What do we learn from intrinsically weak BLRs in AGN?

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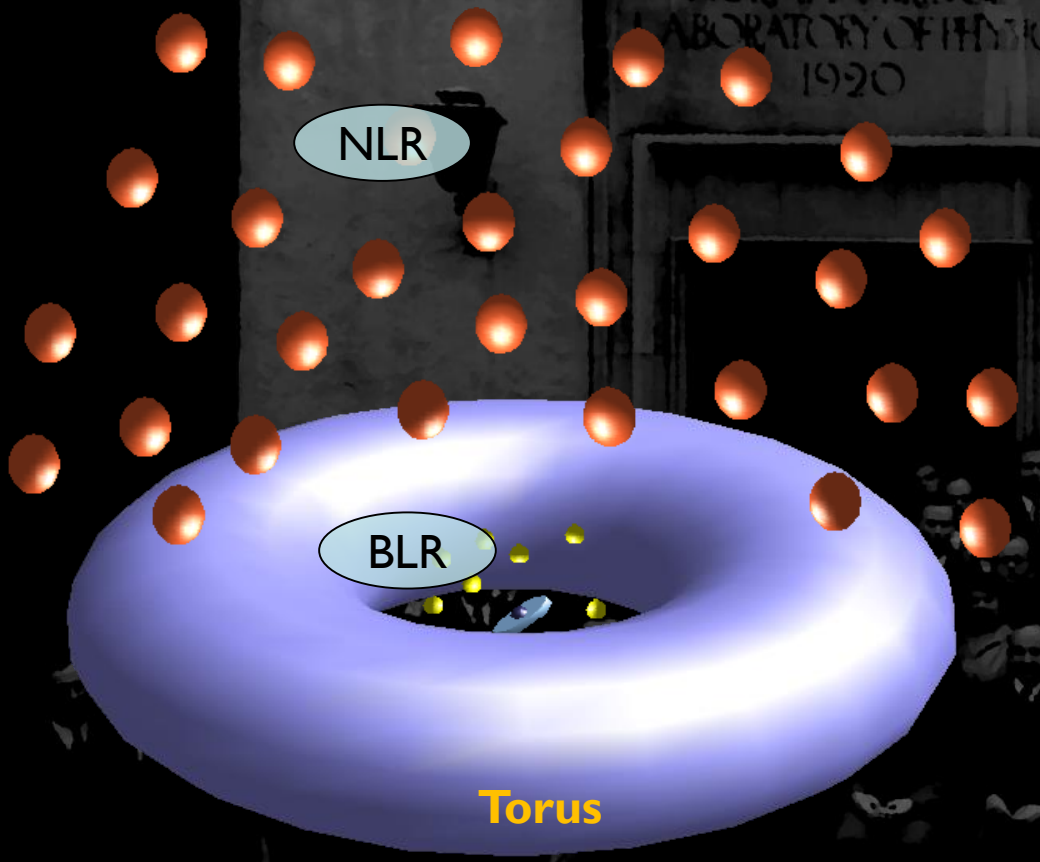
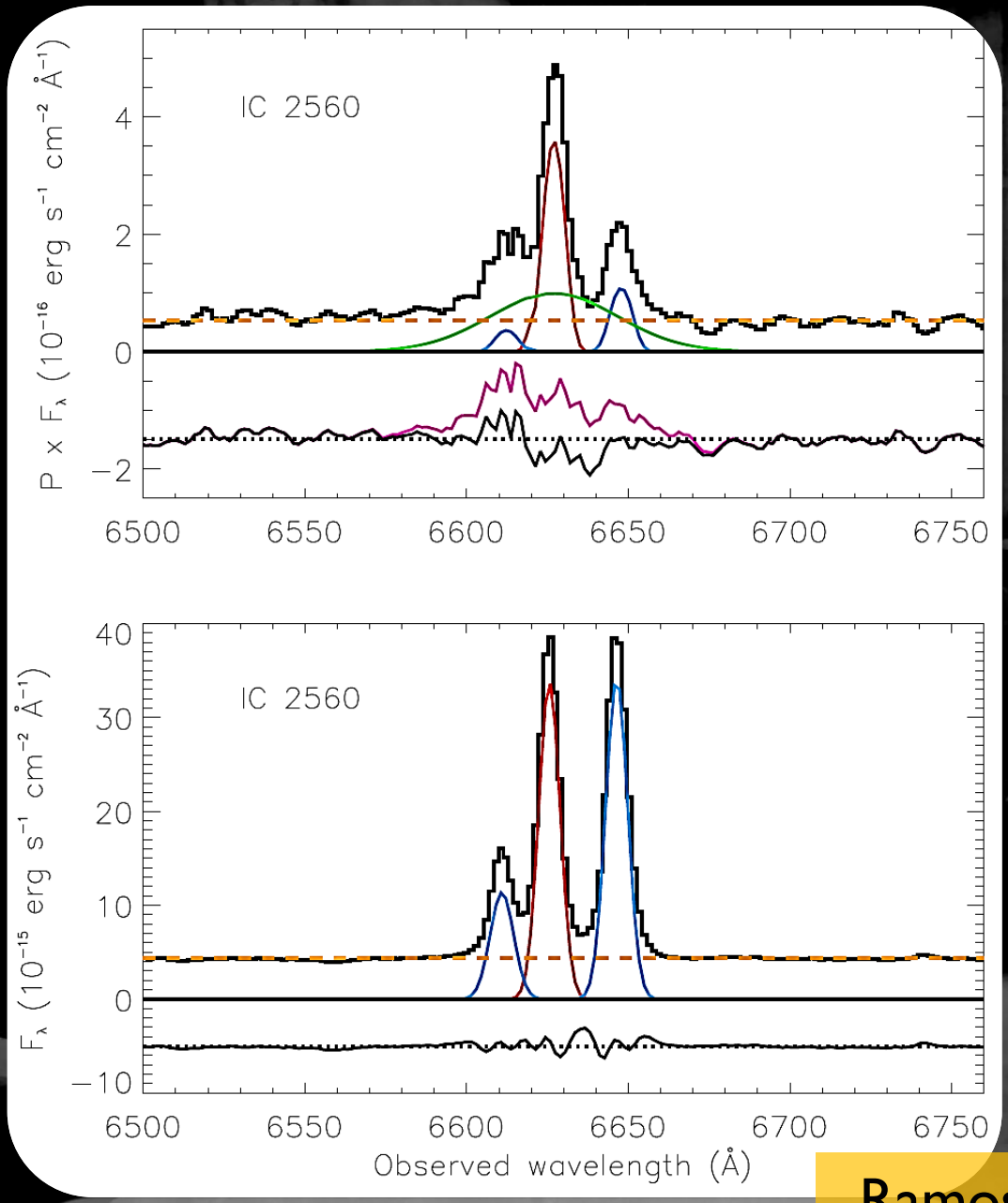
The Unification Model view



