Absorption and accretion properties of local Active Galactic Nuclei

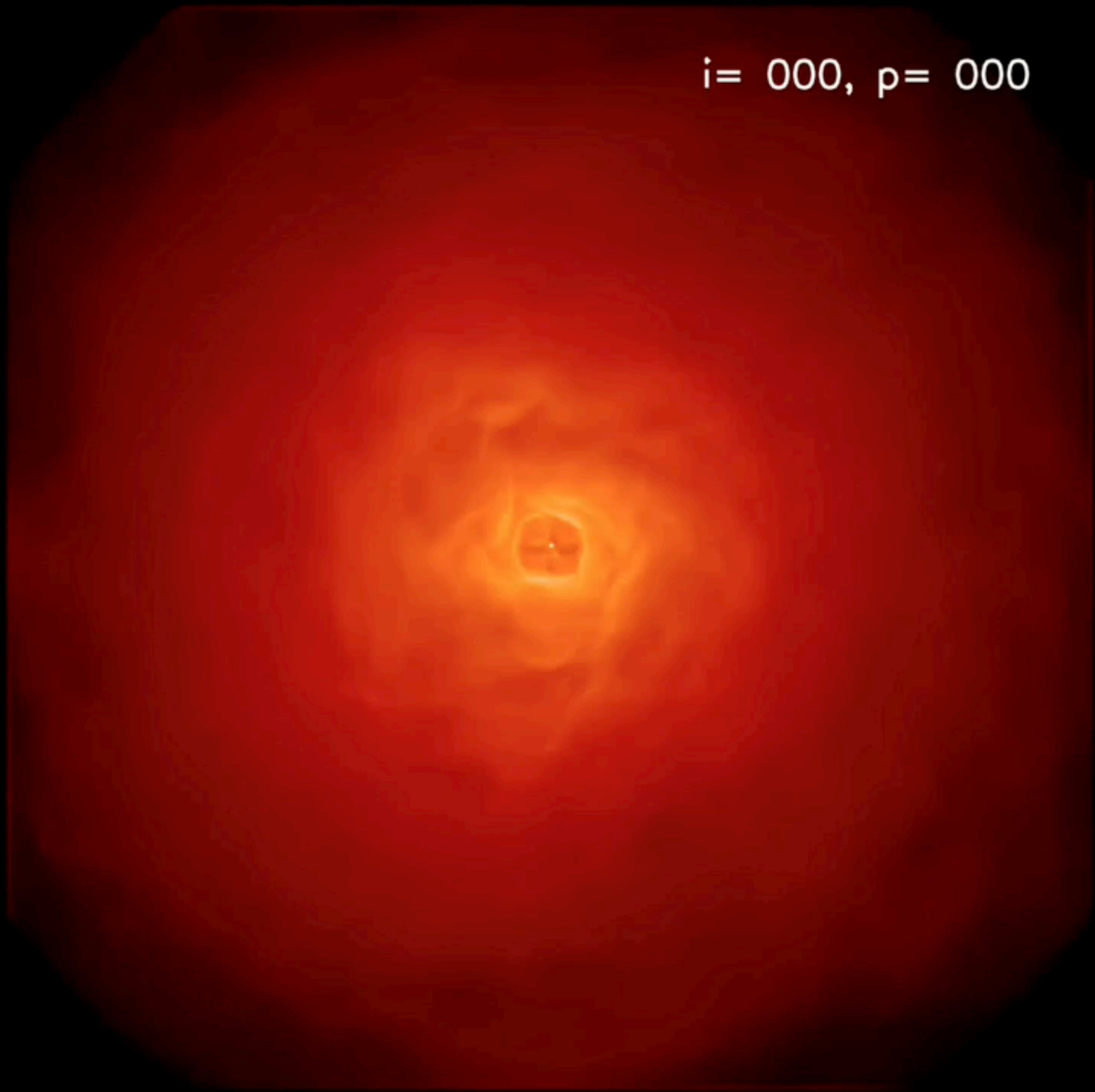
Claudio Ricci

Universidad Diego Portales, Chile

Kavli Institute for Astronomy and Astrophysics, China

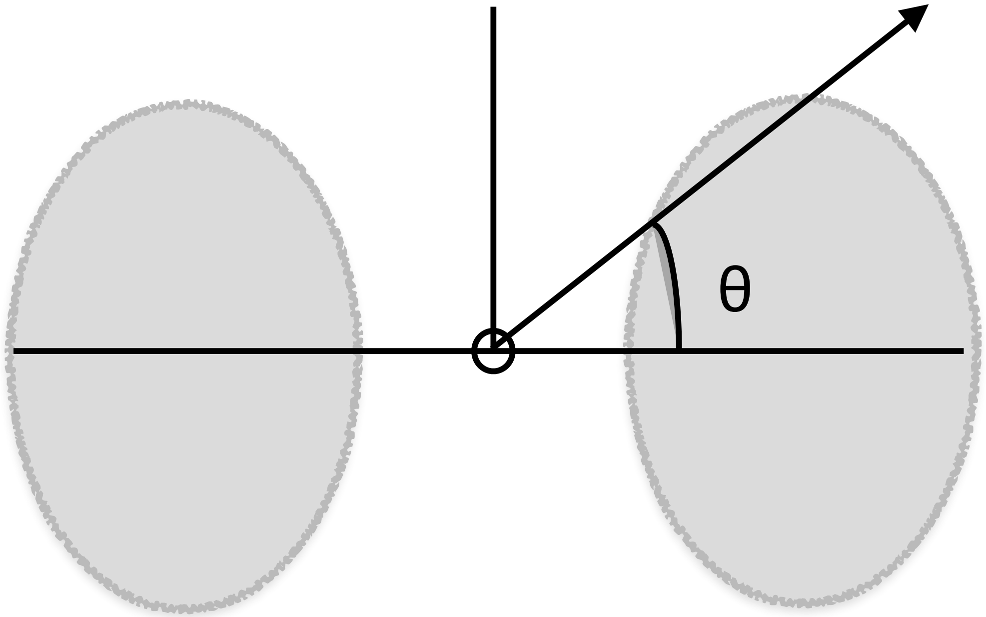
George Mason University, USA

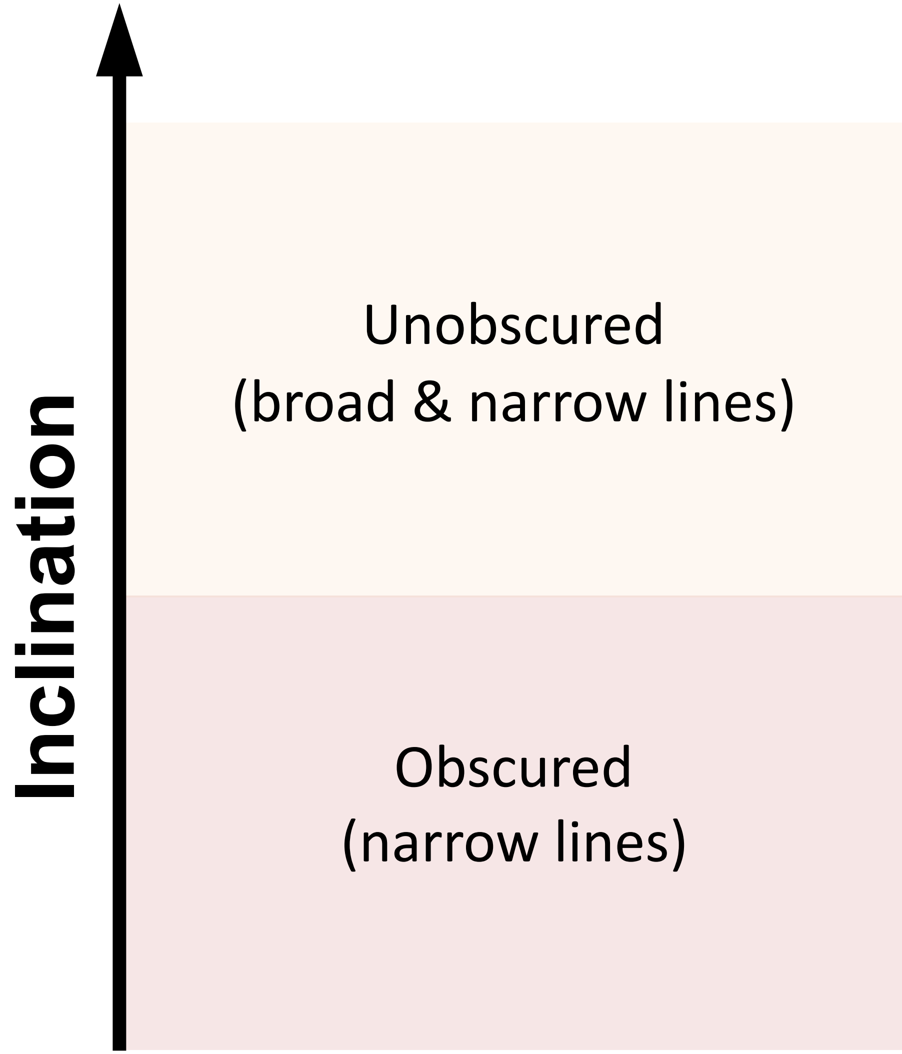
B. Trakhtenbrot (Tel Aviv Univ.), M. Koss (Eureka), L. Ho, R. Li (KIAA), F. Bauer, E. Treister (PUC), R. Mushotzky (UMD), N. Gehrels (NASA), I. Lamperti (UCL), S. Paltani (Geneva Univ.), A. Fabian (Cambridge), Y. Ueda (Kyoto Univ.), K. Gupta (UDP), D. Asmus (Southampton), K. Ichikawa (Tohoku Univ.), M. Stalevski (Belgrade Univ.), I. Arcavi (Tel Aviv Univ.), D. Stern (JPL), P. Gandhi (Southampton U.), M. Balokovic (CfA), F. Harrison (Caltech), P. Boorman (Prague U.), R. Pfeifle (GMU), D. Sanders (U. of Hawaii), L. Armus (Spitzer), K. Iwasawa (ICREA), E. Kara, R. Remillard (MIT), M. Loewenstein, K. Gendreau, Z. Arzoumanian (NASA), the BASS, NuSTAR, GOALS and NICER collaborations



Wada et al. (2016)

