What can we learn about AGN from α_{OX} measurements in GBHs?

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with

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Outline:

X-ray and Radio in Galactic black holes

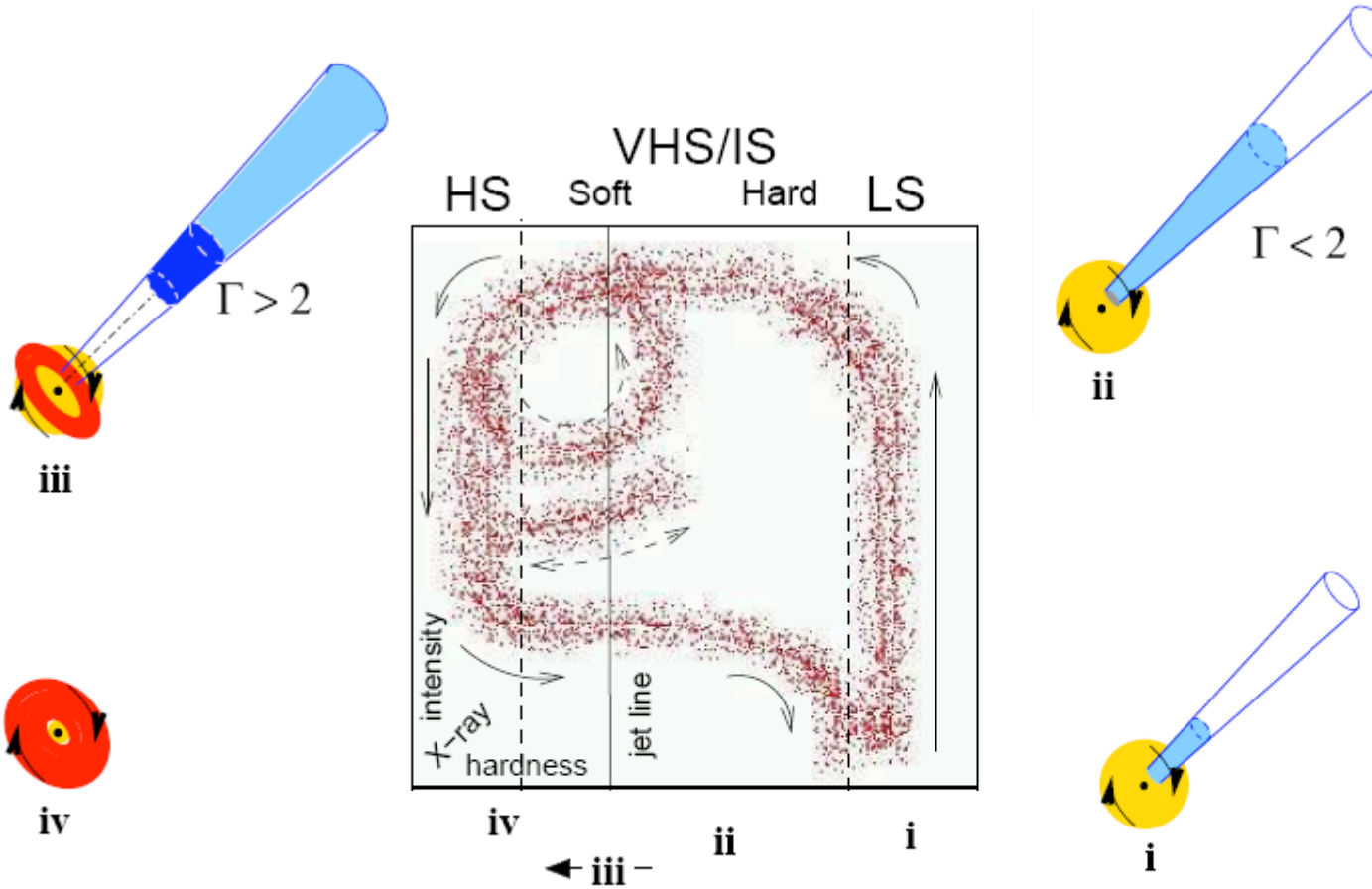
Definition of 'α_{OX}' in GBHs

Comparison of α_{OX} in GBHs and AGN

Results

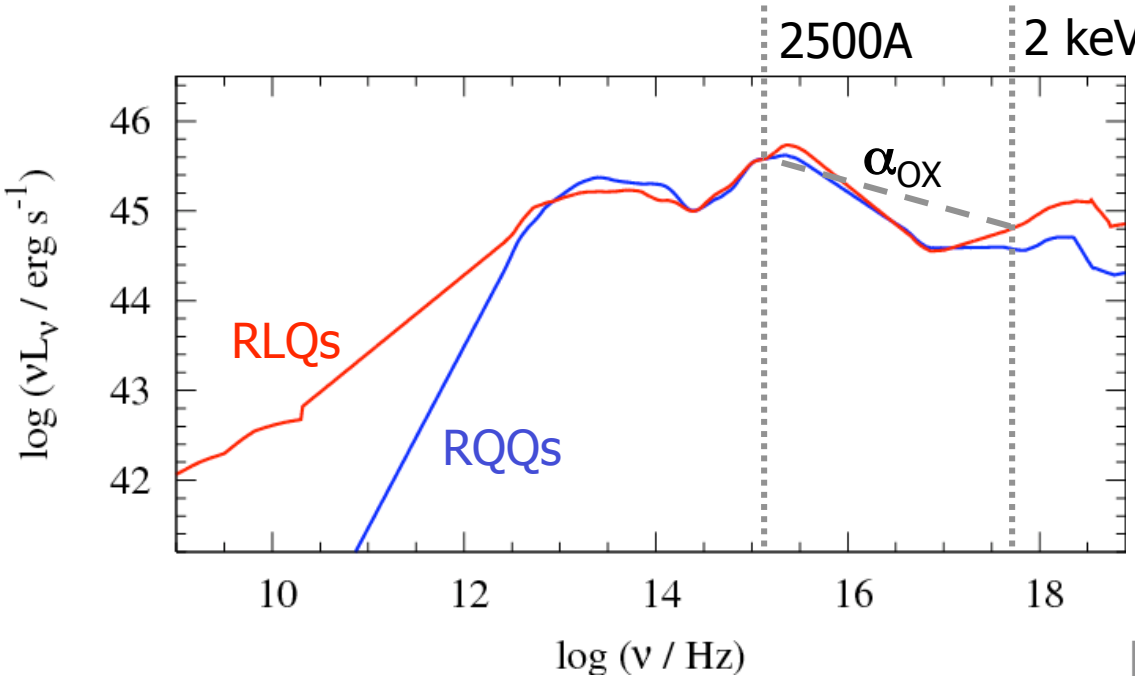
Conclusions

X-ray and Radio coupling in Galactic black holes



Fender, Belloni, Gallo (2004)

