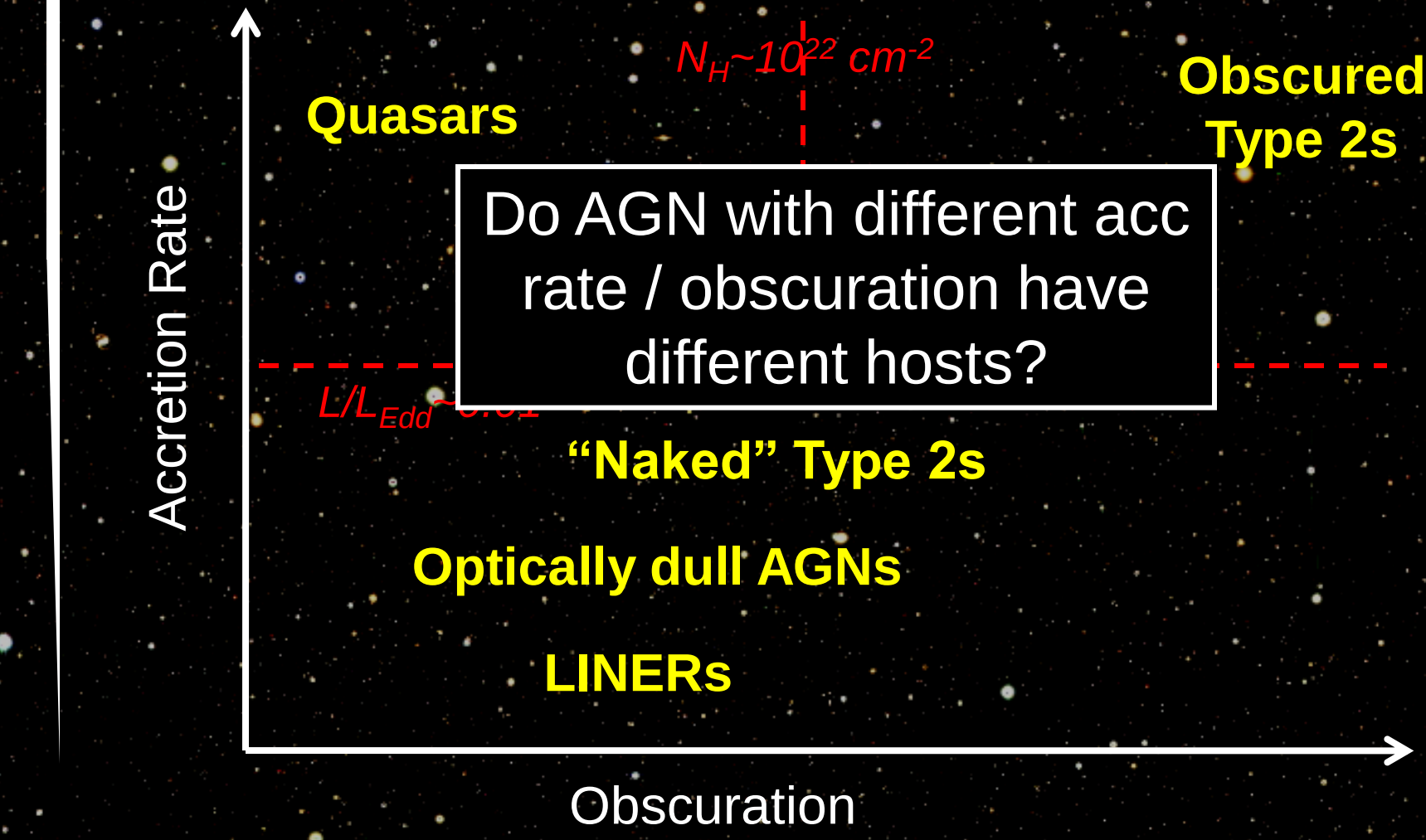
High L_{int}/L_{Edd} like unobscured Type 1s
(using $L_{int} = 8L_{6\mu m}$, Richards+06)