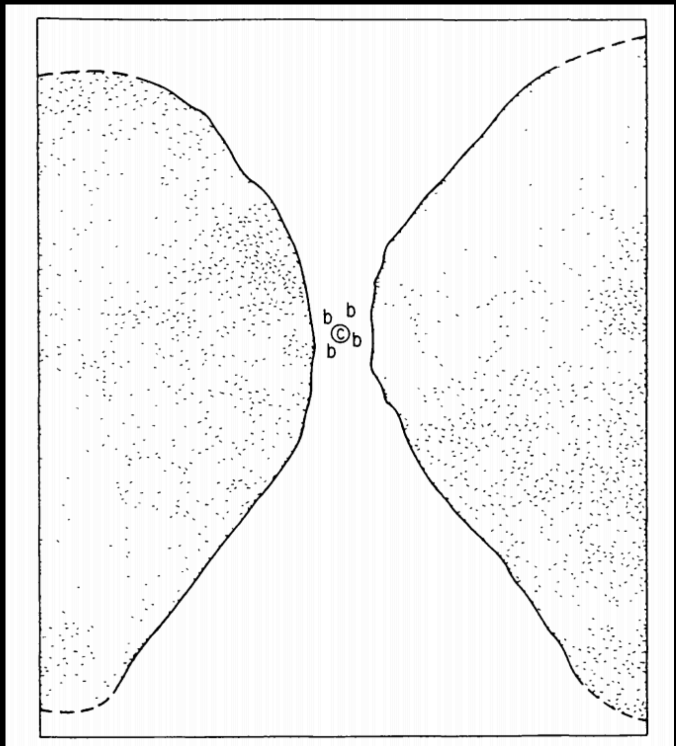
AGN unification



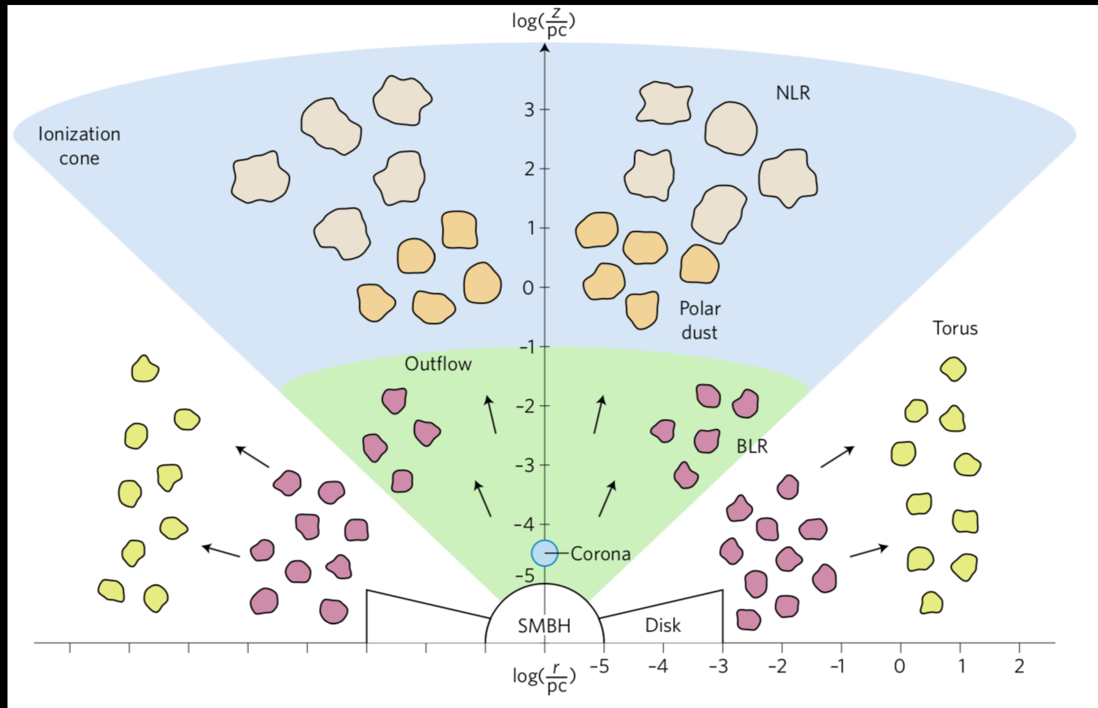


1993

Today

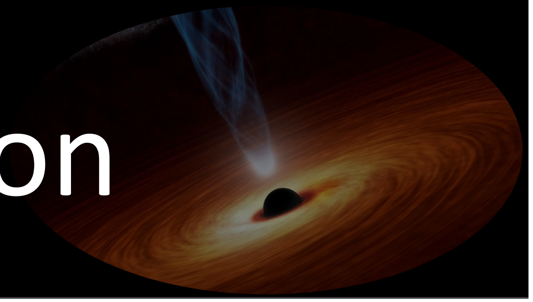


Antonucci (1993)

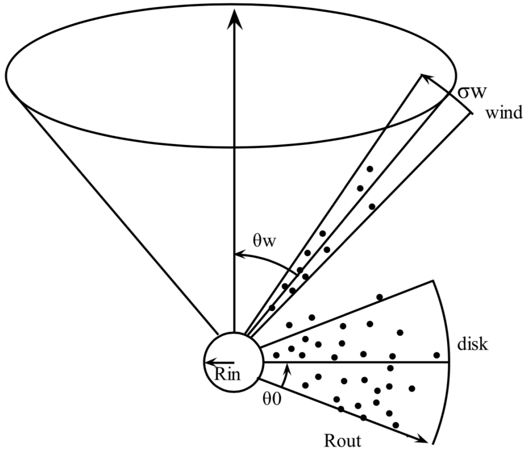


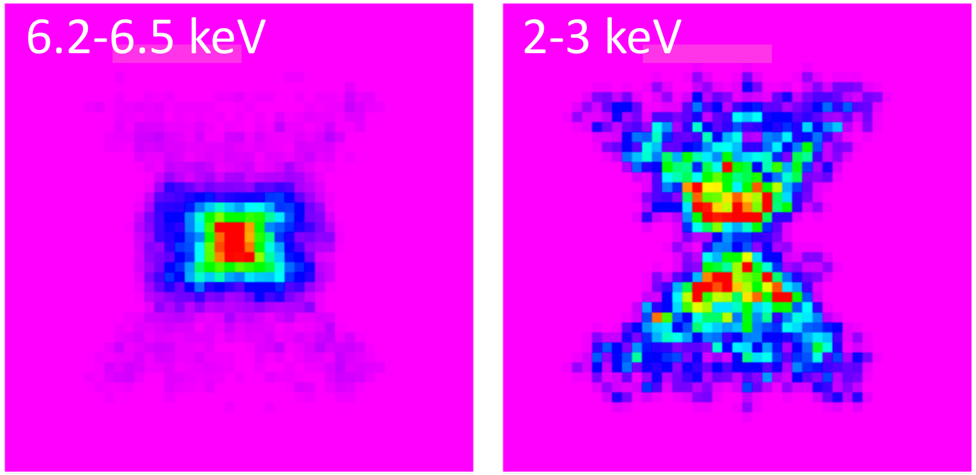
Ramos Almeida & Ricci (2017)
Nature Astronomy Review;
see also Hickox & Alexander (2018),
D. Alexander's review talk

1) Reprocessed radiation



ReflеX: X-ray spectra & imaging from arbitrary geometries (Paltani & Ricci 17)

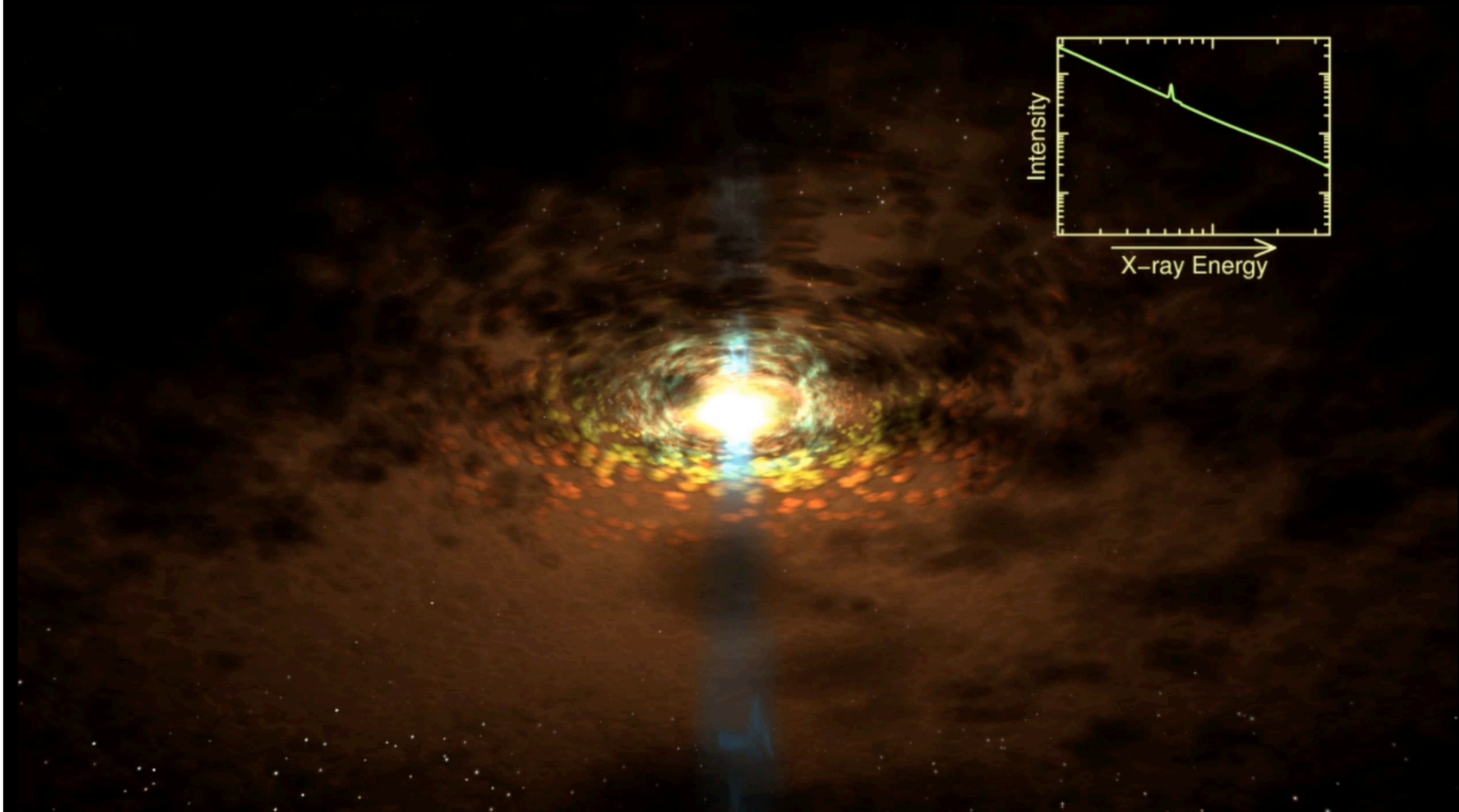




Liu, Hoenig, CR, Paltani submitted

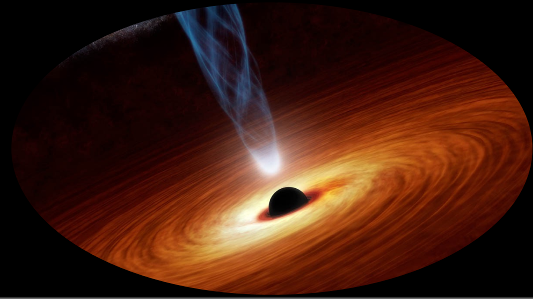
Murphy & Yaqoob 09, Ikeda+09, Brightman+11, Liu & Li 14, Furui+16, Balokovic+18, Tanimoto+19, Buchner+19.