In standard Unified Models (e.g. Antonucci 1993) type 1 and type 2 AGN have no intrinsic physical differences, their classification being instead determined by the presence or absence of absorbing material along the line of sight to the object

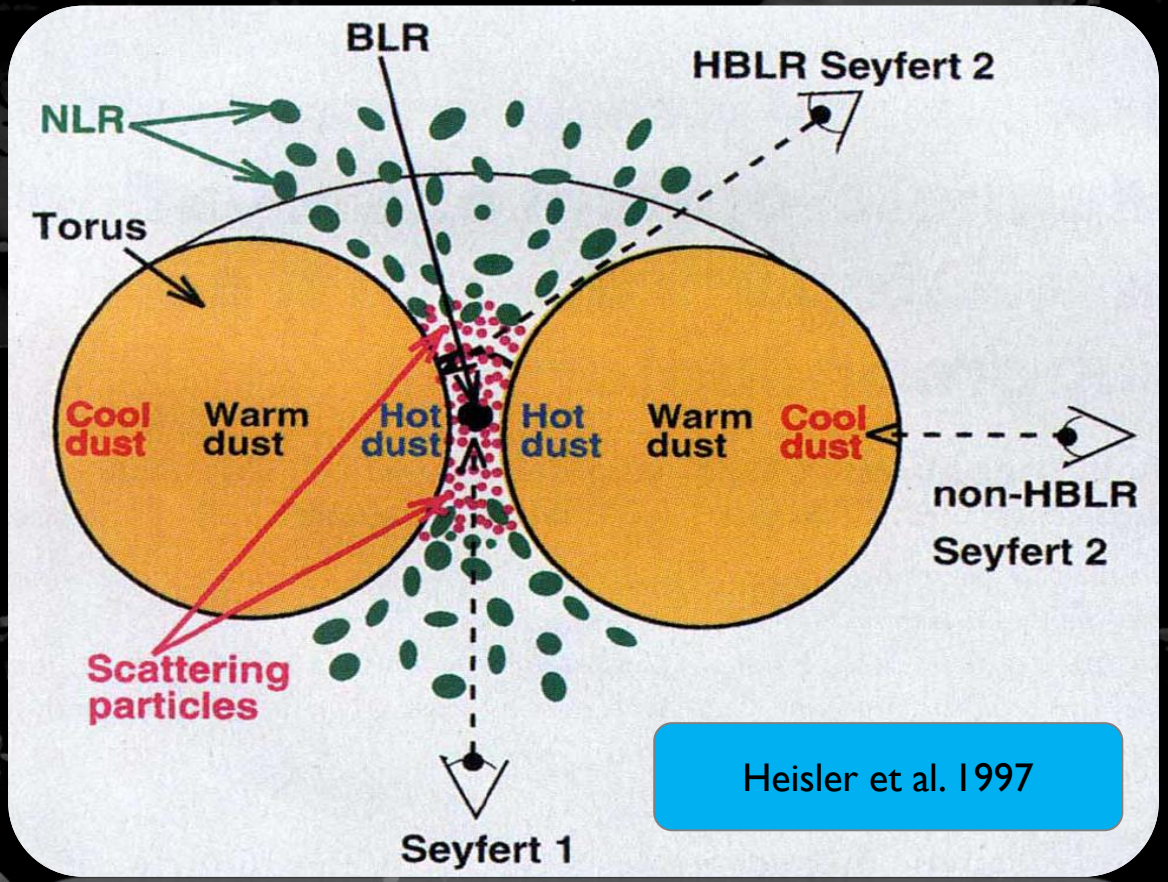
This scenario has been extremely successful, although some additional ingredients are needed in order to take into account all the observational evidence (e.g. Bianchi, Maiolino & Risaliti 2012)



Among the failed expectations of the Unification Model is the lack of broad optical lines in the polarized spectra of about half of the brightest Seyfert 2 galaxies, even when high-quality spectro-polarimetric data are available (e.g. Tran 2001, 2003)

Ramos Almeida et al. 2016

NHBLR Sy2s may be associated with inefficient (low covering factor/column density) or obscured mirrors (Heisler et al. 1997)

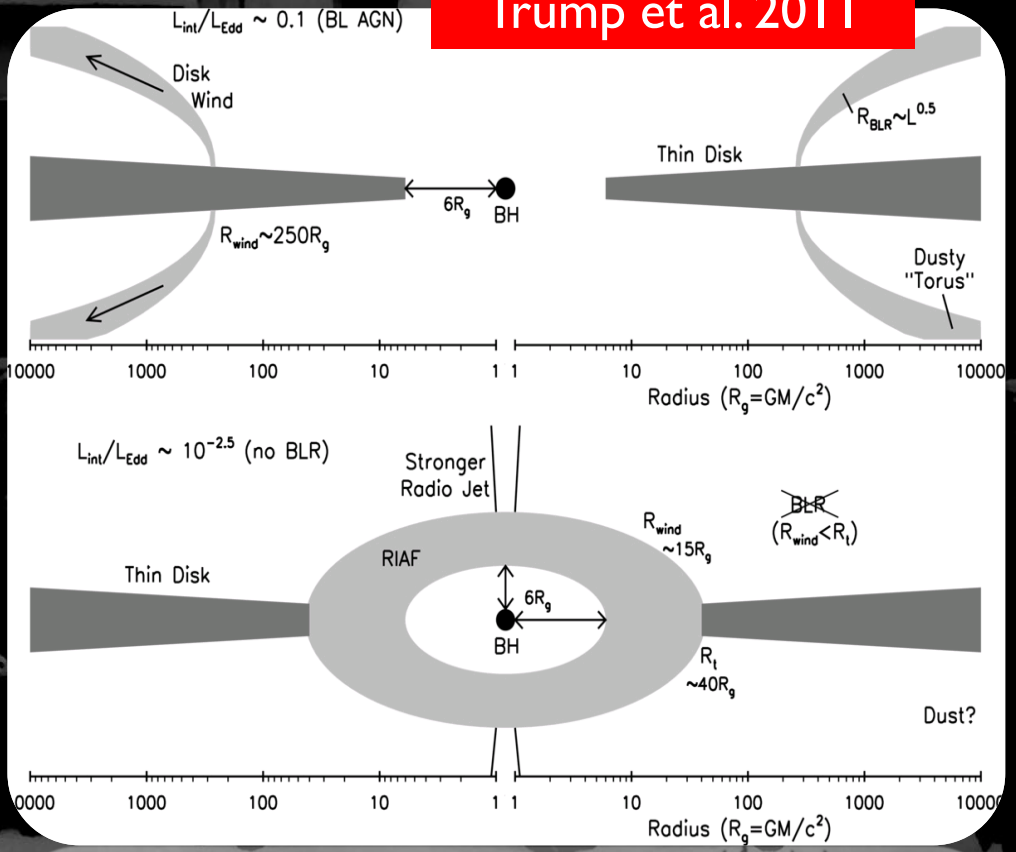


A stronger dilution from the host galaxy or from a circumnuclear starburst can also make the detection of polarized broad lines harder (Alexander 2001, Gu et al. 2001)