Parametrization of quasar SED



Elvis et al. (1994)

$$L_\nu \propto \nu^{\alpha}$$

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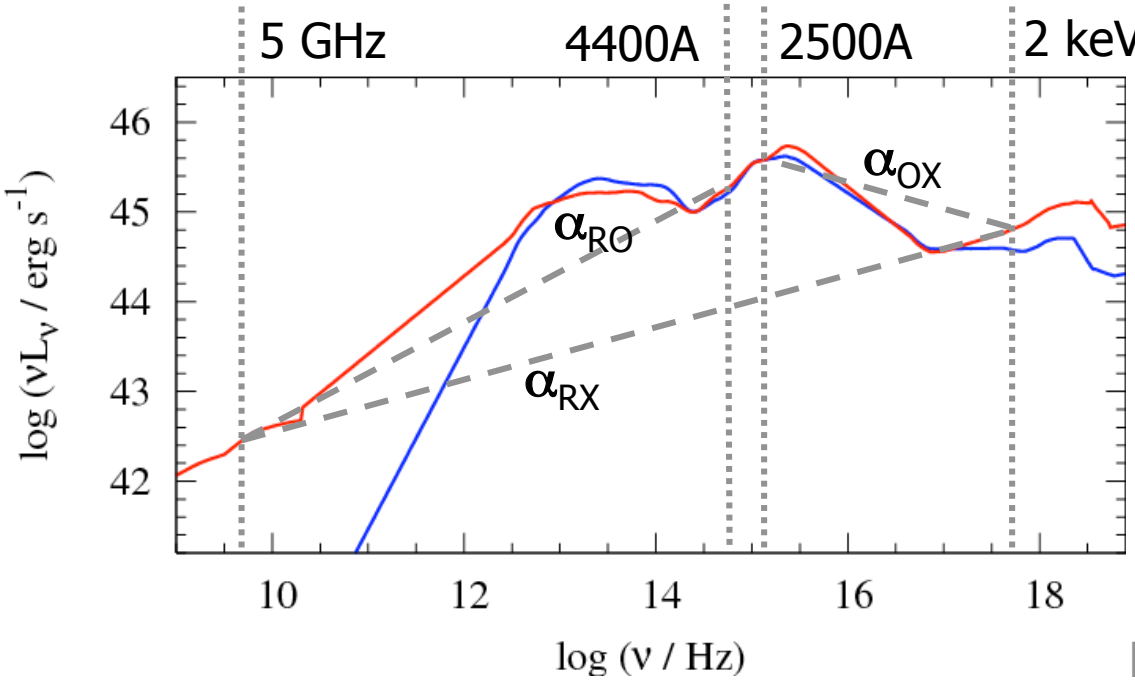


Elvis et al. (1994)