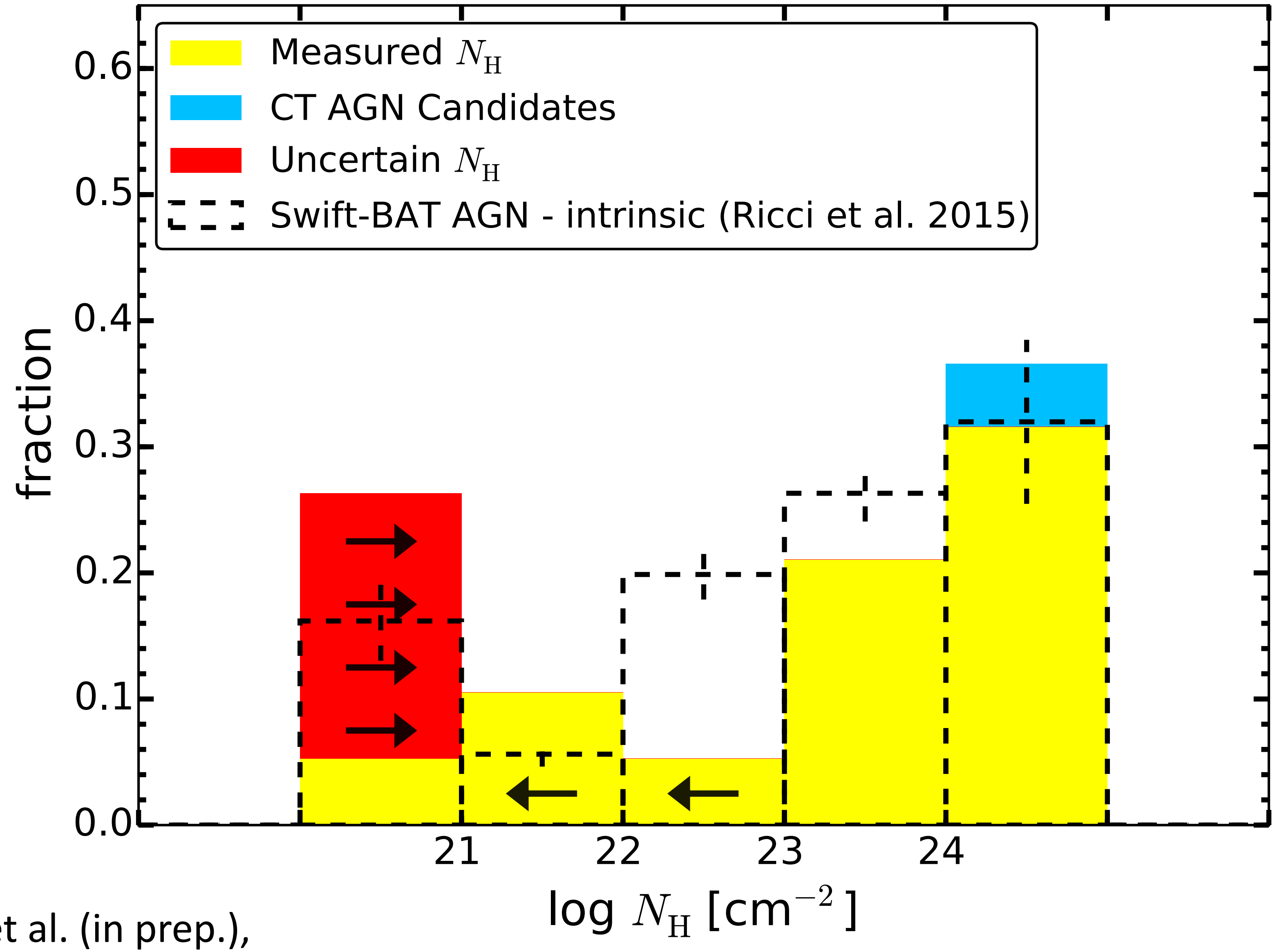
2) Obscuration in the X-ray band



Markowitz et al. (2014)

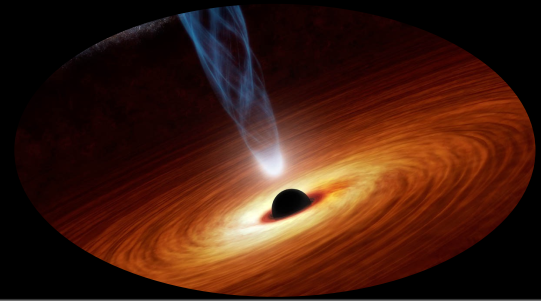
Obscured AGN at the time of NuSTAR and Swift/BAT

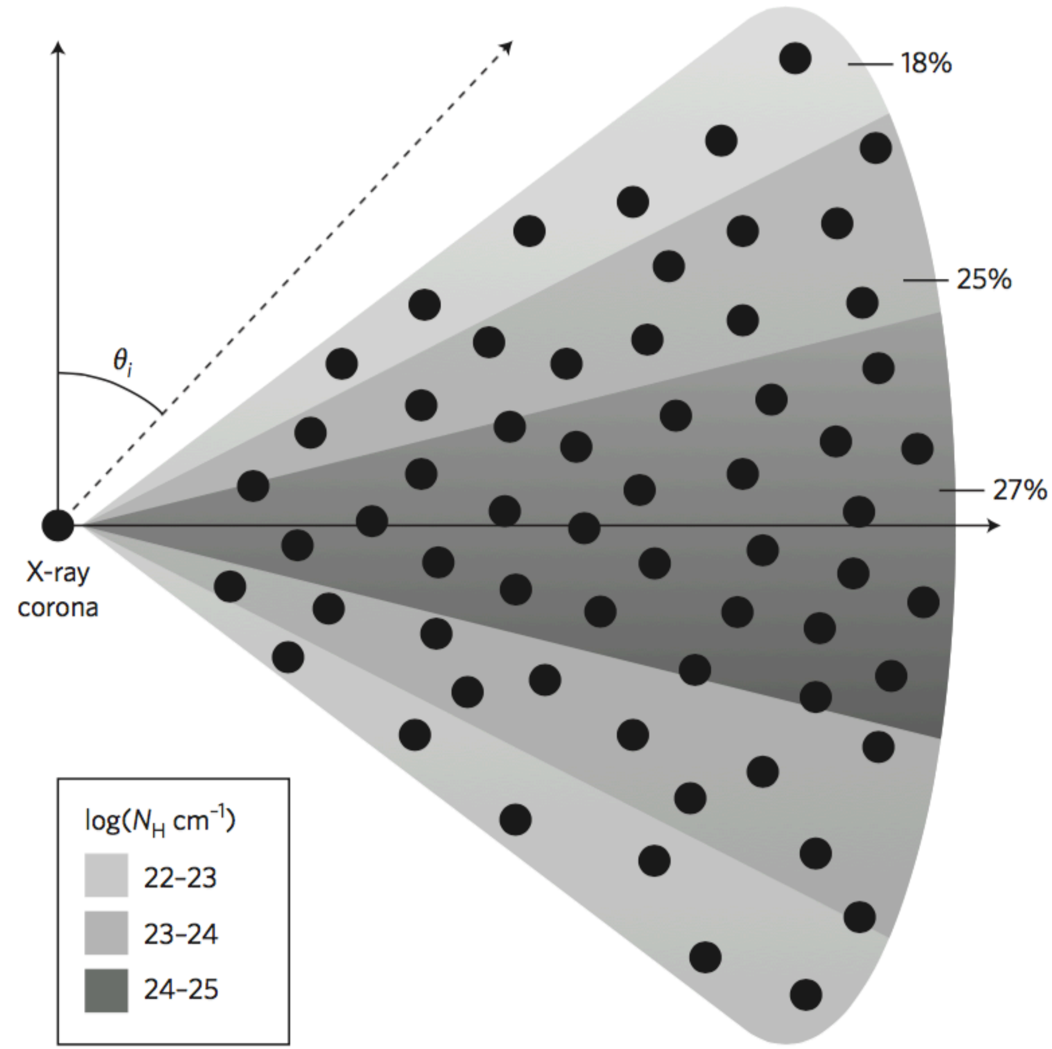




Annuar et al. (in prep.),
see also Burlon et al. (2011), Akylas et al. (2016). **See P. Boorman's talk, S. Marchesi's poster**

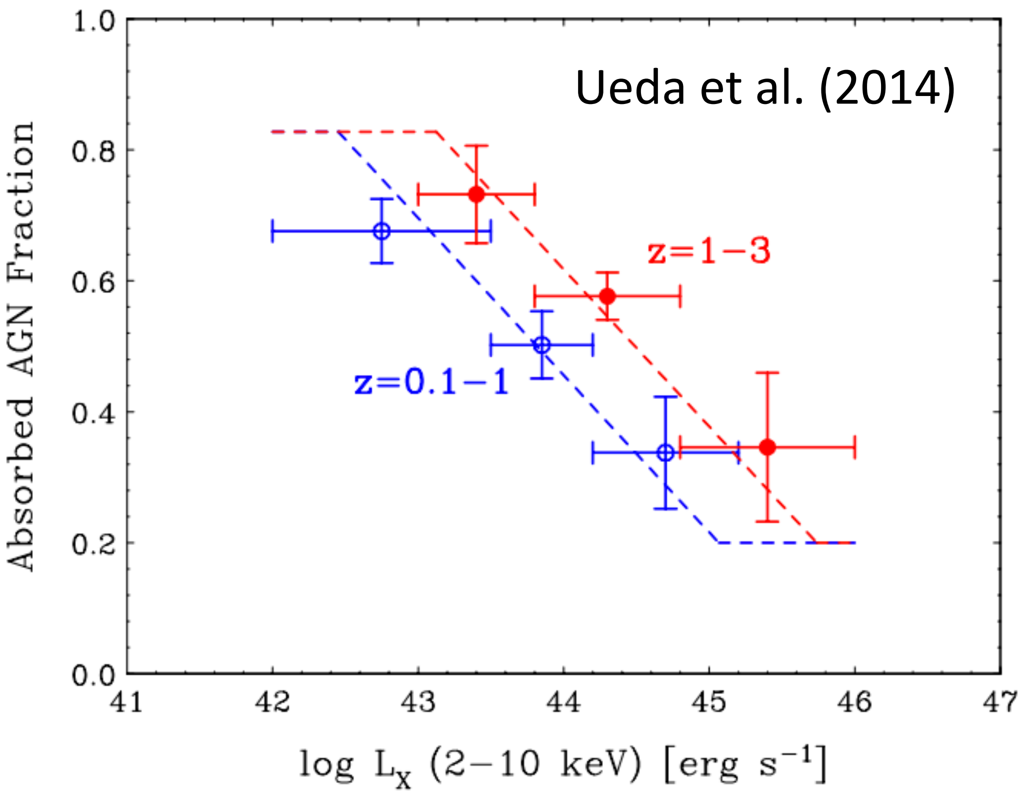
The covering factor of the obscuring material