Accretion in AGN Unification

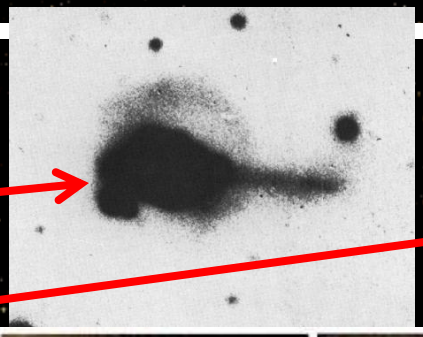


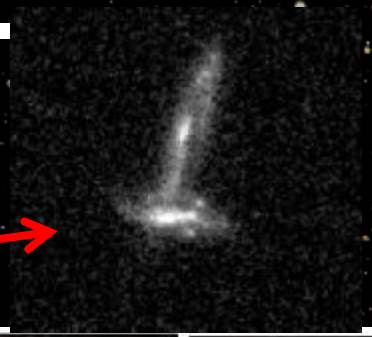
Two Axes in AGN Unification

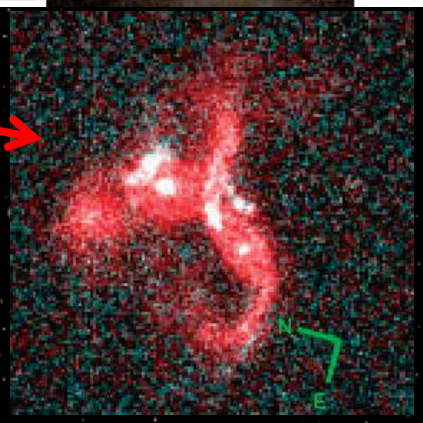


Do Mergers feed Quasars?

- ULIRG AGNs (Sanders+88, ***Kartaltepe+10***)
- Hard X-ray (Swift) AGN (Koss+10)
- BALQSOs (Urrutia+08)