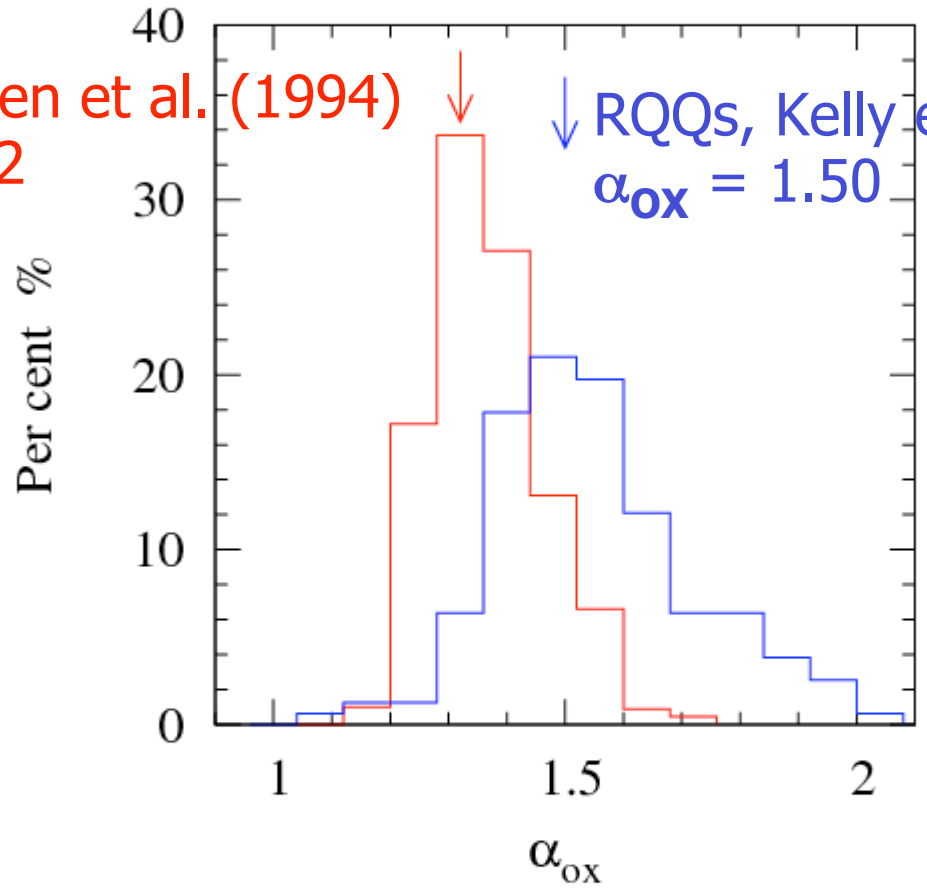
$$L_\nu \propto \nu^{\alpha}$$

Distribution of α_{OX} in AGN

$$\alpha_{OX} \approx 0.3838 \log(F_{2500A}/F_{2\ keV})$$

RLQs, Green et al. (1994)
α_{ox} = 1.32

RQQs, Kelly et al. (2007)
α_{ox} = 1.50



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RLQs, Gambill et al. (2003)
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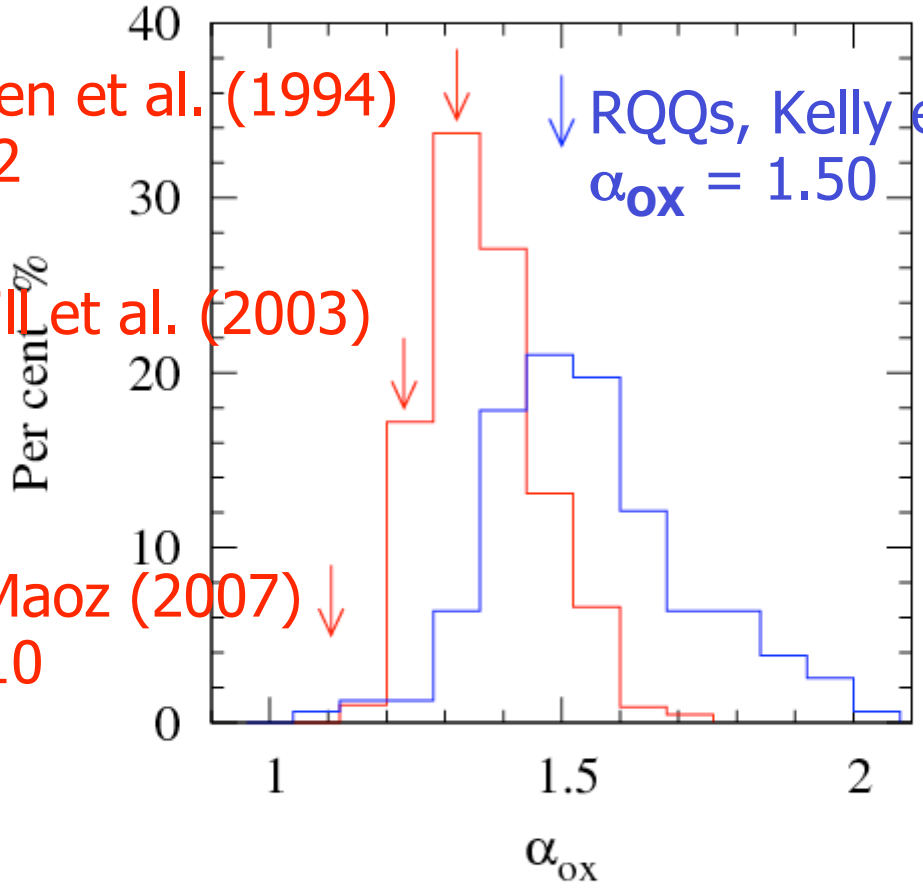
LINERs, Maoz (2007)
α_{ox} = 1.10



Definition of α_{GBH} in Galactic Black Holes

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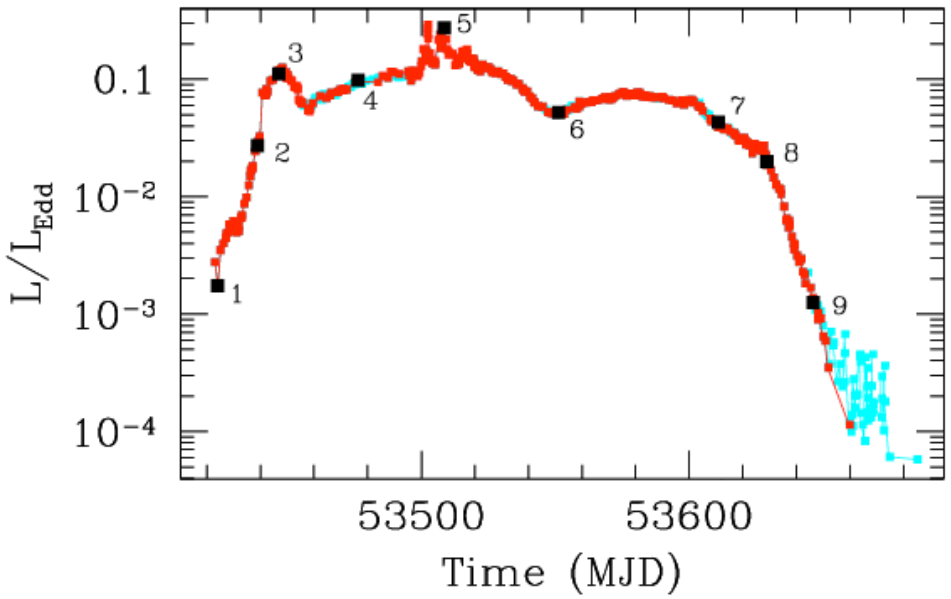
Outburst of GRO J1655-40, about 270 days, RXTE data