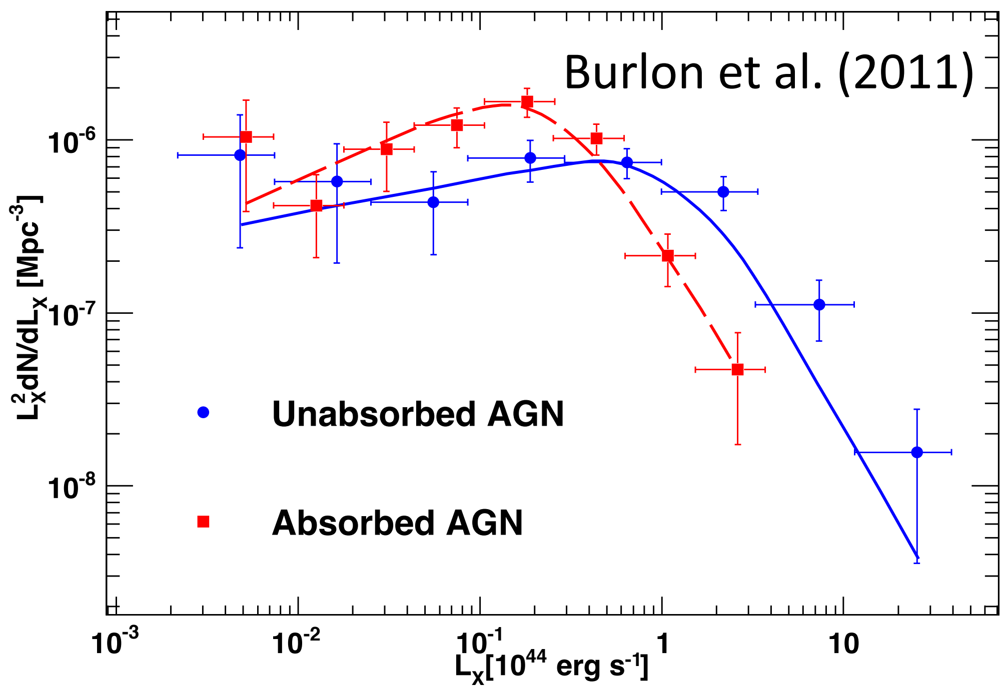




Ricci+15; Ramos Almeida & Ricci, Nature Astronomy 2017

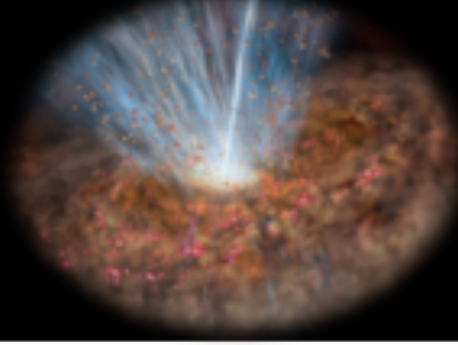
Luminosity dependence of obscuration - X-rays



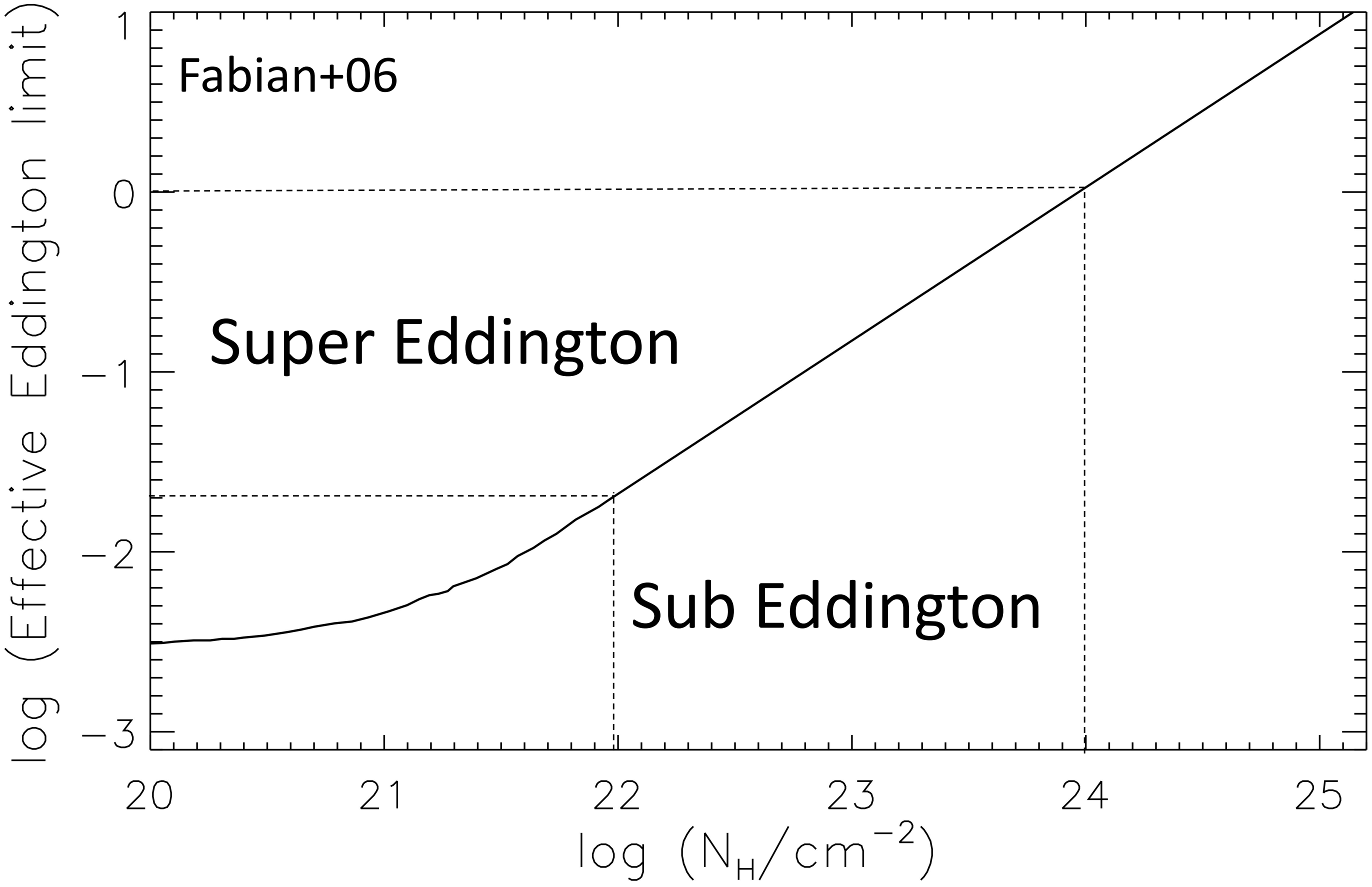


see also Ueda+03,11,14; LaFranca+05; Sazonov+07; Hasinger 08; DellaCeca+08; Beckmann+09; Brightman+11; Merloni+14; Buchner+15,17; Aird+15; Sazonov+16; Georgakakis+17; Mateos+17; Ricci+17

Radiation pressure on dusty gas



Effective Eddington limit $\lambda_{Edd}^{eff} = \sigma_T / \sigma_i(N_H;\xi)$



Fabian+06,08,09; See also Raimundo+10; Vasudevan+13; Cresci+15; Kakkad+16; Ishibashi+18. See also talk by W. Ishibashi

The BAT AGN Spectroscopical Survey (BASS)

A multi-wavelength study of ~1000 local (z=0.055) AGN:

X-ray, optical, near-IR, mid-IR, far-IR, radio observations

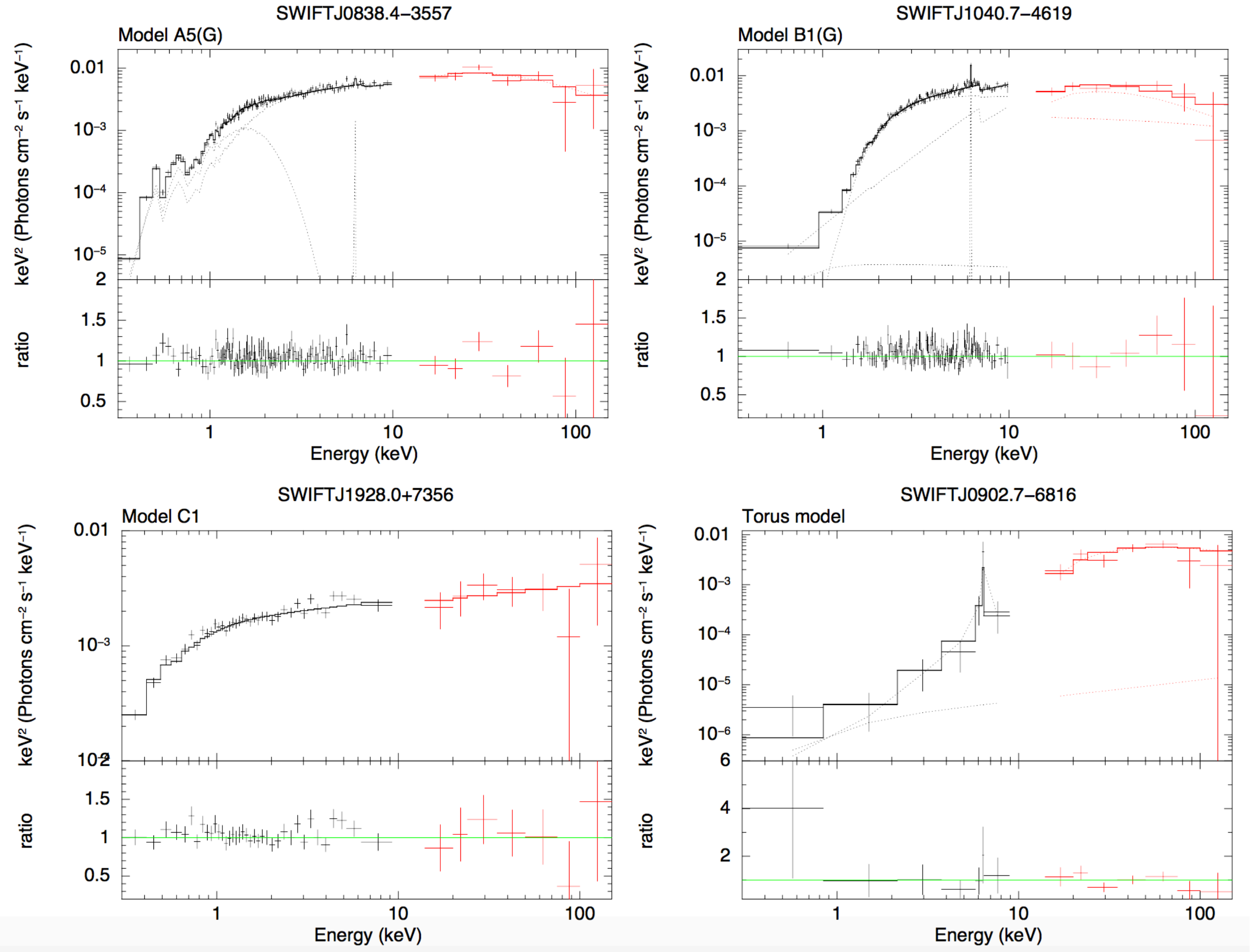
http://www.bass-survey.com

BASS
BAT AGN Spectroscopic Survey

Logo by: K. Oh (Kyoto U.)