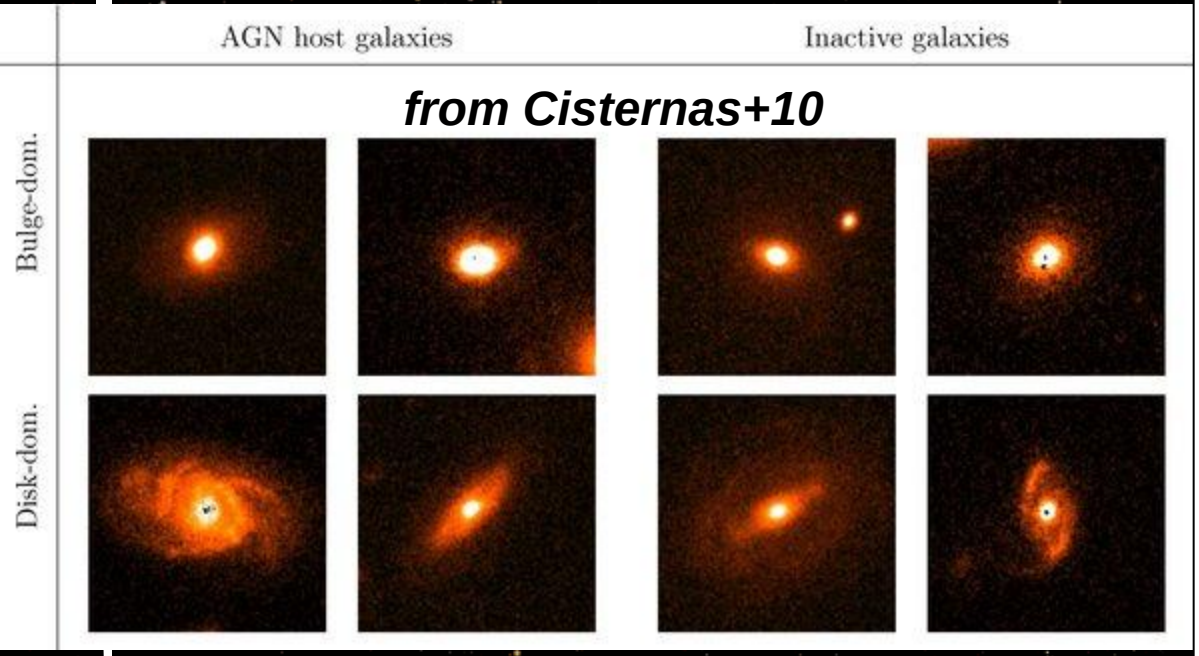


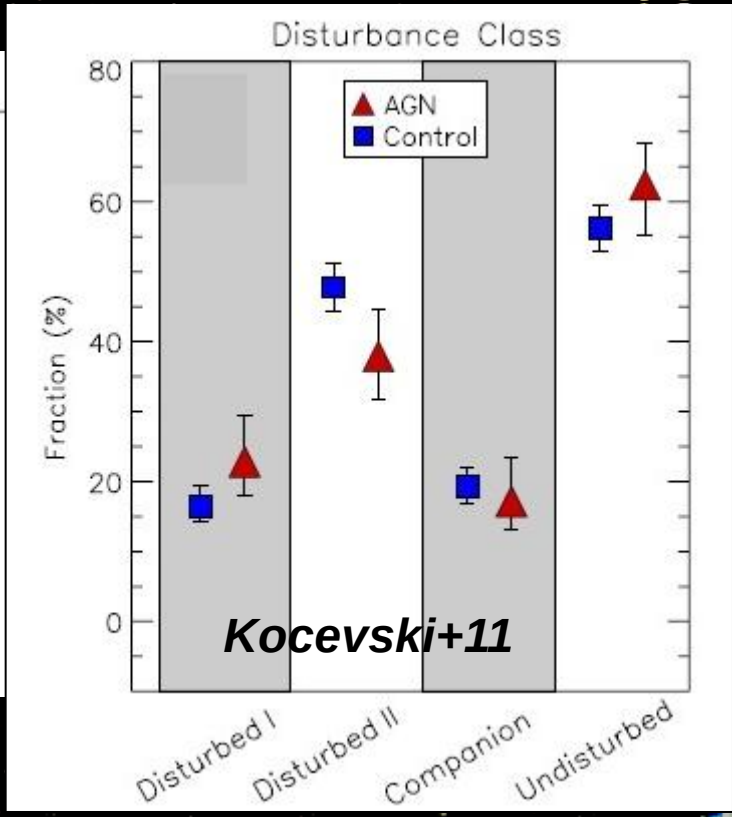




All these are obscured, rapidly accreting, and local

X-ray AGNs are not more likely to be in Mergers

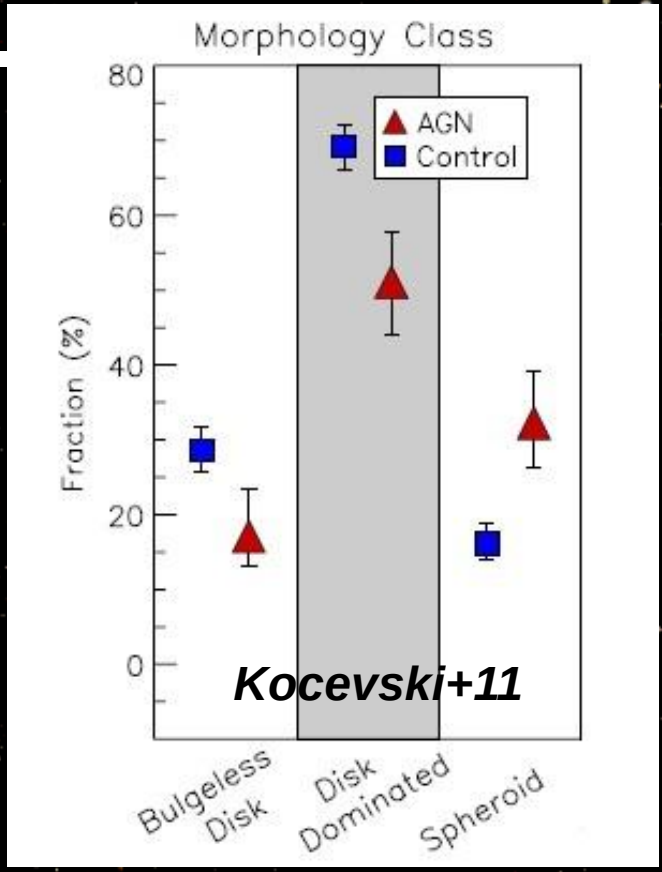




- Not in mergers!
- (Grogin+05, Pierce+07, ***Gabor+09***, ***Cisternas+10***)
- Is this because the AGN only appears after the merger is relaxed?