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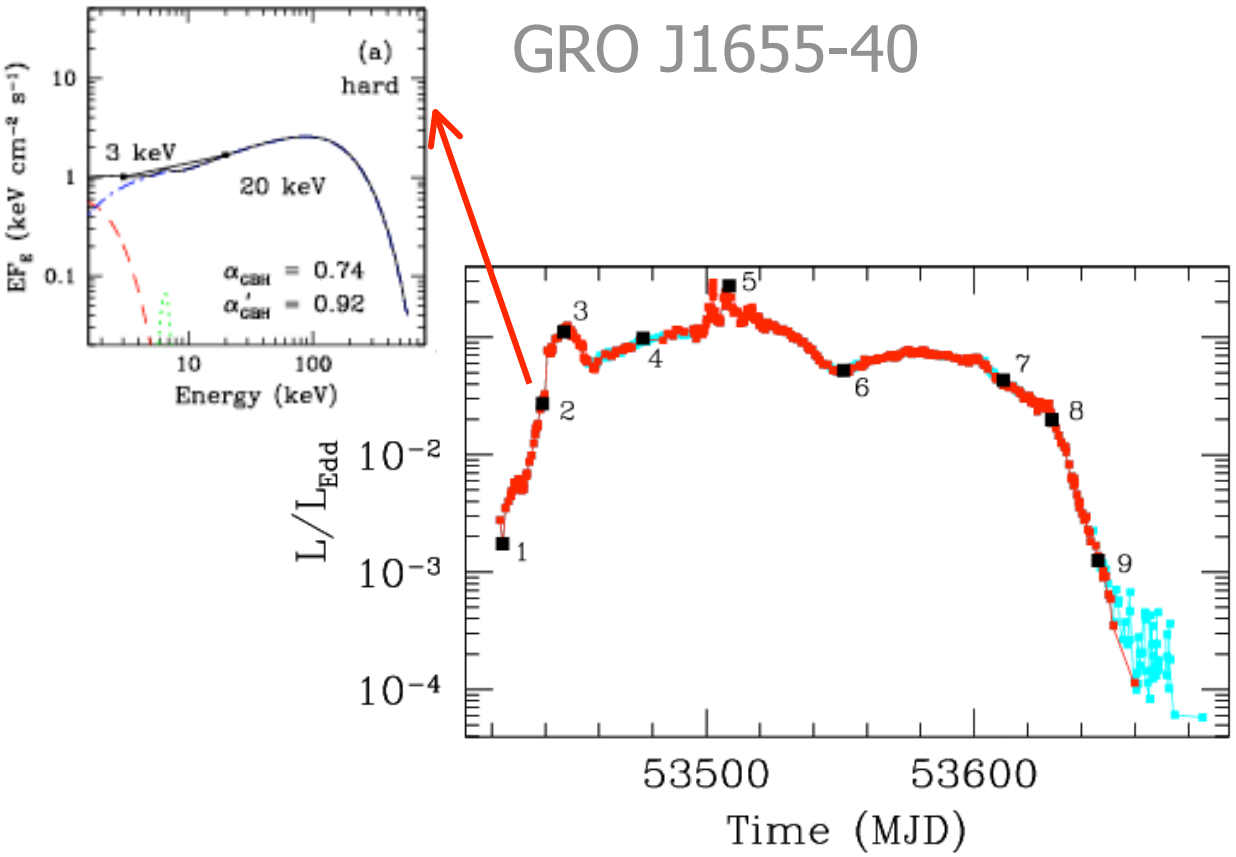

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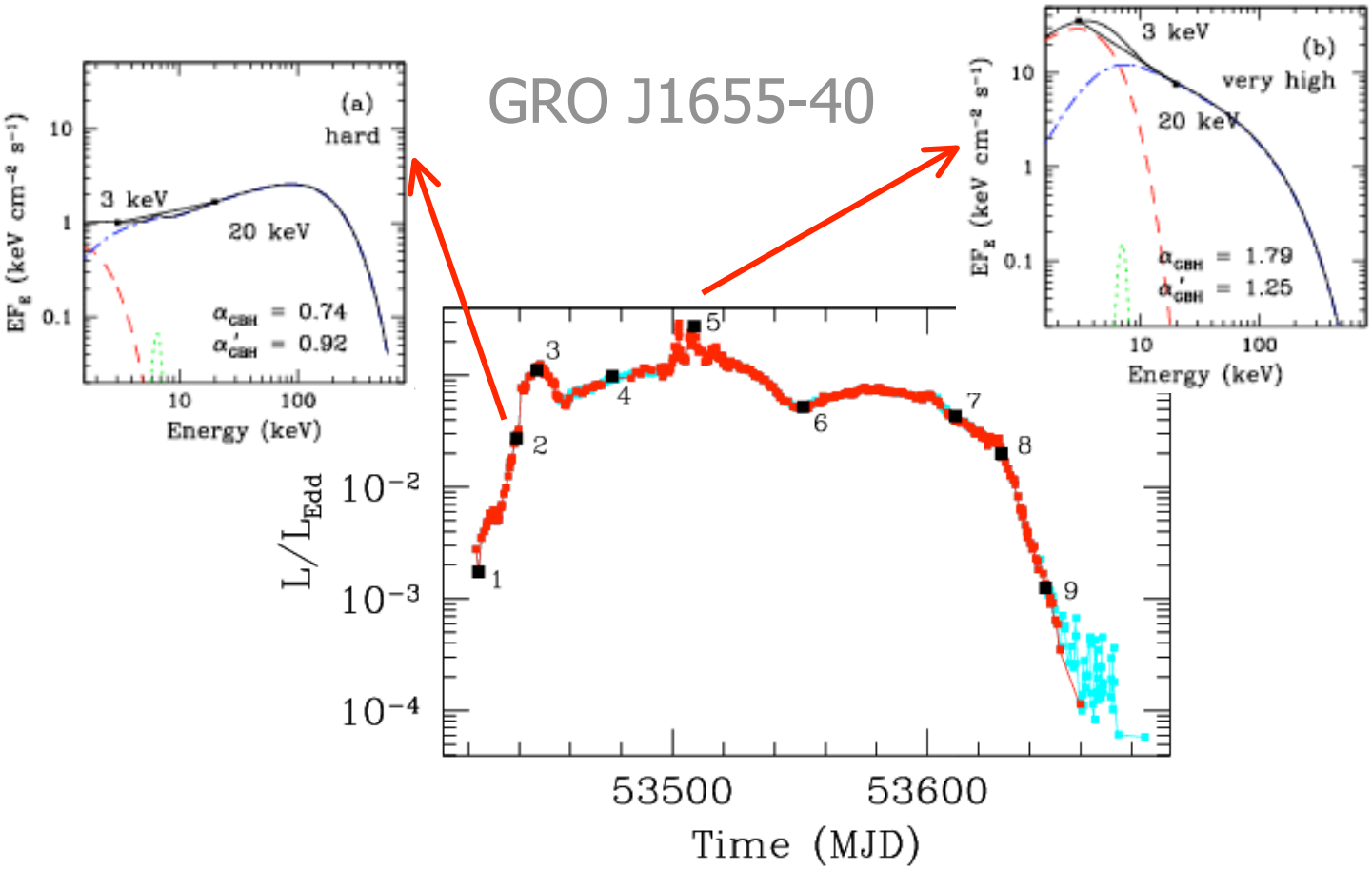