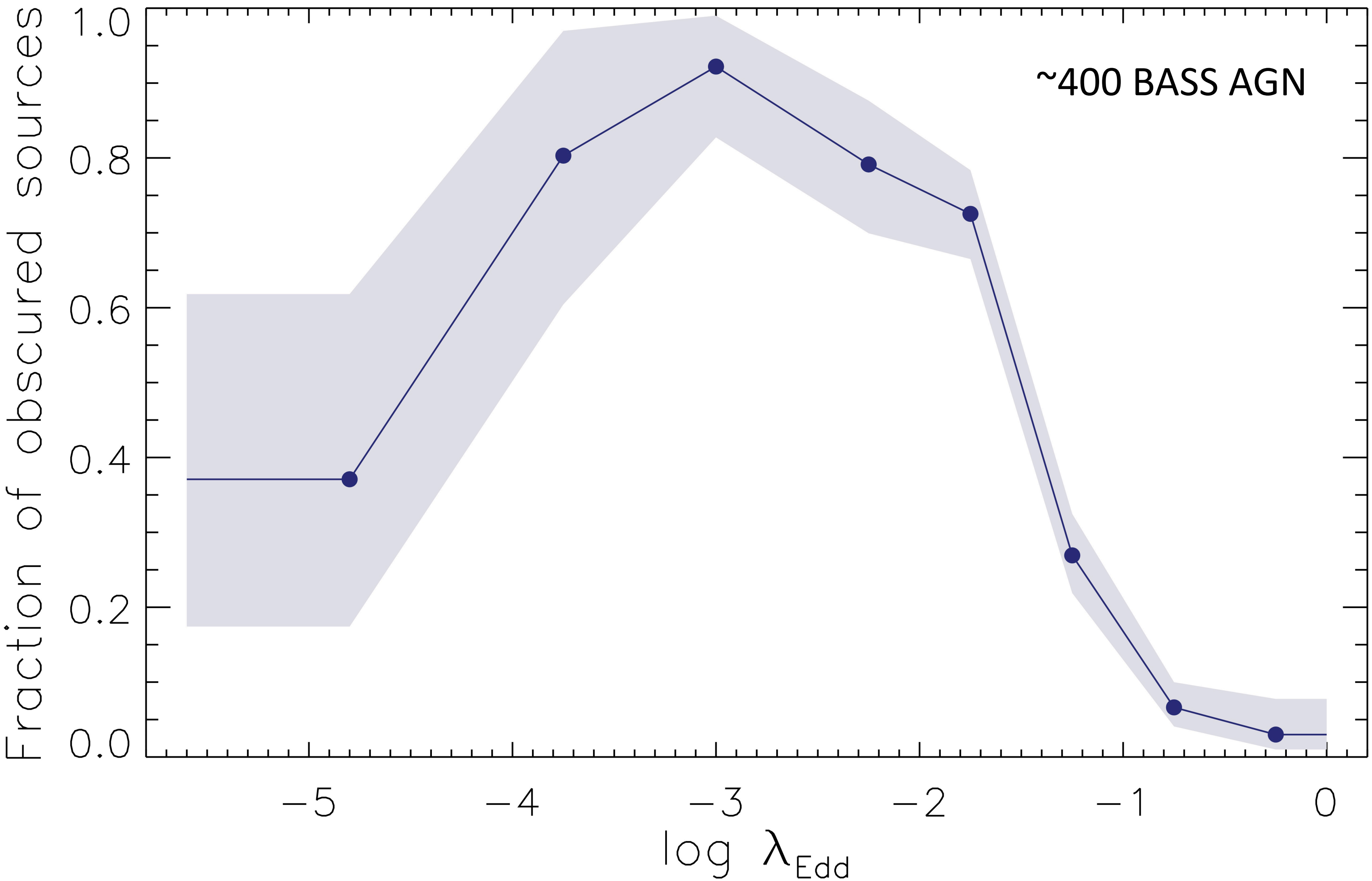
DR1: Koss+17; Ricci+17d; Lamperti+17; Ichikawa+17
DR2 coming up very soon

X-ray spectroscopy of BAT AGN



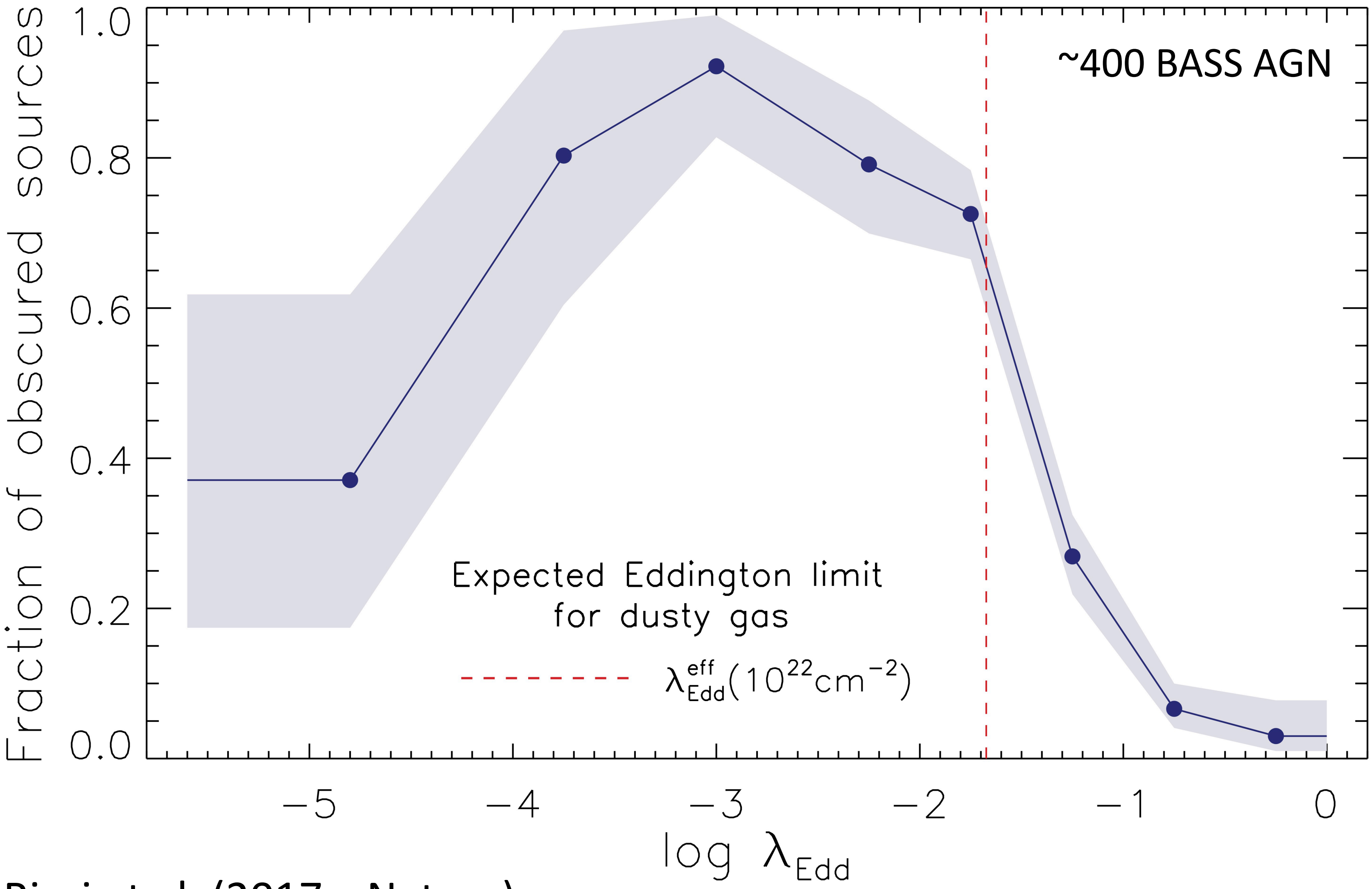
Ricci et al. 2017d, ApJS, ***See Poster 423 (Kriti Gupta)***

Obscuration vs Eddington ratio



Ricci et al. (2017c, Nature)

Obscuration vs Eddington ratio

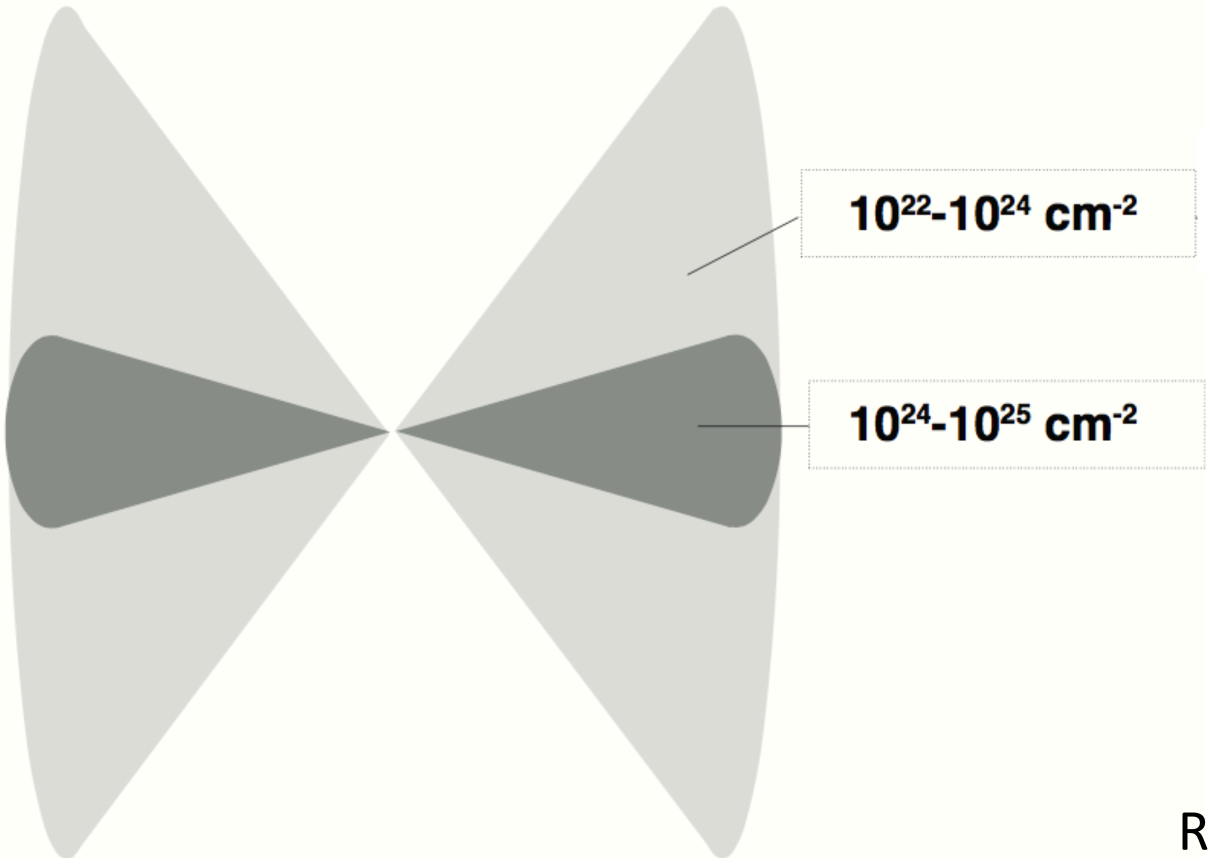


Ricci et al. (2017c, Nature)