A number of Sy2s without polarized broad lines may intrinsically lack a BLR

If the BLR is part of a disk wind, it cannot form if its launching radius falls below a critical radius:
the innermost orbit of a classic Shakura & Sunyaev (1973) disk (Nicastro 2000), or the transition radius to a radiatively inefficient accretion flow (Trump et al. 2011)

Trump et al. 2011

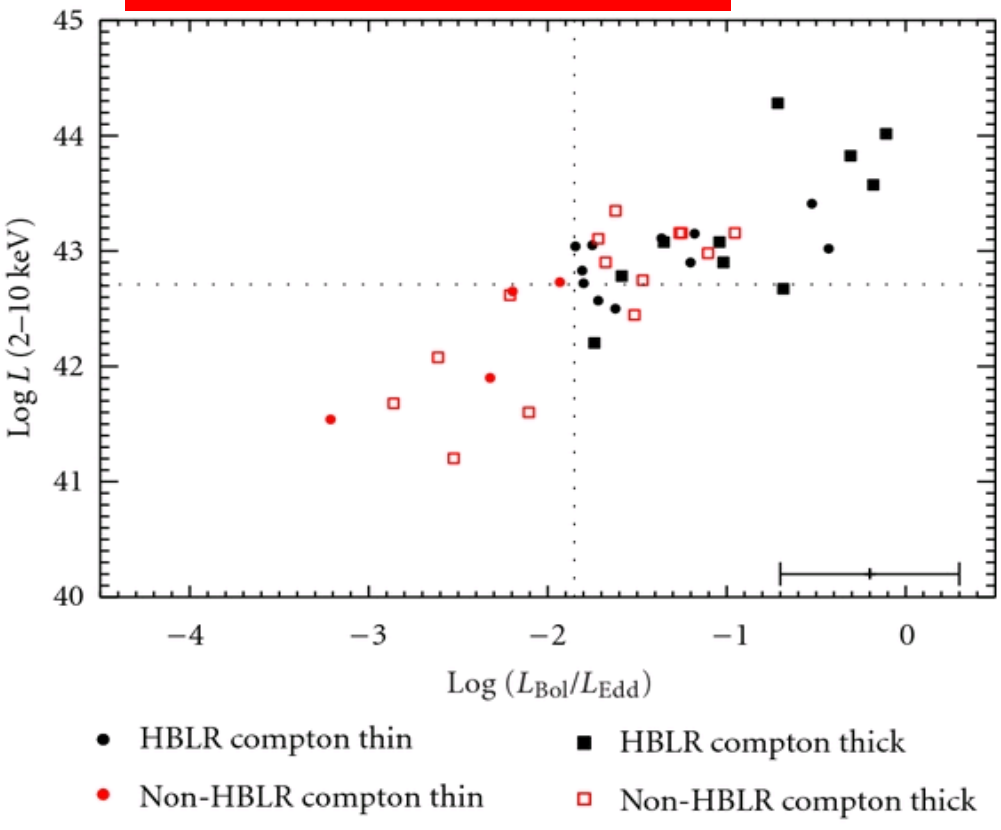


No BLR is formed for Eddington rates lower than a critical value ($\sim 2 \times 10^{-3}\ M_8^{-1/8}$)

Broad optical lines are generally absent in the spectra in polarized light of Seyfert 2s with low Eddington rates
(Nicastro et al. 2003; Bian & Gu 2007; Wu et al. 2011)

The threshold in Eddington rate is generally found at ~0.01, both for optical/Xray surveys (Trump et al., 2011) and spectro-polarimetric data (Marinucci et al., 2012)