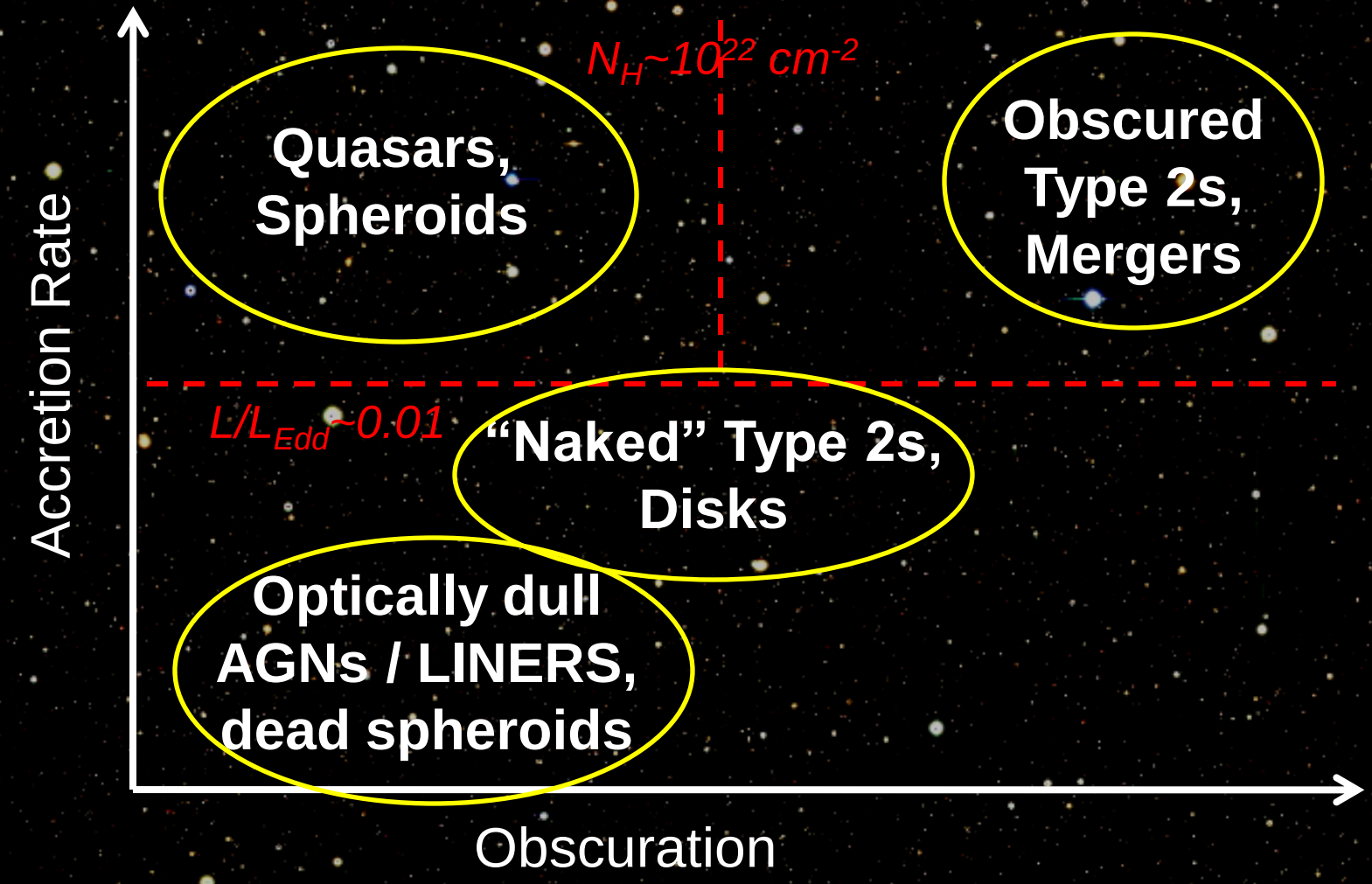
Are Active Galaxies Disks or Spheroids?