Radiation-regulated unification

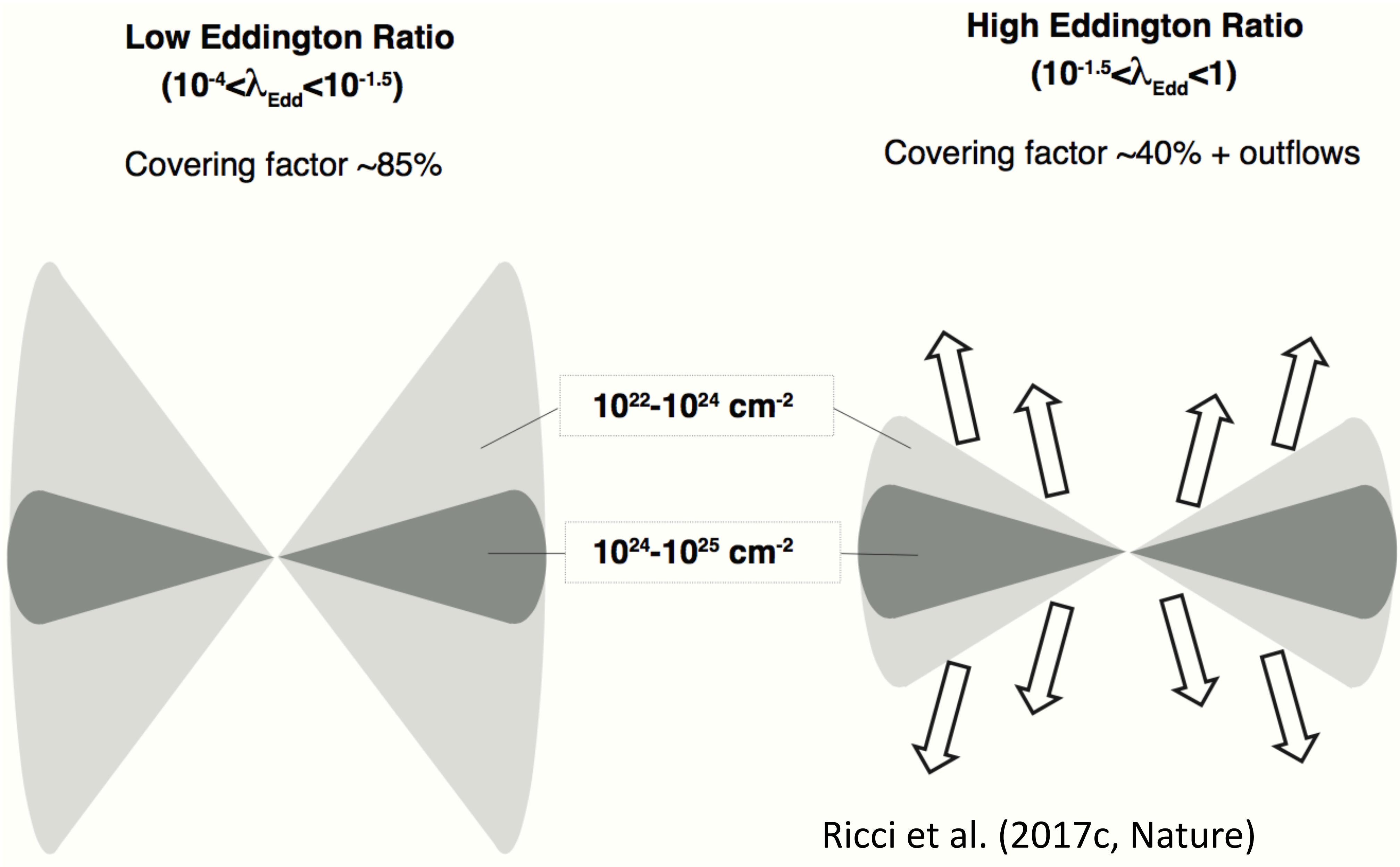
Low Eddington Ratio
($10^{-4}<\lambda_{Edd}<10^{-1.5}$)

Covering factor ~85%



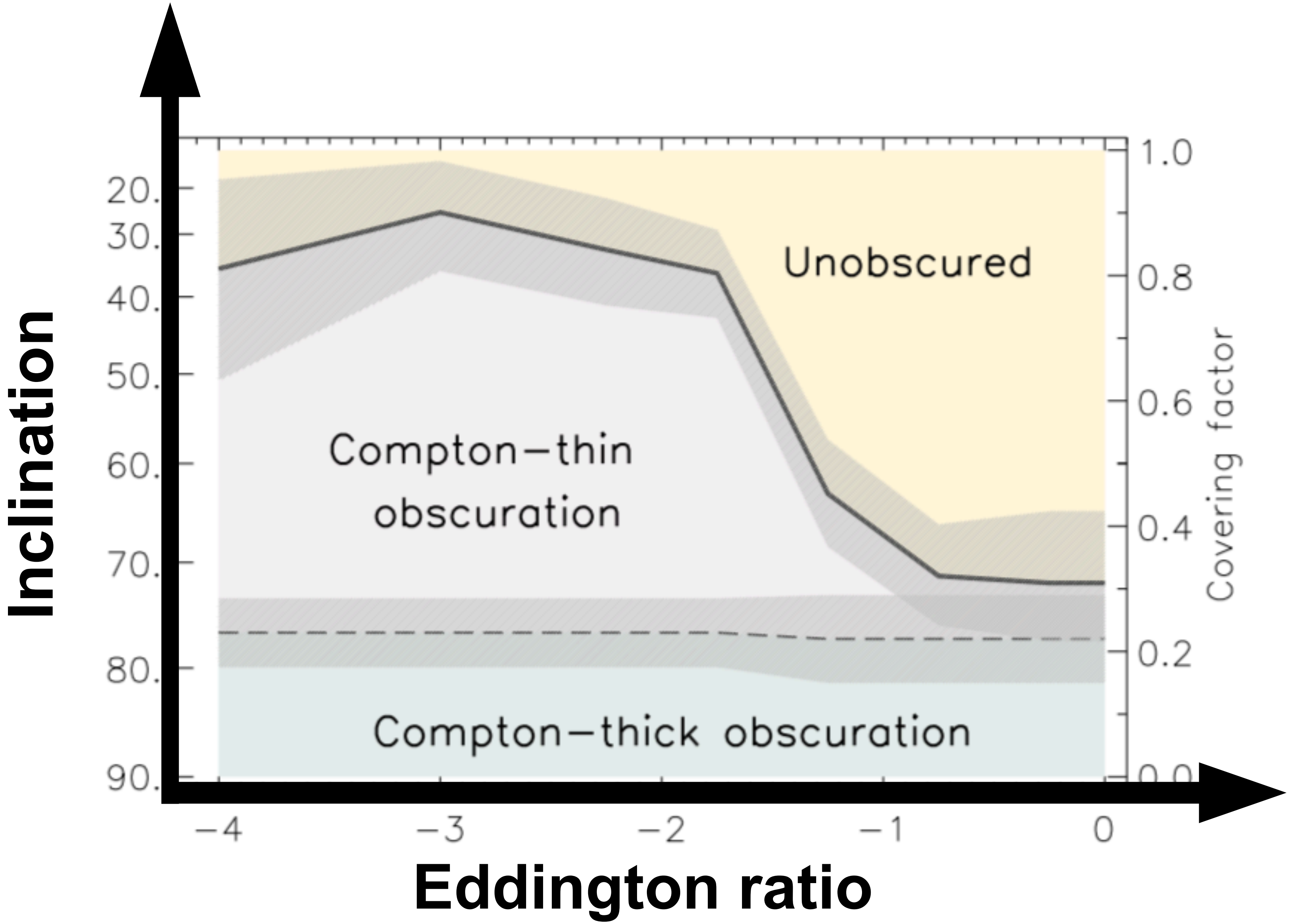
Ricci et al. (2017c, Nature)

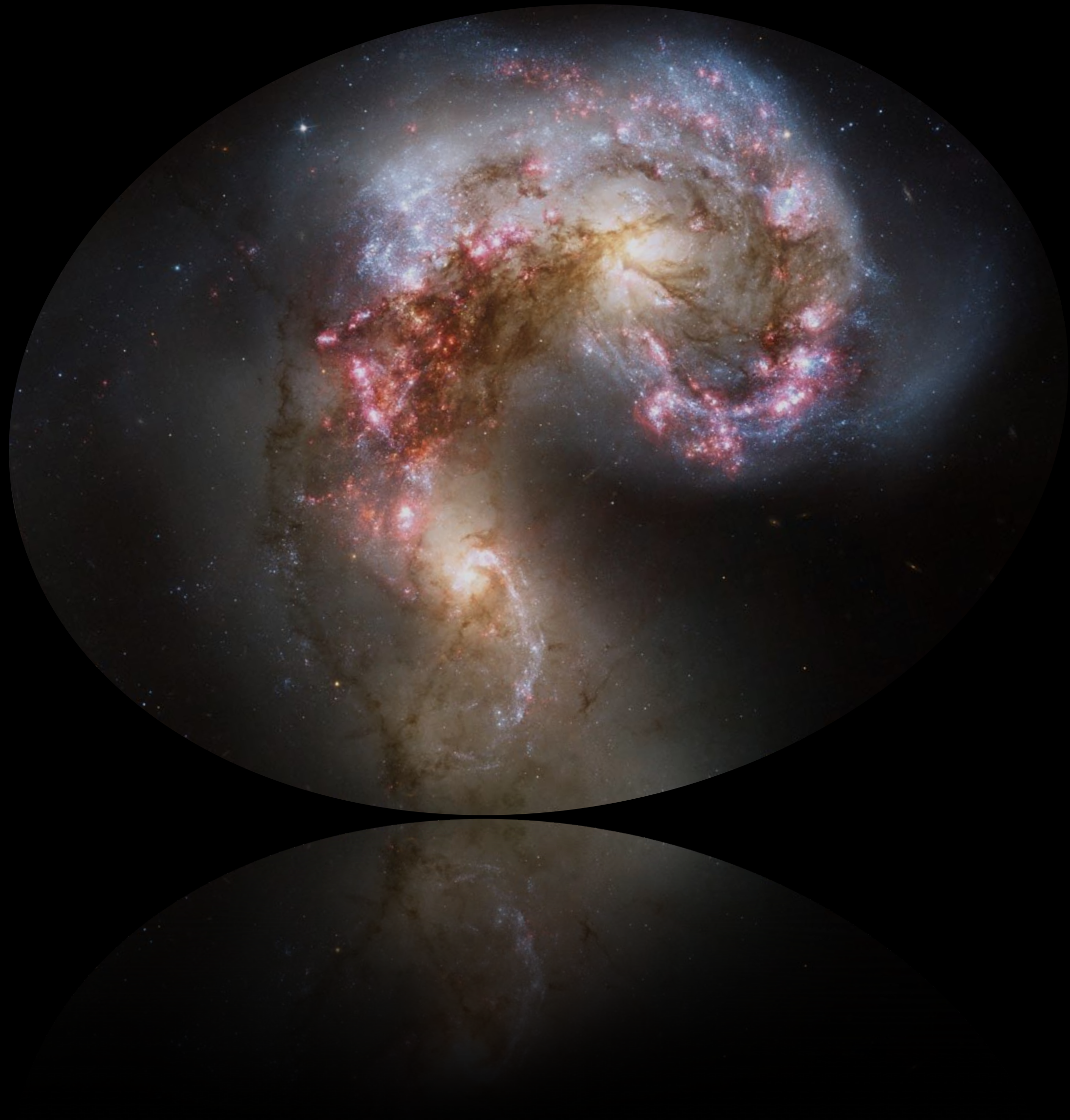
Radiation-regulated unification



Ricci et al. (2017c, Nature)