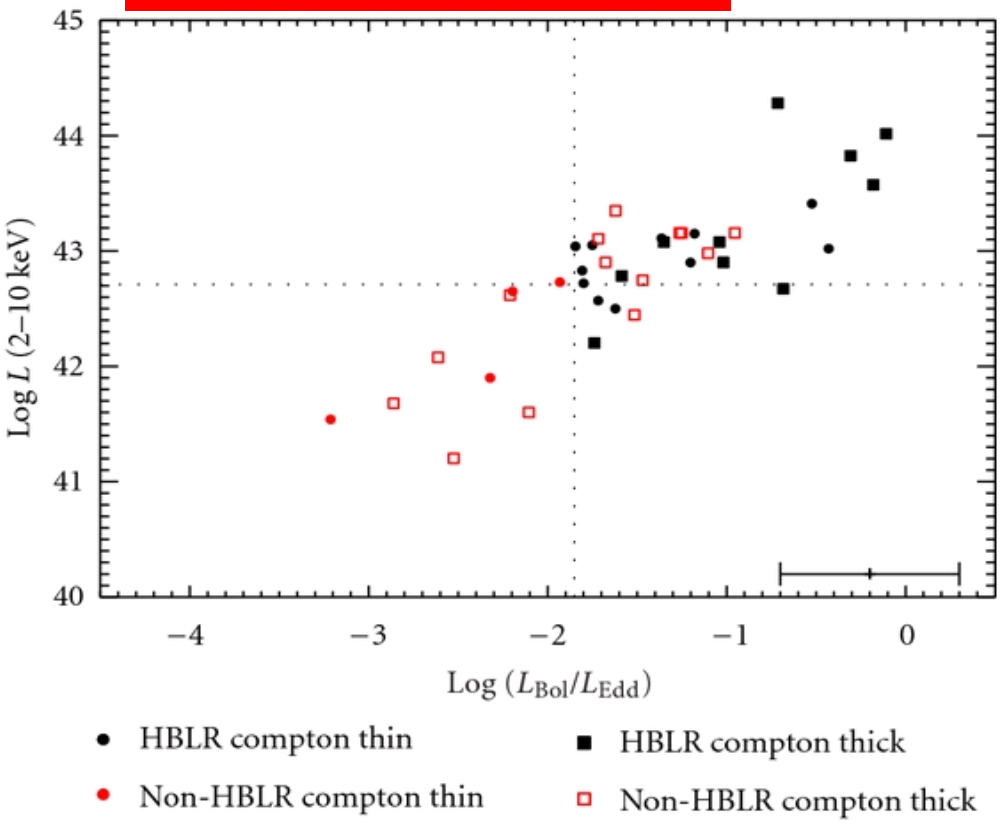
Marinucci et al. 2012

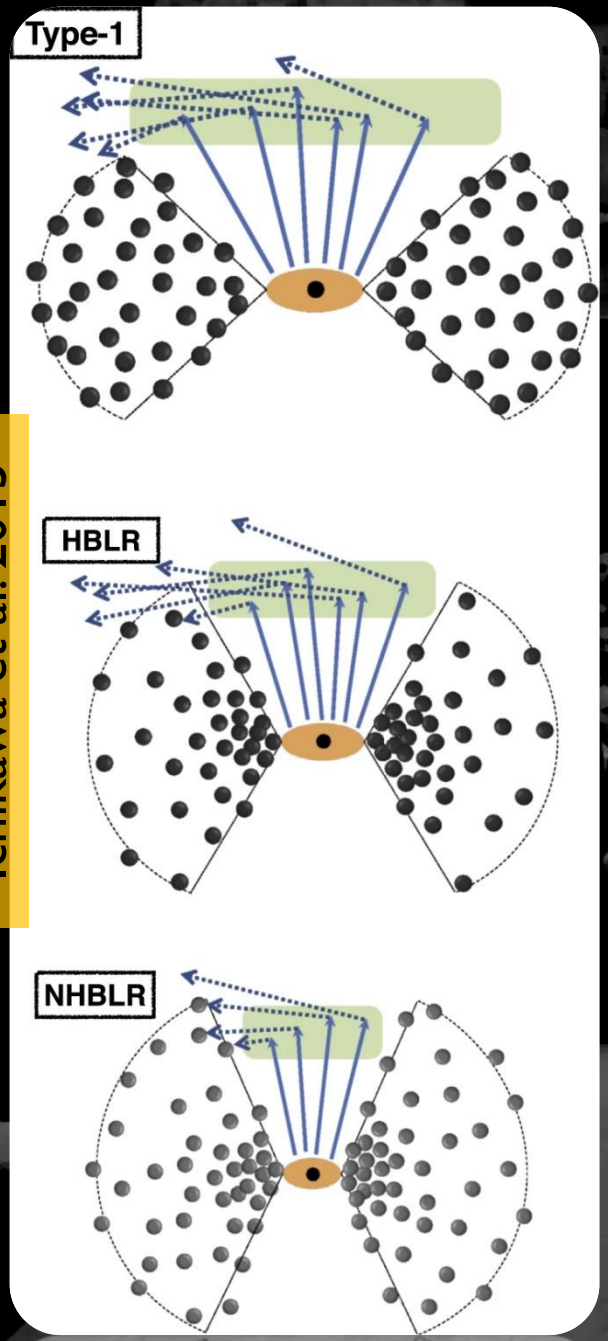


Below this threshold no broad lines are detected (either in total or polarized light), but **above the threshold the BLR still cannot be detected in many Sy2s**

These sources should possess a BLR, something prevents us from observing it: more inclined sources (with respect to the line of sight) should intercept a larger column density of the torus and may obscure the medium responsible for the scattering of the BLR photons (Shu et al. 2007)

Marinucci et al. 2012





Ichikawa et al. 2015

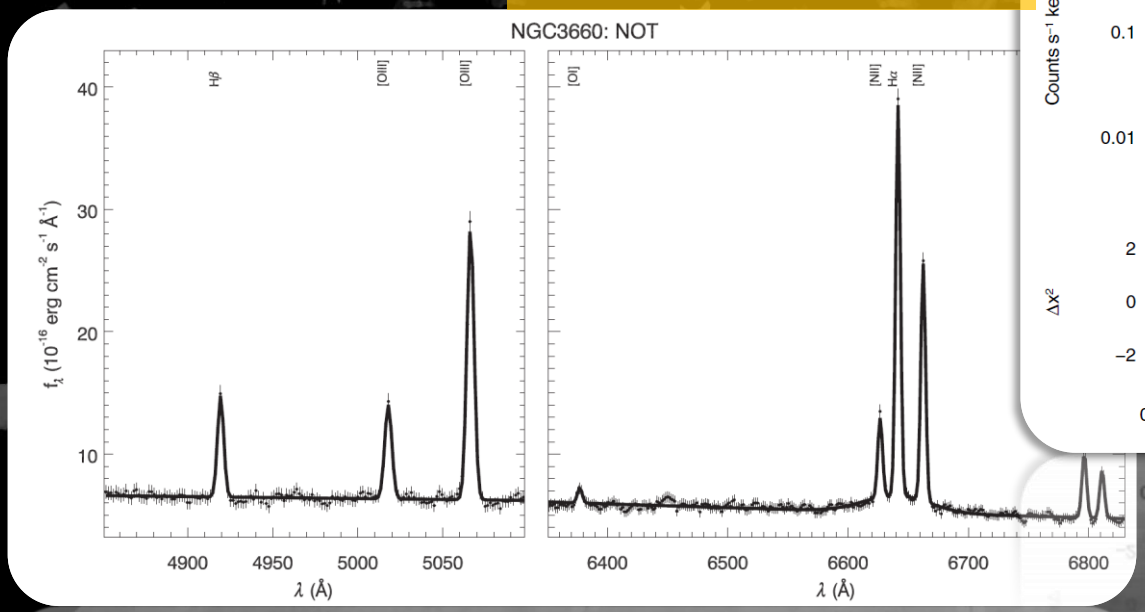
It appears that there are two classes of NHBLR Sy2s:

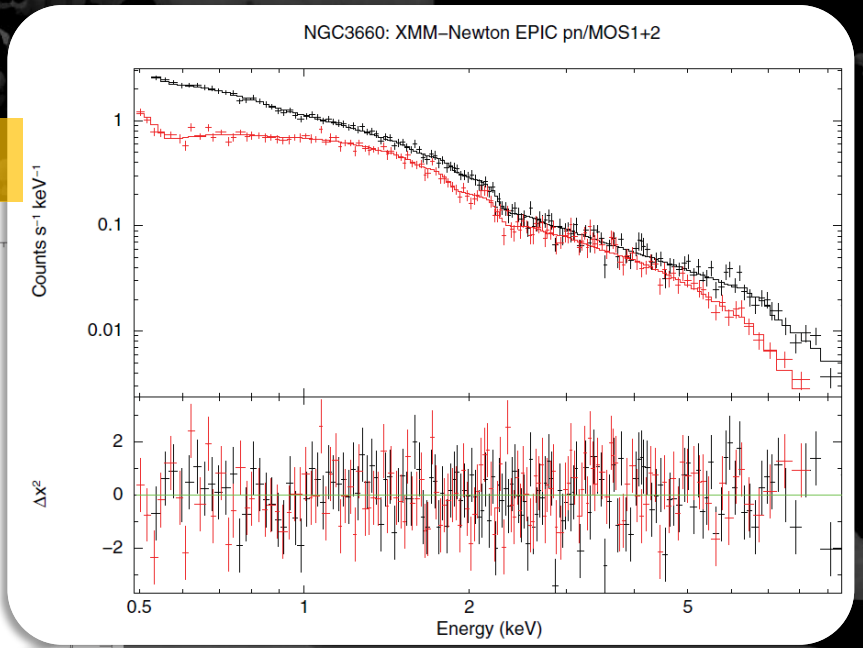
1. low accretion rates, really lacking the BLR
2. higher accretion rate, likely hosting the BLR, but something prevents us from observing it