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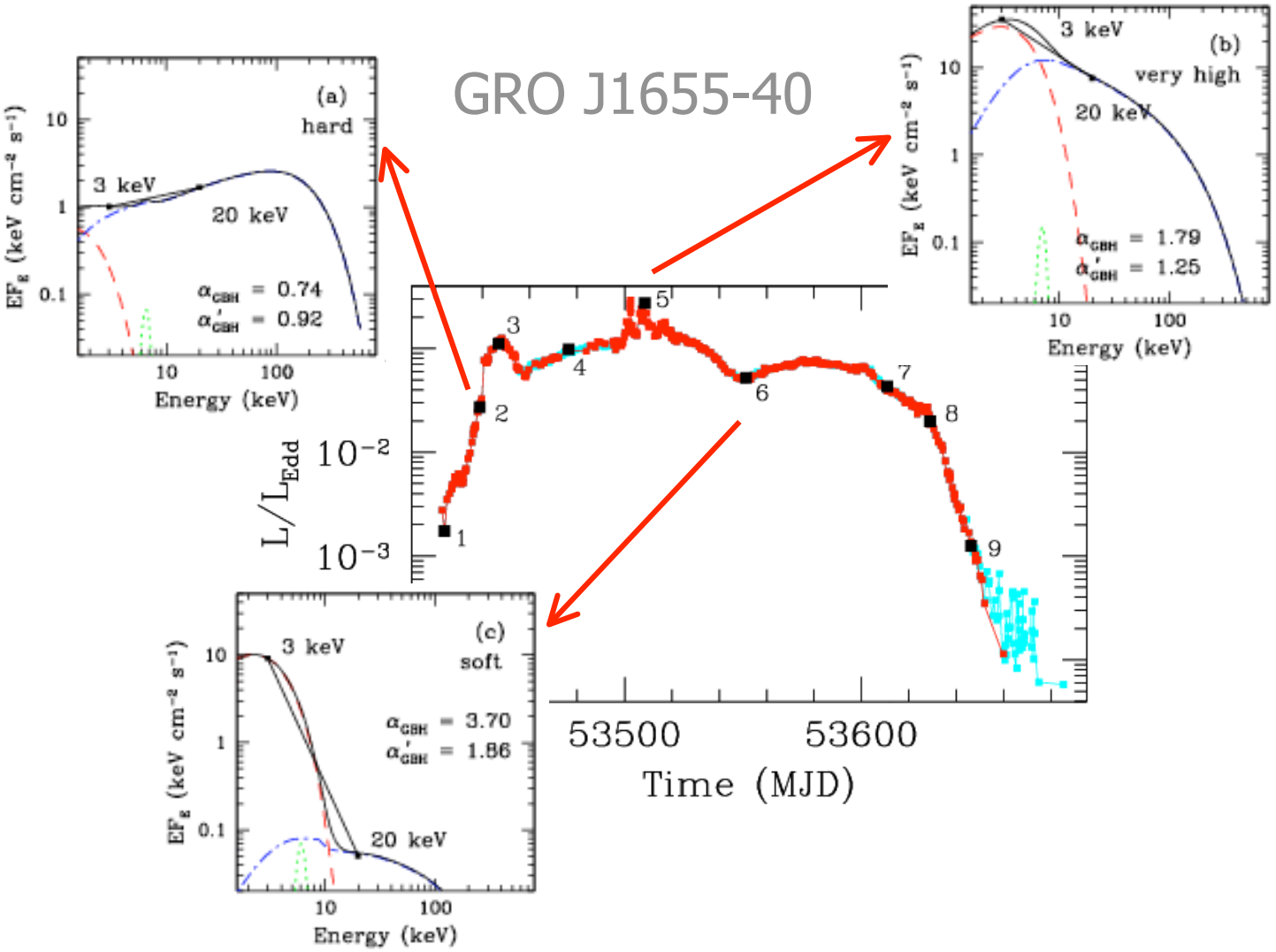

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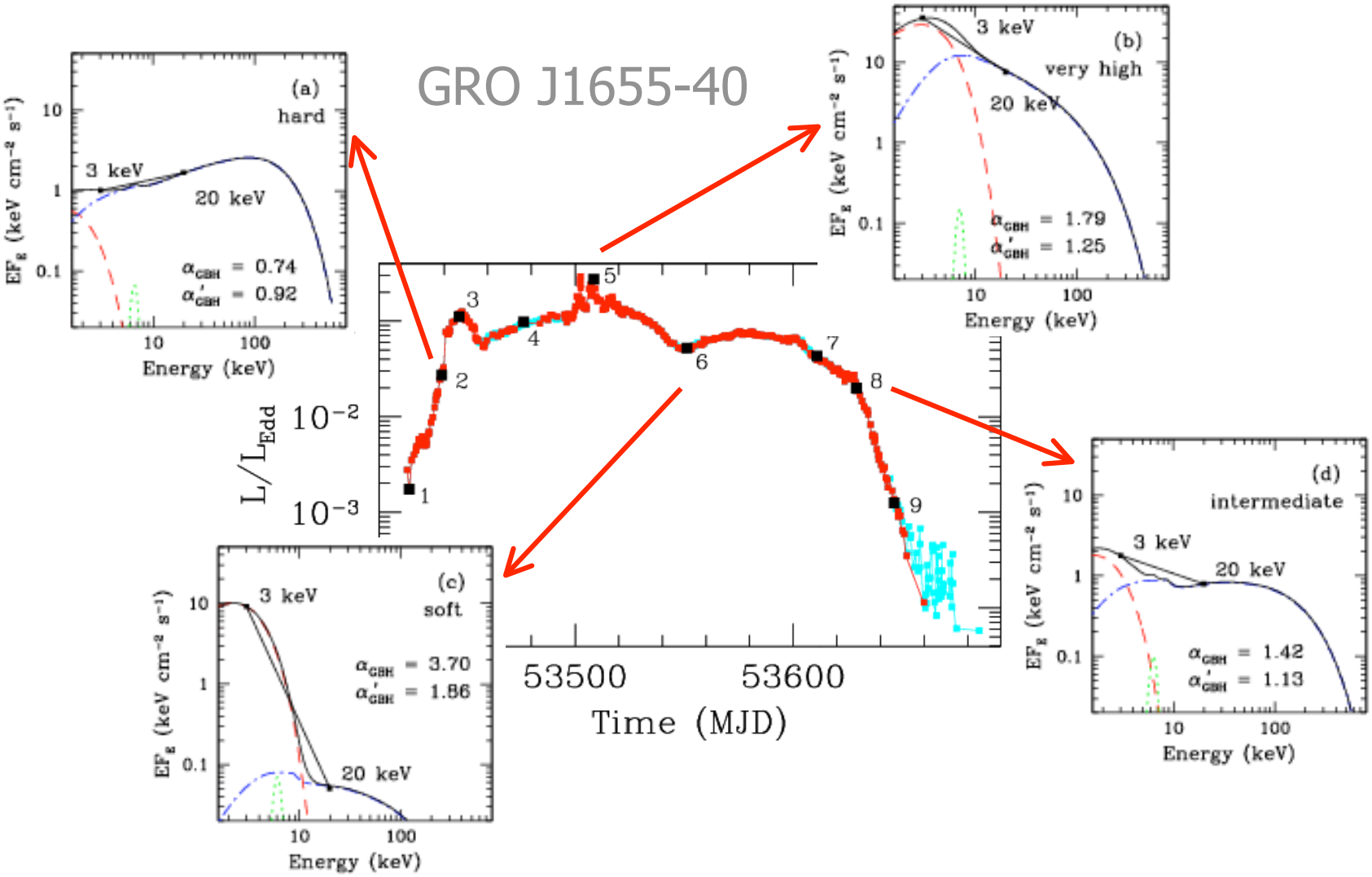