- AGNs are frequently in disks! (e.g. Schawinski+11)
- Disks are unlikely to have recent merger (but see Robertson+06)
- But, AGNs are more typically in spheroids… and spheroid fraction increases with L_{AGN}



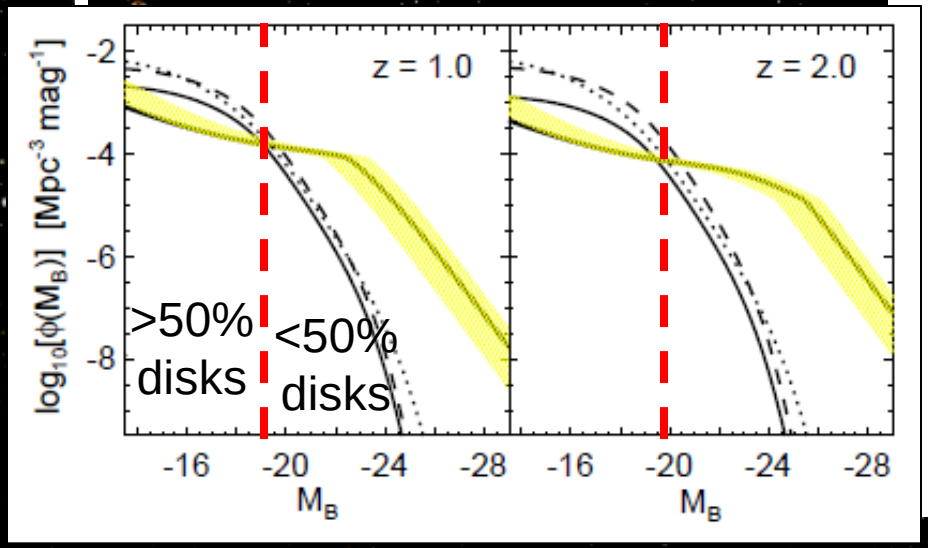
Weak X-ray AGNs in disks, Luminous X-ray AGNs in spheroids