If the BLR cannot form in weakly accreting AGN, **we expect the existence of "true" Seyfert 2 galaxies: optically Type 2 objects, without obscuration**

These objects are found with simultaneous optical/X-ray observations, and have low Eddington rates: NGC 3147 ($4 \times 10^{-5} - 3 \times 10^{-4}$: Bianchi et al. 2008), Q2131427 ($2 - 3 \times 10^{-3}$: Panessa et al. 2009), and NGC 3660 ($4 \times 10^{-3} - 2 \times 10^{-2}$: Bianchi et al., 2012)

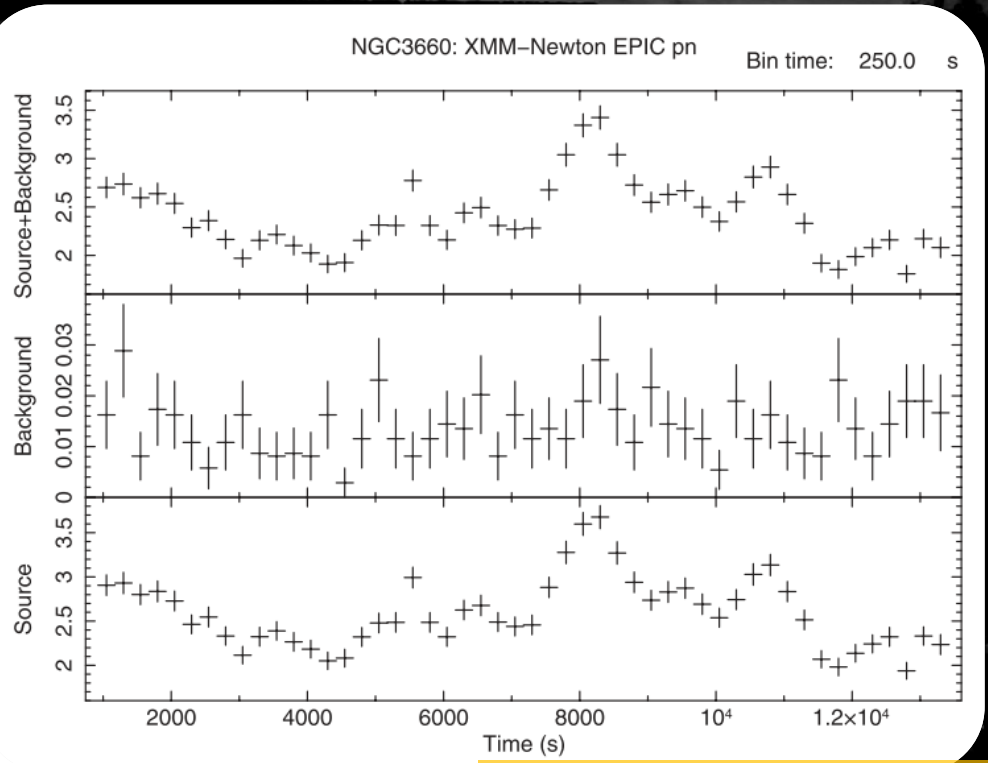
Bianchi et al. 2012



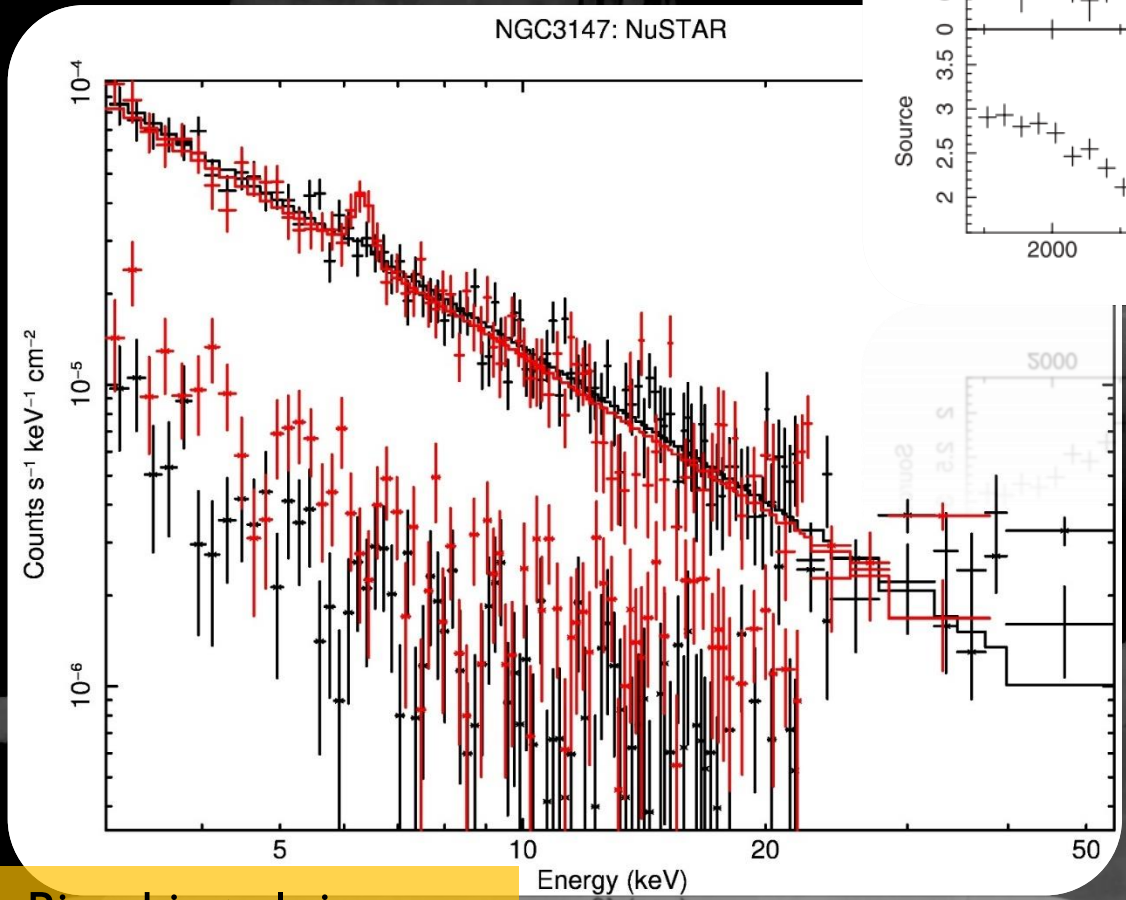


They are not Compton-thick!

NGC 3660 show clear evidence for intra-observation short-term variability



Bianchi et al., 2012



NGC 3147 show long-term variability, and a NuSTAR broad-band spectrum with no signs of absorption/hard excess

Bianchi et al., in prep.