Definition of α_{GBH} in Galactic Black Holes

$\alpha_{OX} \approx 0.3838 \log(F_{2500A}/F_{2\ keV})$

$\alpha_{GBH} \approx 1.2137 \log(F_{3\ keV}/F_{20\ keV})$

α'_{GBH} in Galactic Black Holes

$\alpha_{OX} \approx 0.3838 \log(F_{2500A}/F_{2\ keV})$

$\alpha_{GBH} \approx 1.2137 \log(F_{3\ keV}/F_{20\ keV})$

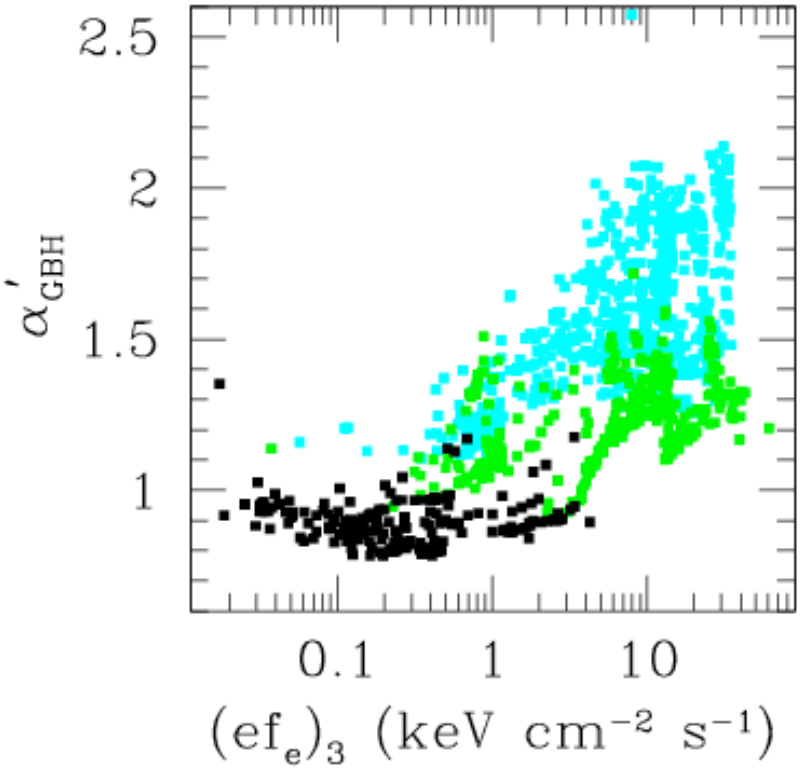
MS et al. (2008)

GRO J1655-40
XTE J1550-564
XTE J1650-500
XTE J1859+226
GX 339-4
H1743-322

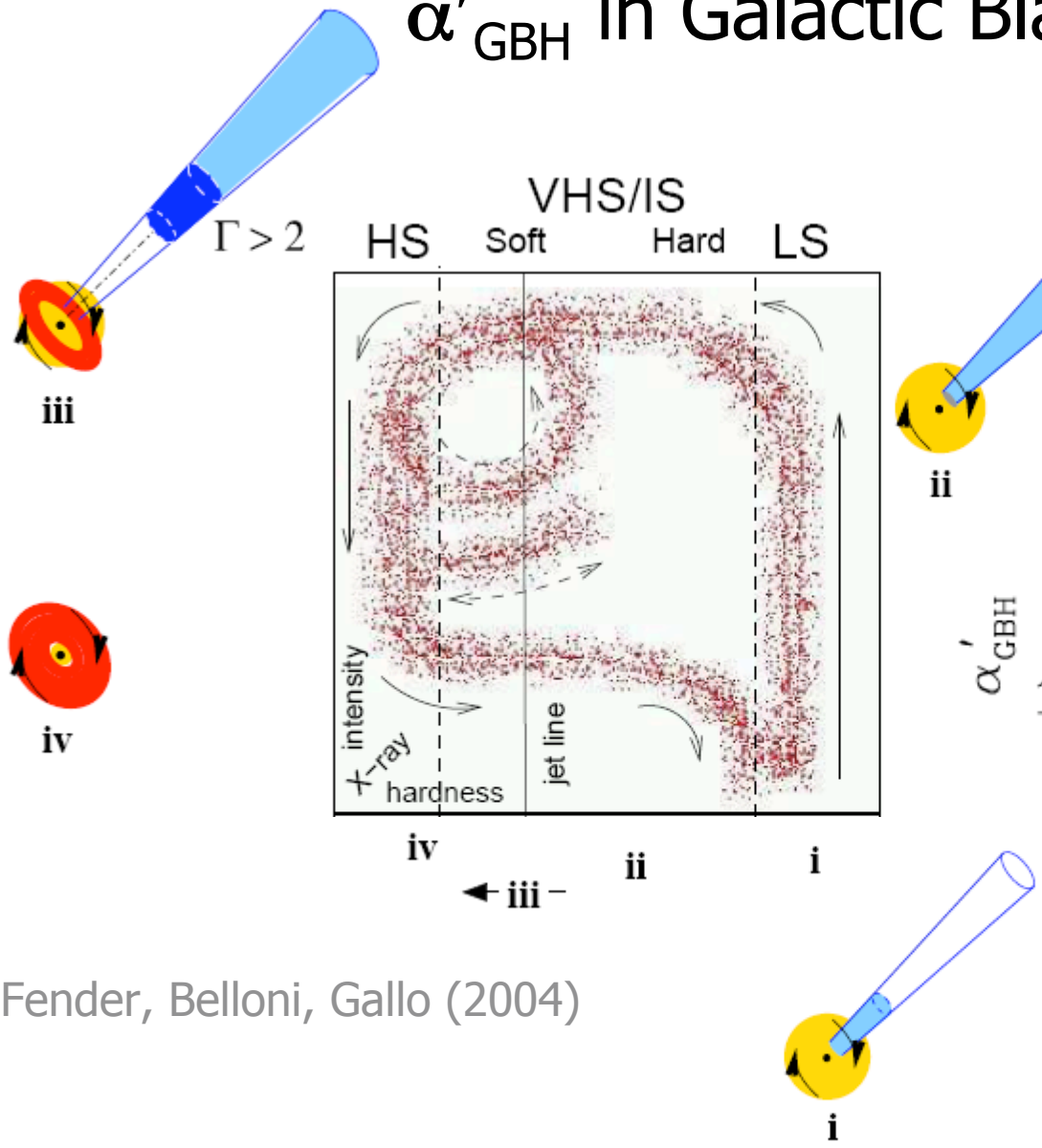
soft state
(very high, typical soft, ultra-soft)