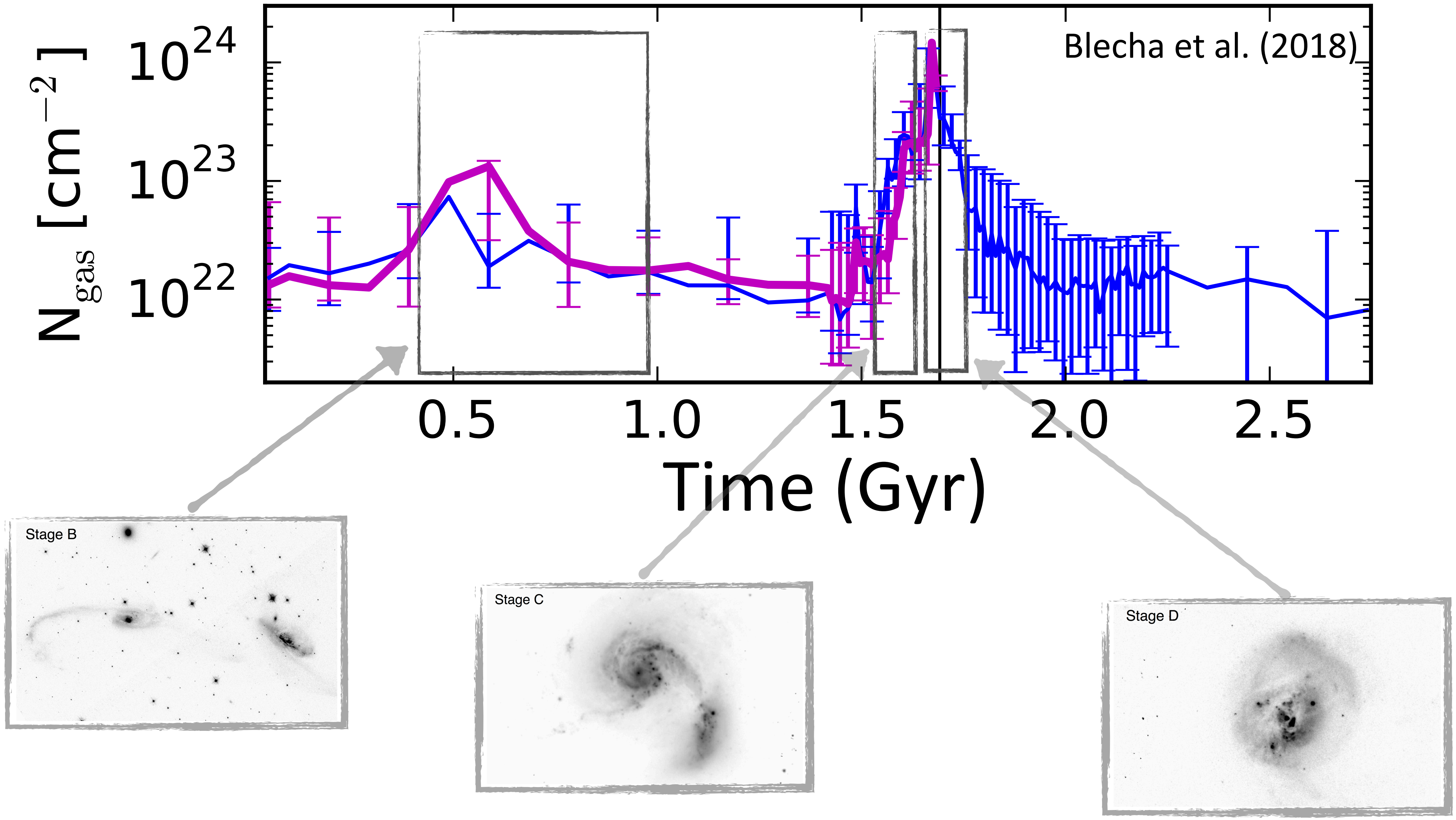
Radiation-regulated unification



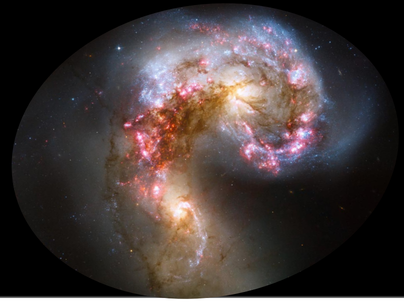


The influence of mergers

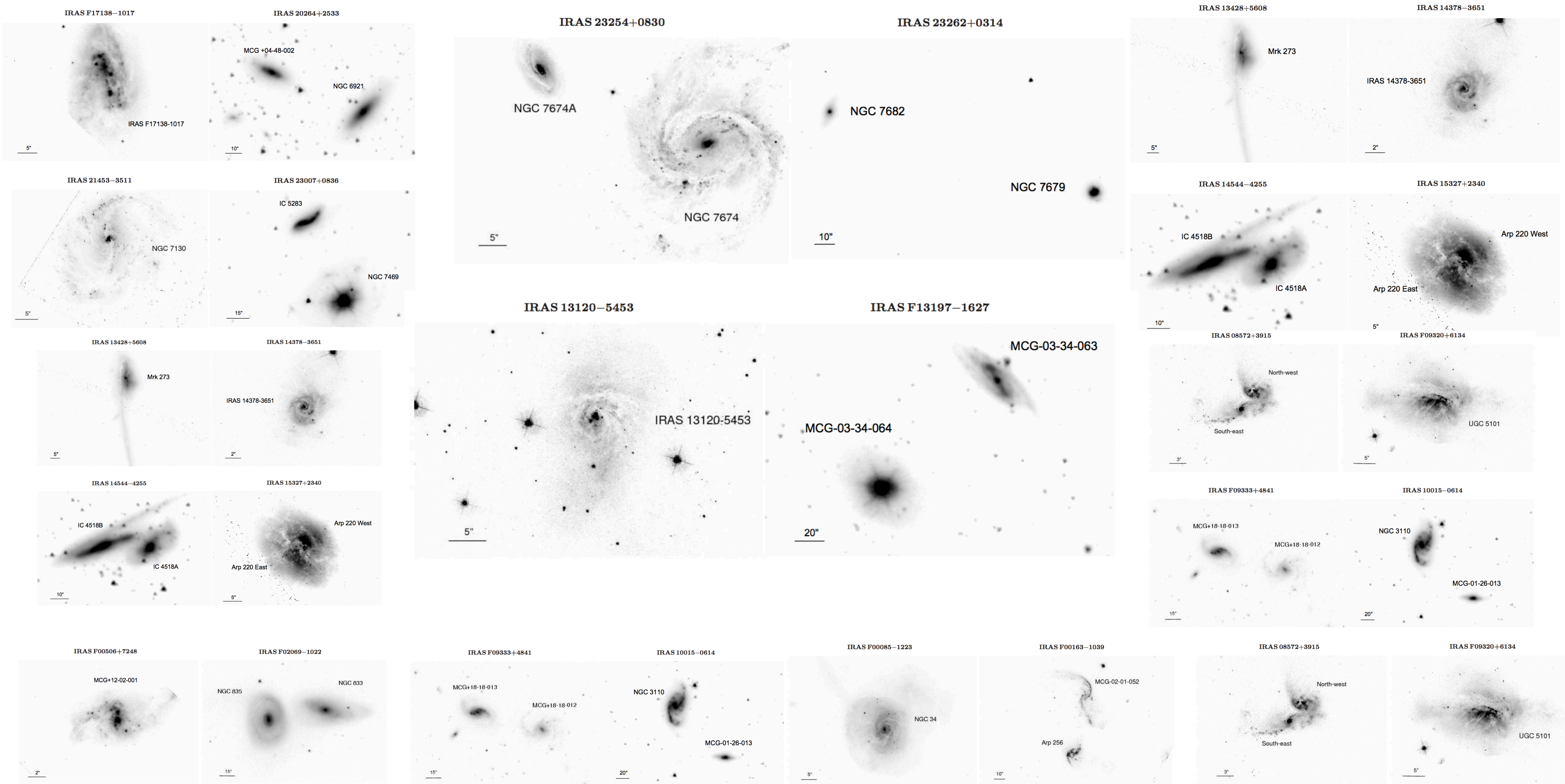
Galaxy mergers and obscuration



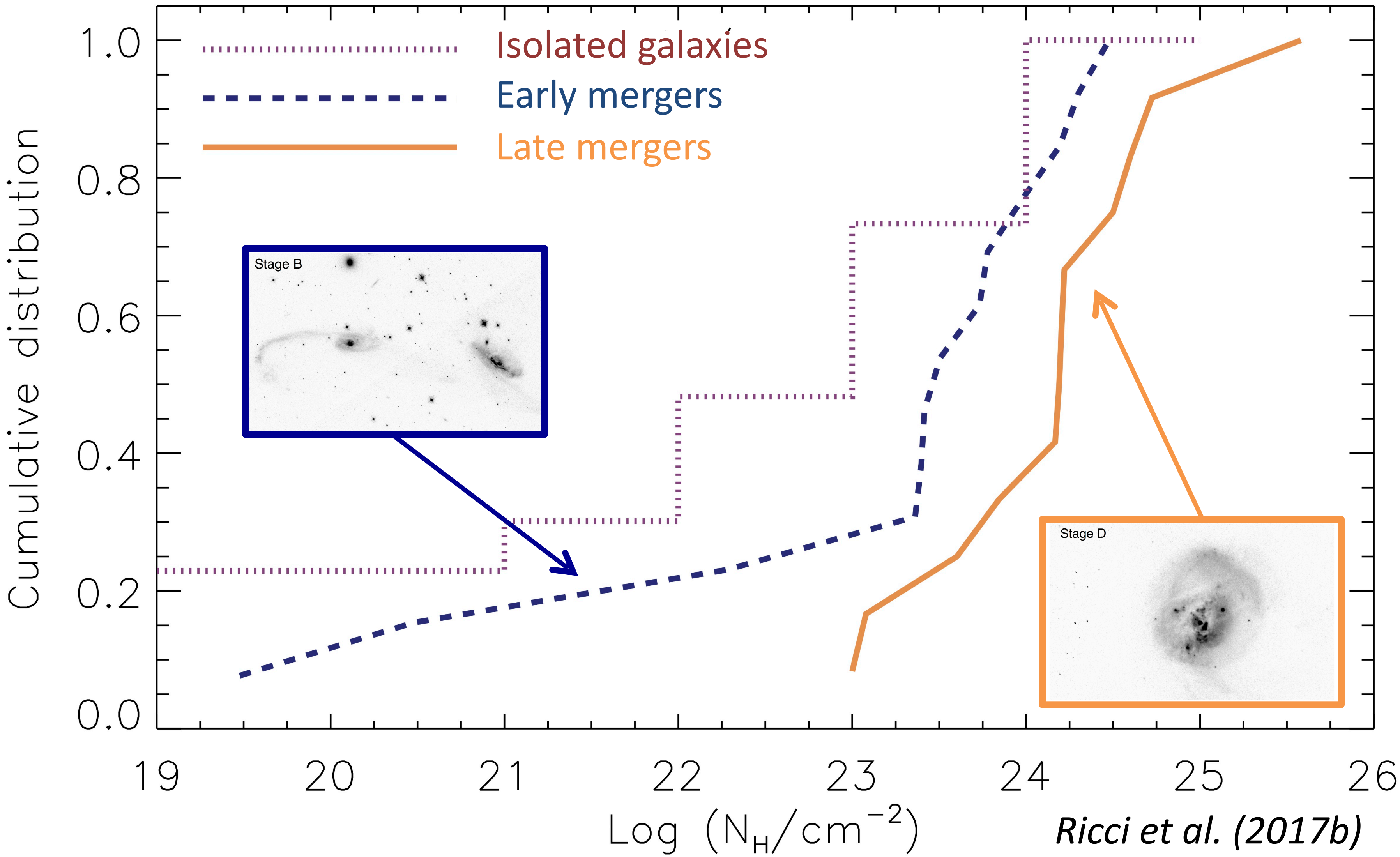
Obscuration properties of mergers



NuSTAR observations of 32 merging galaxies from the GOALS sample $z \simeq 0$



Obscuration properties of mergers



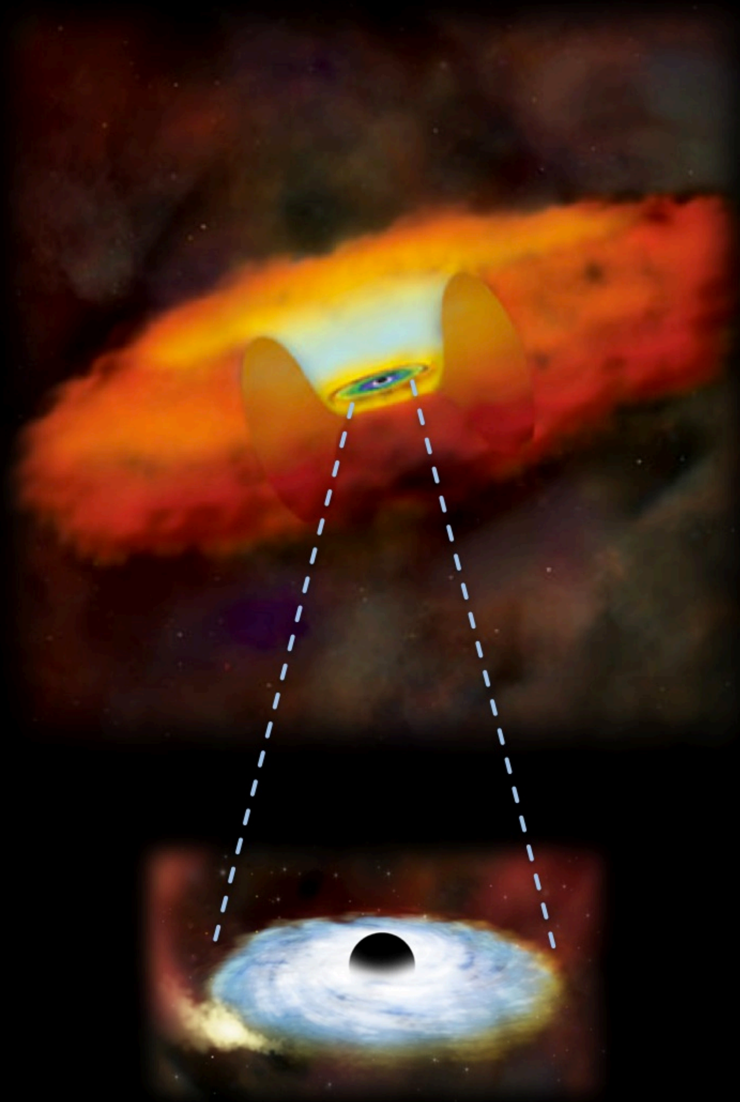
Ricci et al. (2017b)

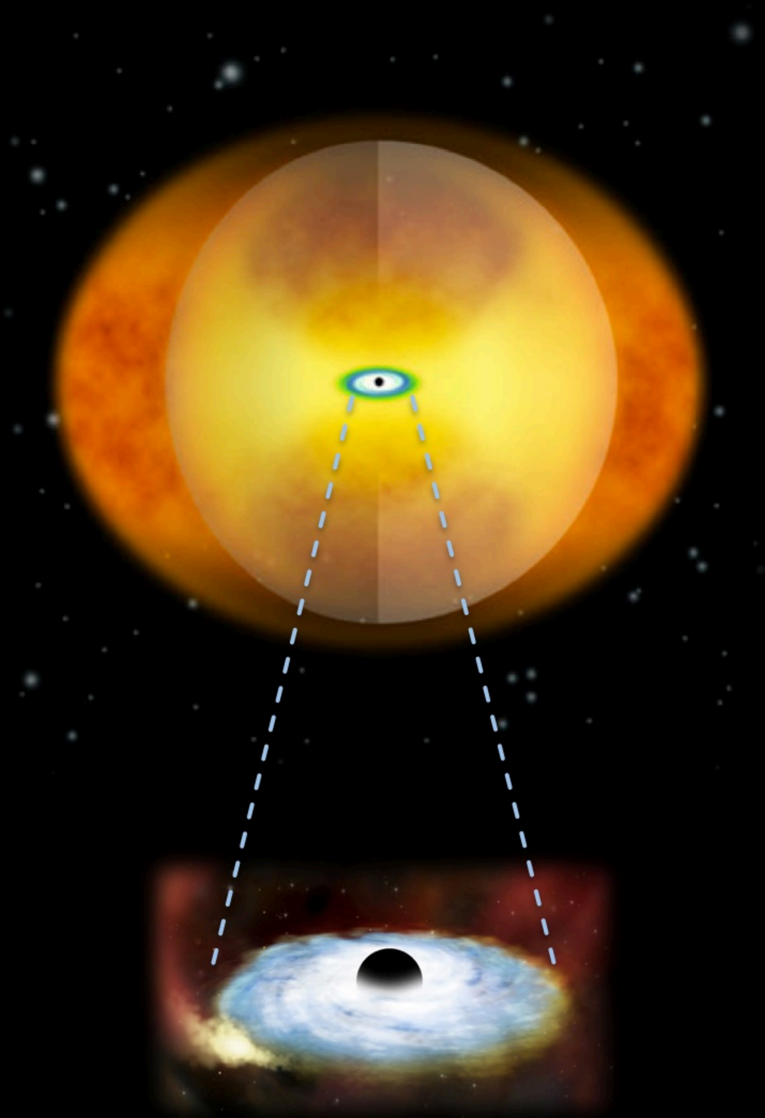
See also Kocevski et al. (2015), Lanzuisi et al. (2015), Del Moro et al. (2016), Koss et al. (2016), De Rosa et al. (2018), Koss et al. (2018)