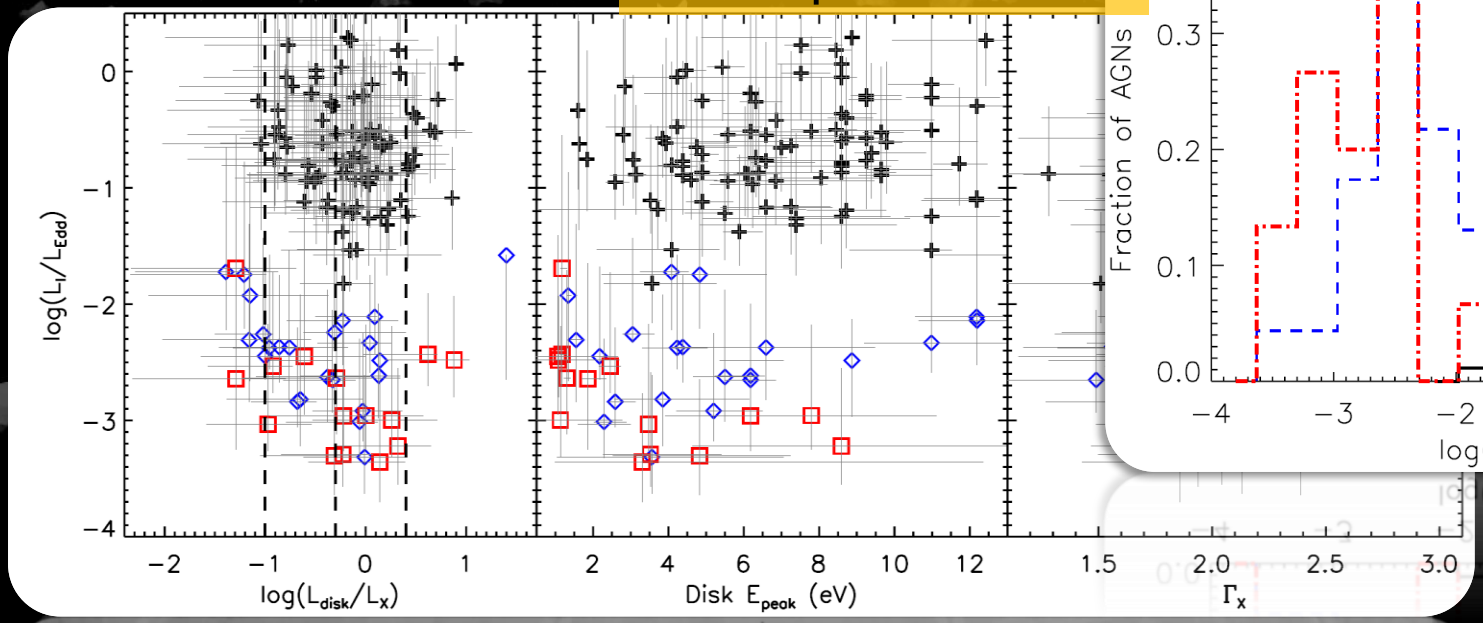
Are true type Seyfert 2s rare objects?

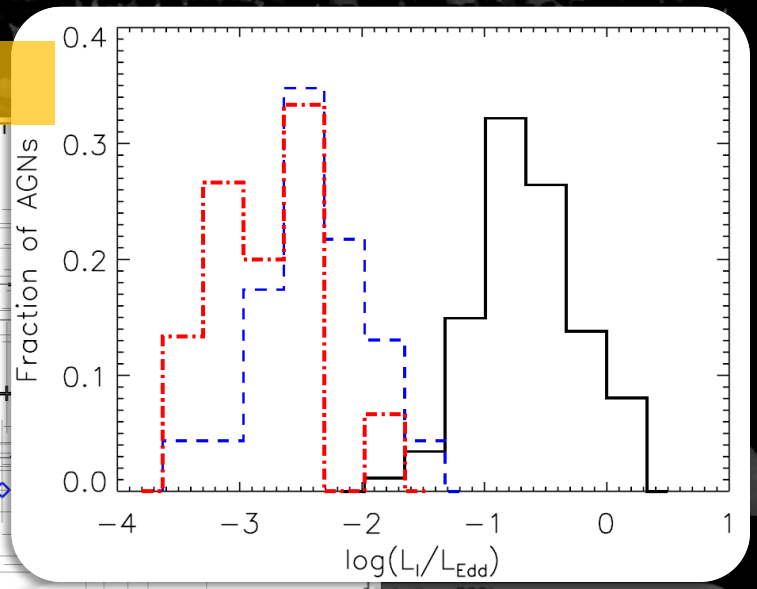
Few high SNR X-ray unobscured radio-quiet AGN (< 5%) lie below $L_{bol}/L_{Edd} \simeq 0.01$ (CAIXA: Bianchi et al. 2009)

Low-accreting unabsorbed Sy2 *candidates* rise up to 30% in surveys (COSMOS: Trump et al. 2011)

Similarly, ≃25% of low-accreting objects lack a hidden BLR in polarized light in obscured AGN (Marinucci et al. 2012)