intermediate state

hard state

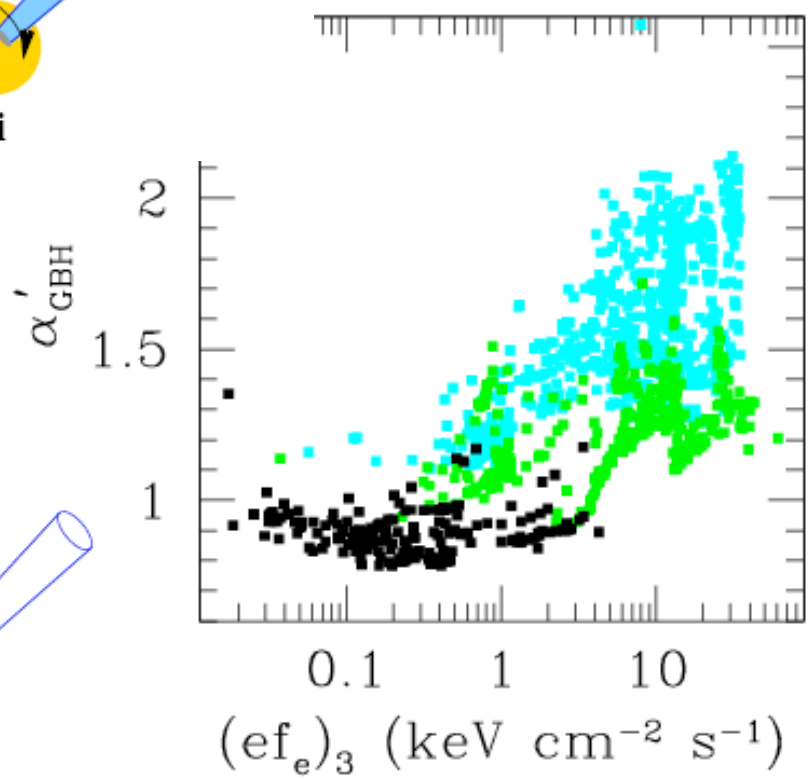


α'_{GBH} in Galactic Black Holes

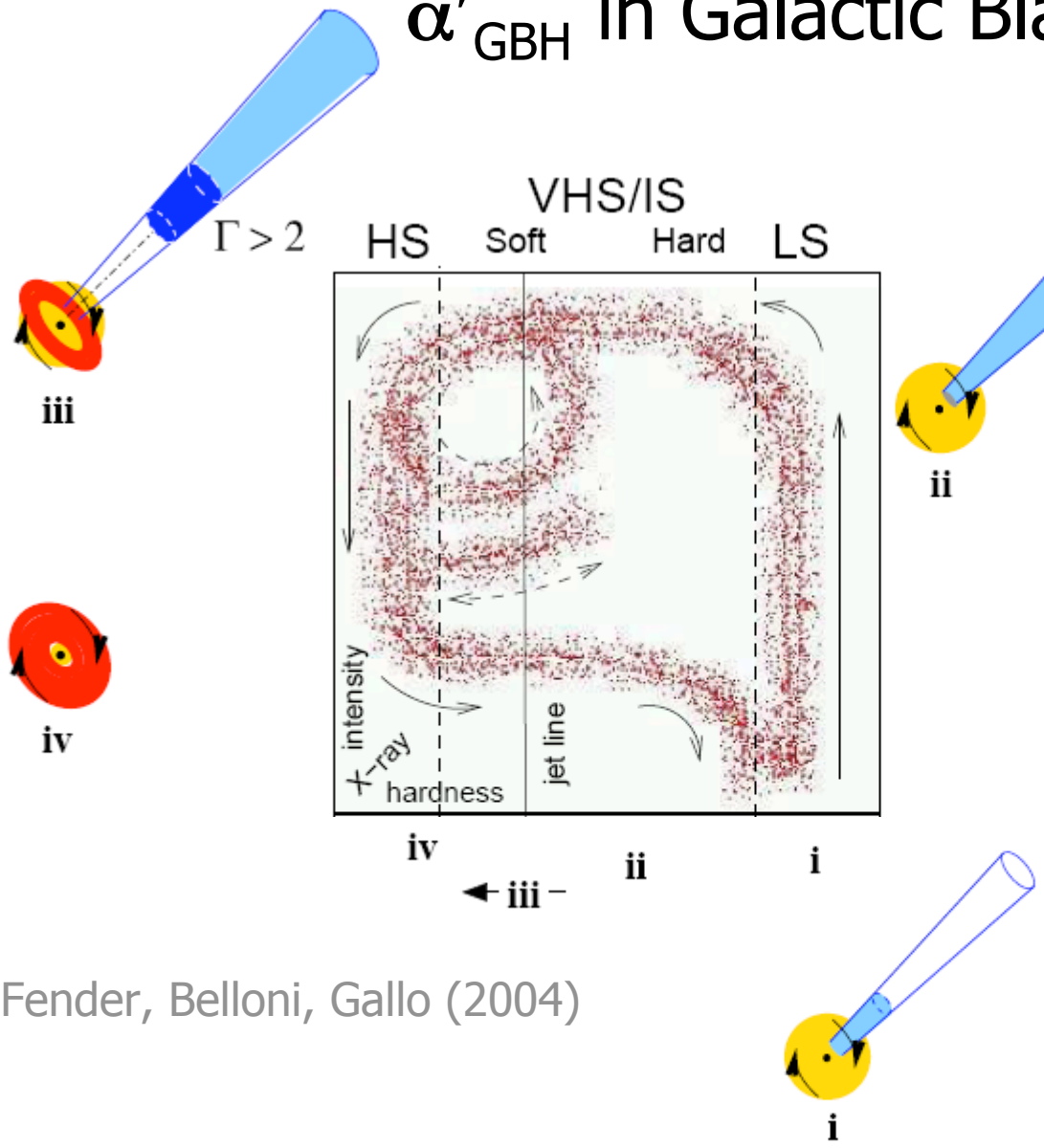


Fender, Belloni, Gallo (2004)