AGN Host Types

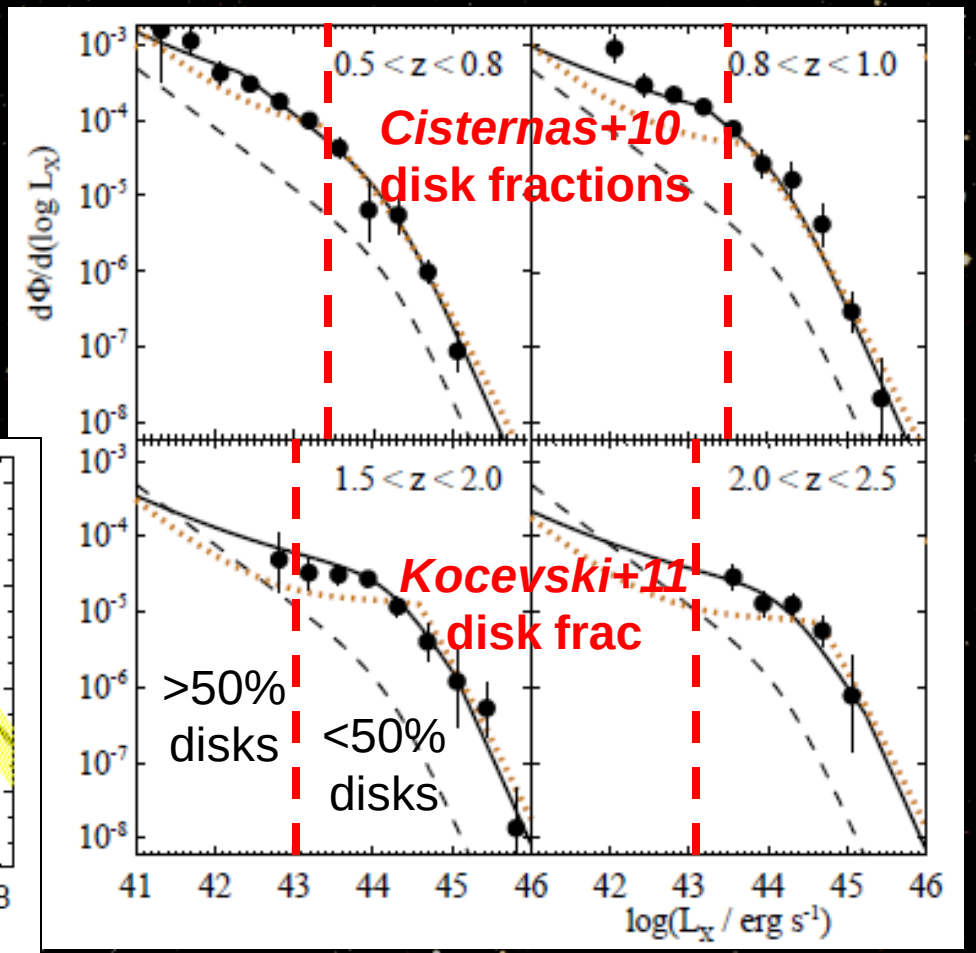


How important is disk fueling?