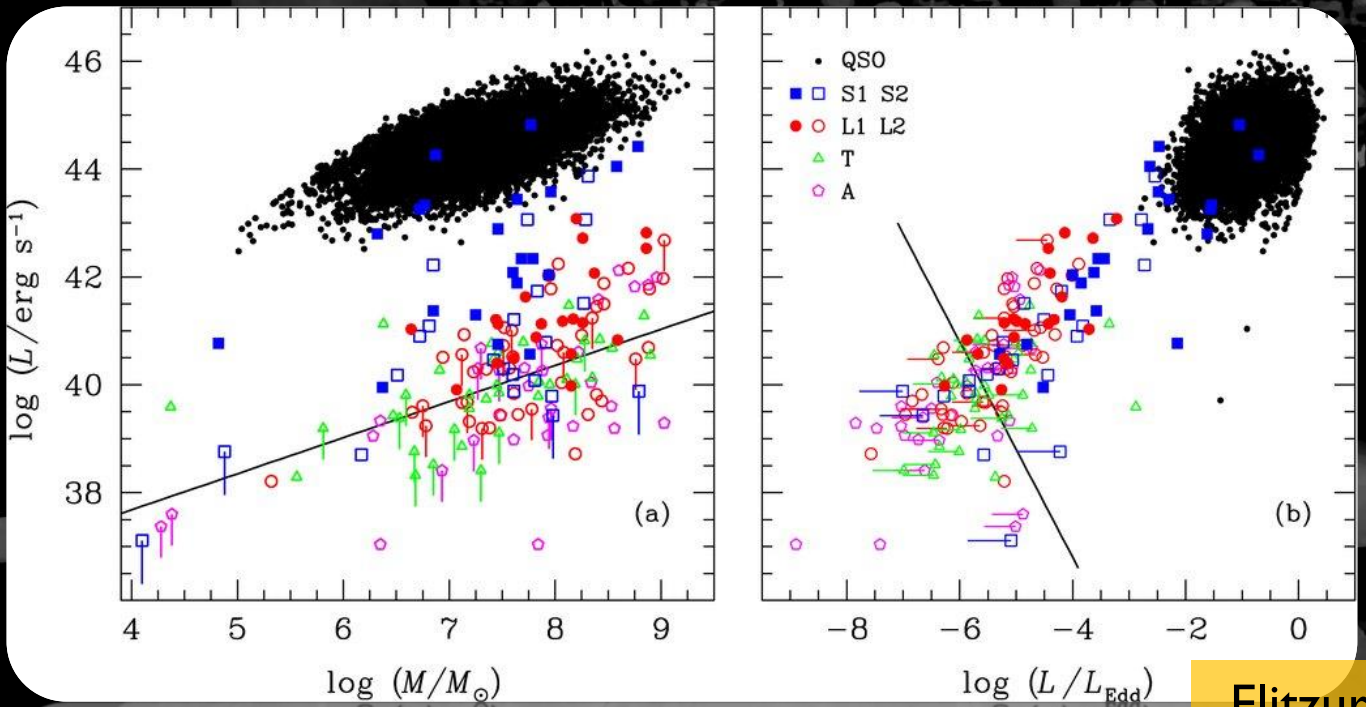
Trump et al. 2011





There are claims of highly accreting True Type Seyfert 2s: 1ES 1927 +654 (Gallo et al. 2013, but see also Tran et al. 2011), GSN 069 (Miniutti et al. 2013), 2XMM J123103.2+110648 (Ho et al. 2012) The latter two sources have very uncommon soft spectra

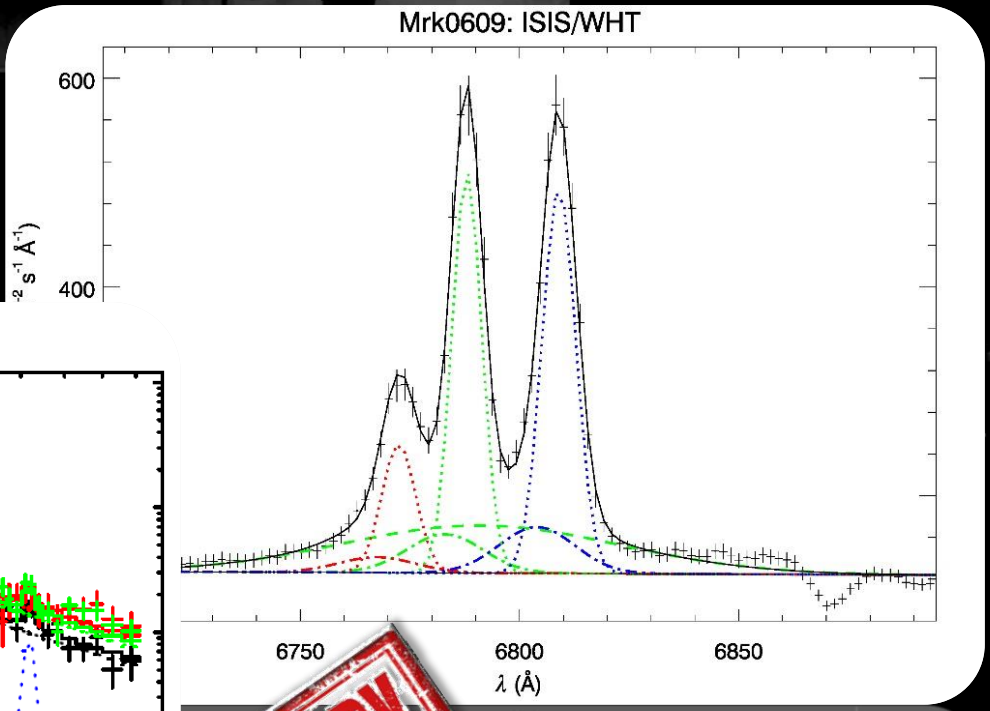
There are some LLAGN accreting at rates well below 0.01 with broad optical emission lines (e.g. M81; Ho, Filippenko & Sargent 1996)

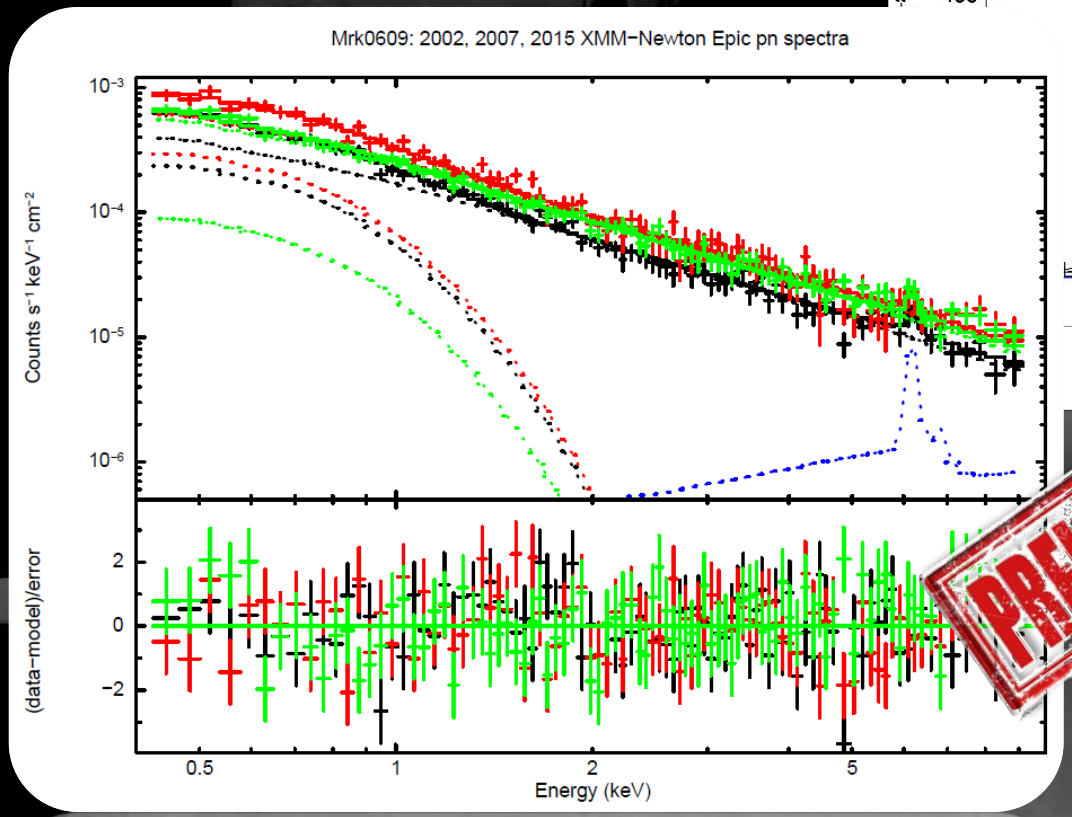


It seems that the formation of the BLR in objects with very inefficient accretion regimes may be different