Isolated galaxies

Late stages of merger

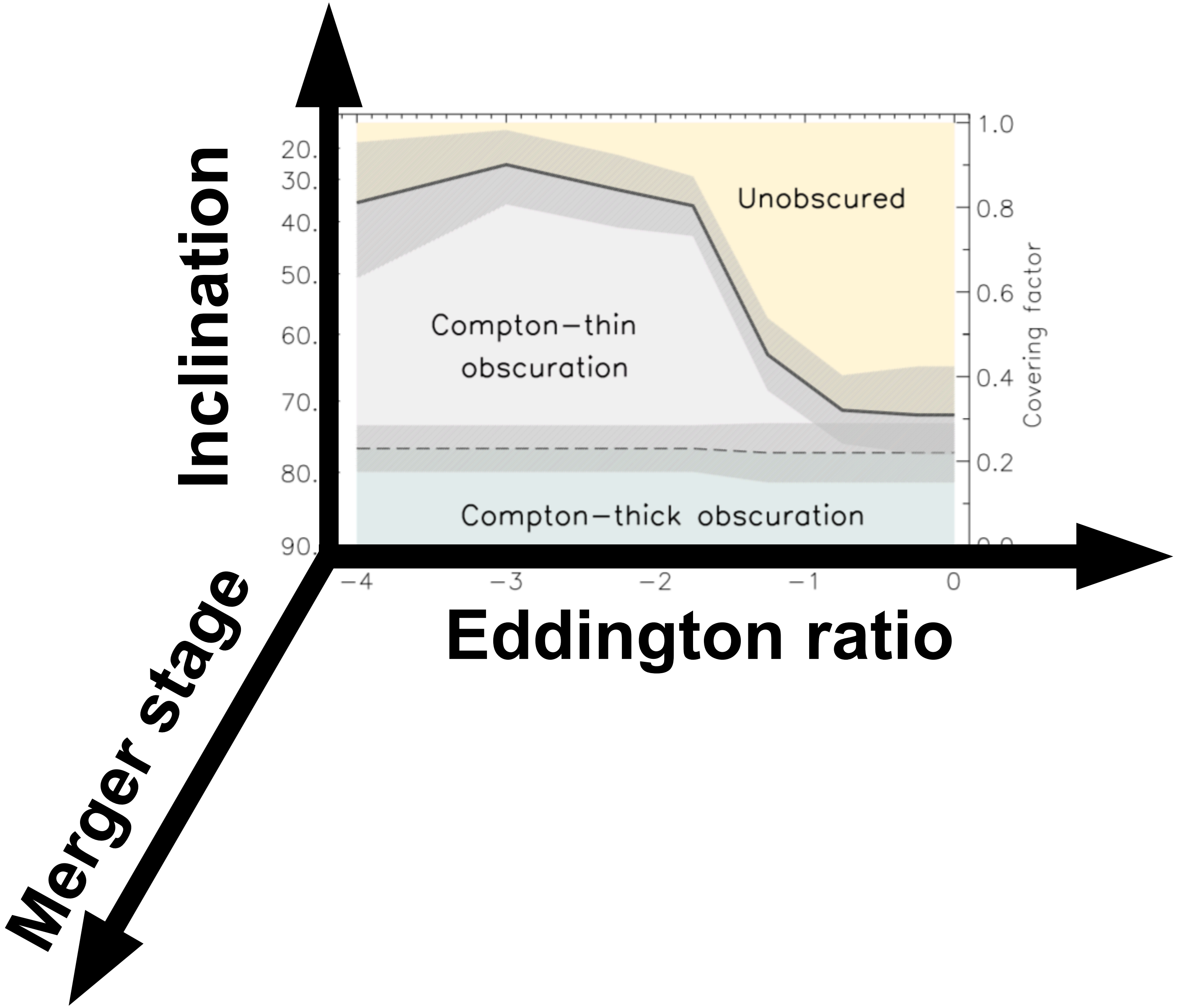
	Isolated galaxies	Late stages of merger
Log N_H> 23	52±4%	95±5%
Log N_H> 24	27±4%	65±12%





From the NASA press release; Credits: NAOJ/NASA/CXC/M. Weiss (Imanishi et al. 2006)

The drivers of obscuration



Summary

- X-ray surveys can show us what are the typical properties of the obscuring material

- Radiation pressure regulates the amount of obscuring material

- Galaxy interactions are the other main ingredient regulating the amount of circumnuclear material.