- More disks than predicted (~40×)
- QSOs (& mergers?) still dominate XLF



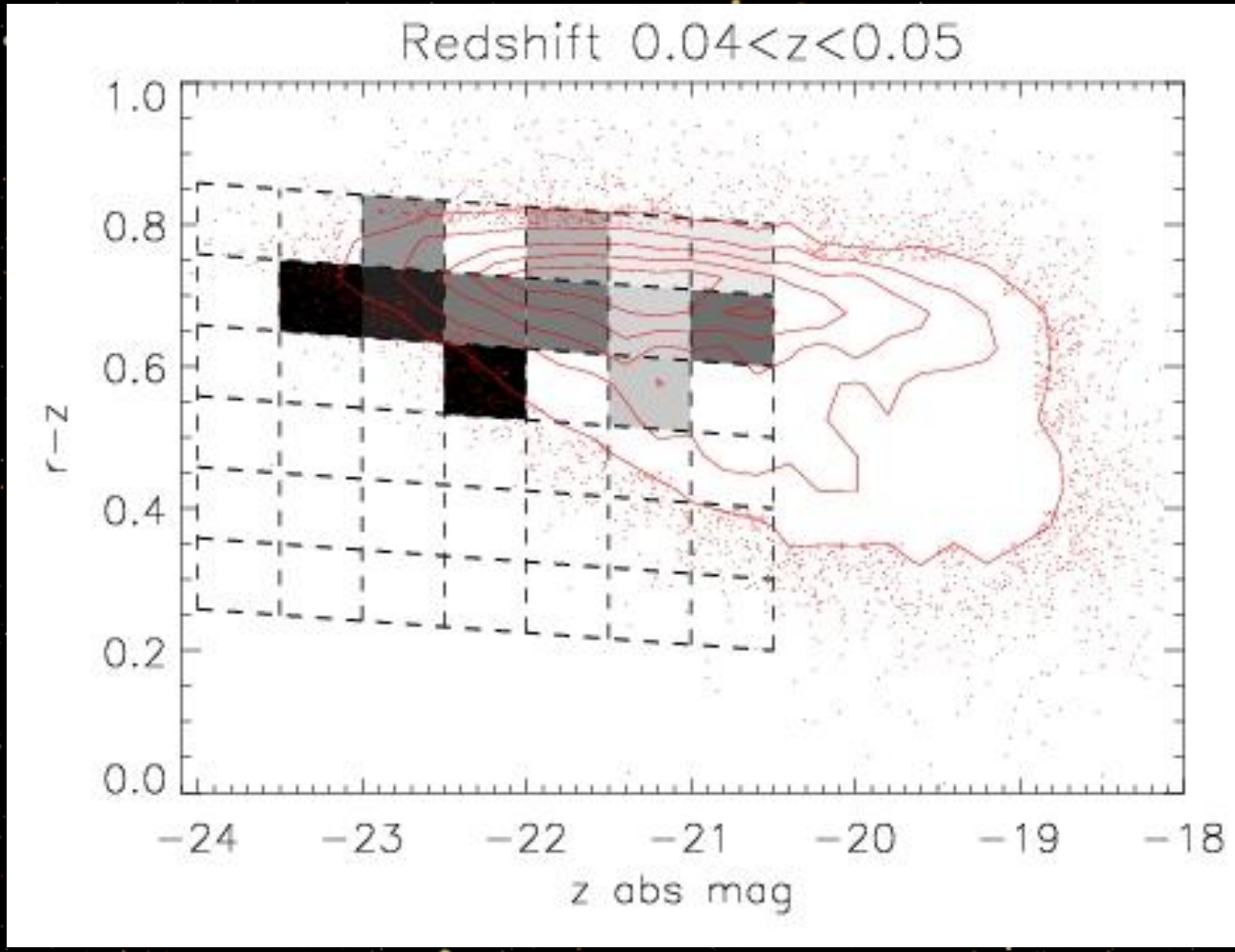
Hopkins & Hernquist 06 model



XLF from Aird+10

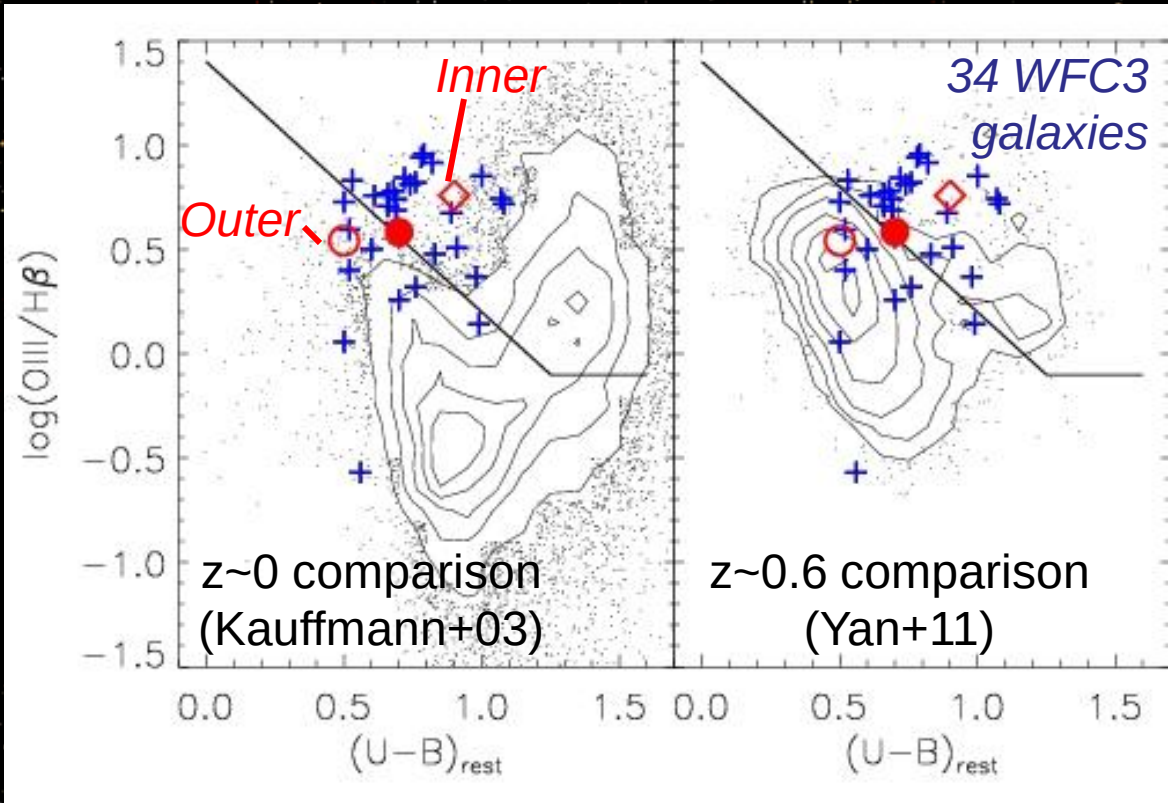
QSO hosts are S0 / green valley, not red dead ellipticals

- QSO host galaxies from SDSS, with QSO removed from phot.
- *Trump & Hsu in prep.*



AGN presence in low-mass galaxies at z~2

- WFC3 slitless grism
- z~2 galaxies typically have AGN ratios in stacked core!
- Similar result from Wright+10 (1 galaxy)
- Also see recent Aird+11 paper



Trump+11c (submitted)

Summary

Accretion Rate: new axis in AGN Unification

- Low accretion rate: ADAF at inner radii
- ADAF: radio-loud, cooler + weaker disk, different IR, BLR disappears
- Rapid accretion / obscured -> merger
- Rapid accretion / unobscured -> spheroid
- Weak accretion (“naked” Type 2) -> disk