Elitzur & Ho 2009

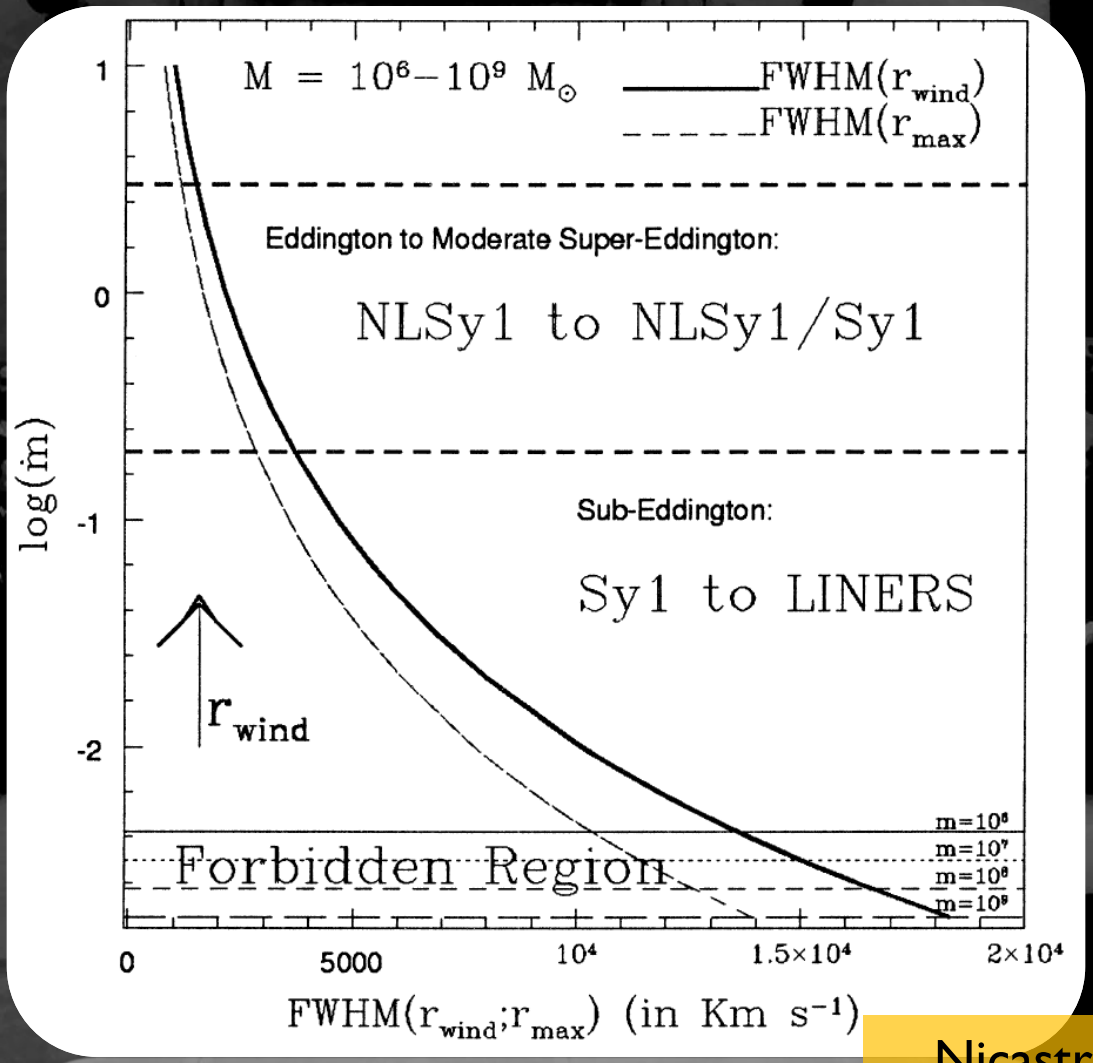
We have recently found an object without X-ray obscuration and (simultaneously) a very weak broad (~2000 km/s) Hα line (and no Hβ): a **True Type 1.9 source**!





PRELIMINARY

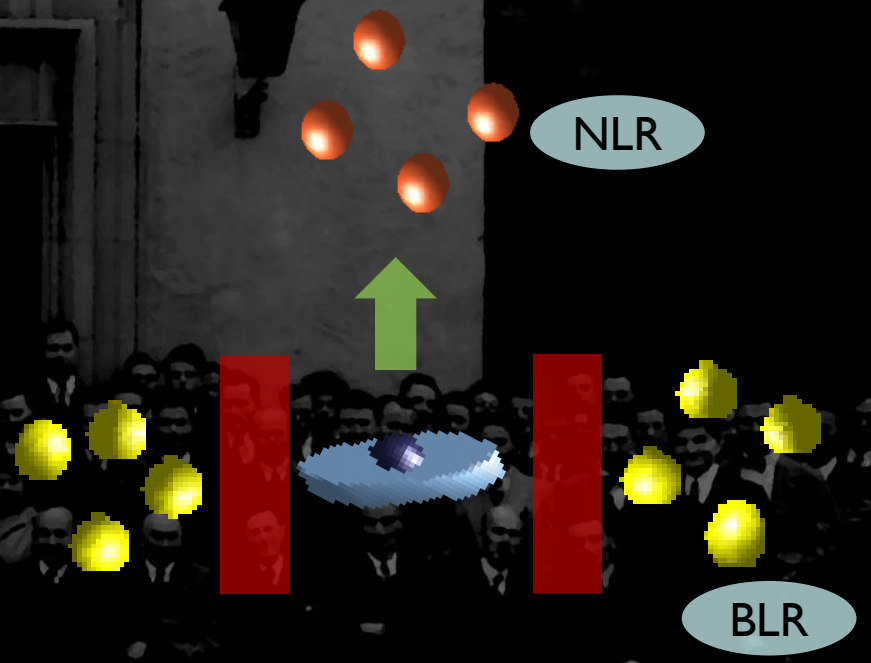
It appears that BLR emission is intrinsically weak in this object ($L/L_{Edd} \sim 0.01$), at odds with models explaining True Type 2s, where the BLR disappears moving towards large FWHMs



Nicastro(2000)

SMALL COVERING FACTOR Is the BLR still forming or is it evaporating?
The primary source has been active at least for the past 40 years

SHIELDING OF THE IONIZING FLUX
Warped disk, self-shielding, wind? Both the NLR and the observer would view the primary source, while the BLR (if mostly equatorial) would see a much lower ionizing flux



Are these mechanisms viable interpretations also for True Type Sy2s?

How many intermediate Seyferts are like Mrk0609?

What is the link between Mrk609 and high-z, high-luminosity Weak Line Quasars (e.g. Shemmer et al. 2010)?