MS et al. (2008)



α'_{GBH} in Galactic Black Holes



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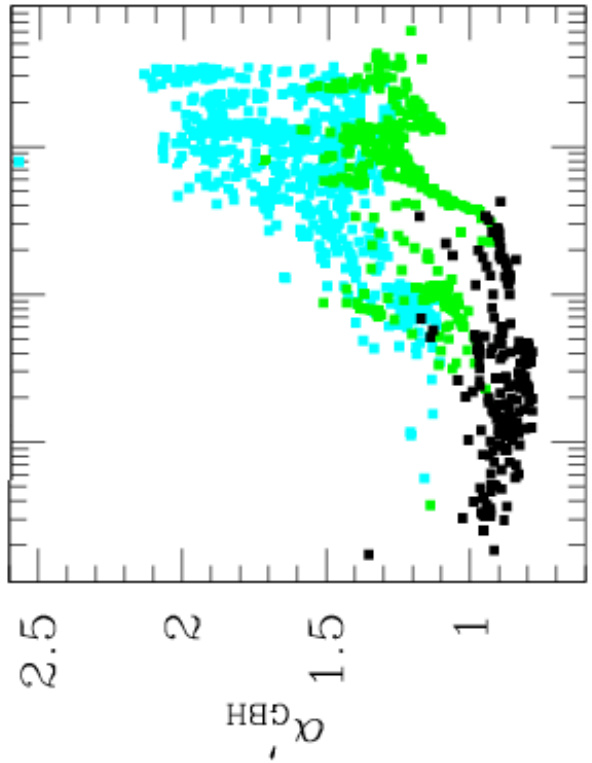

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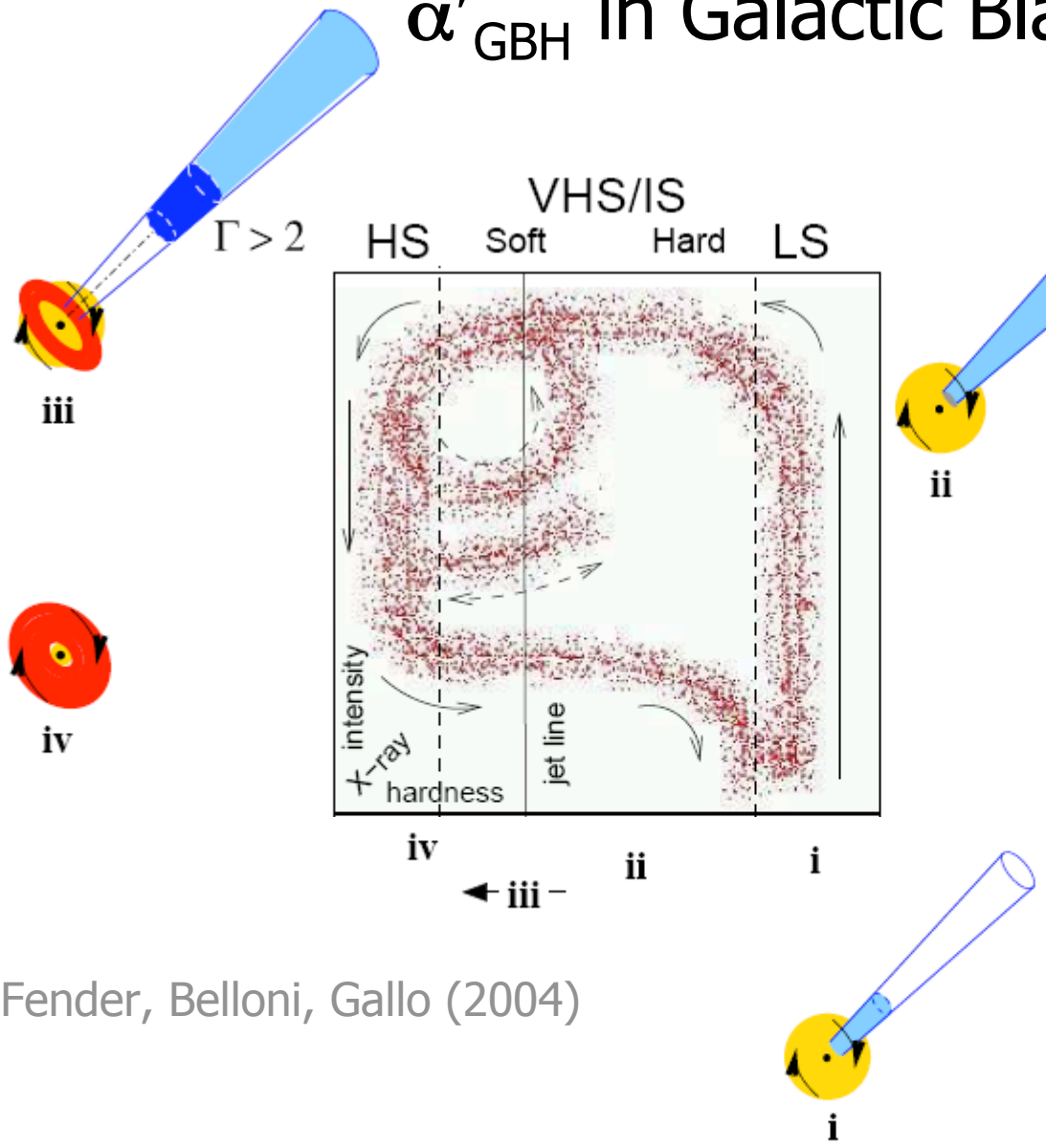

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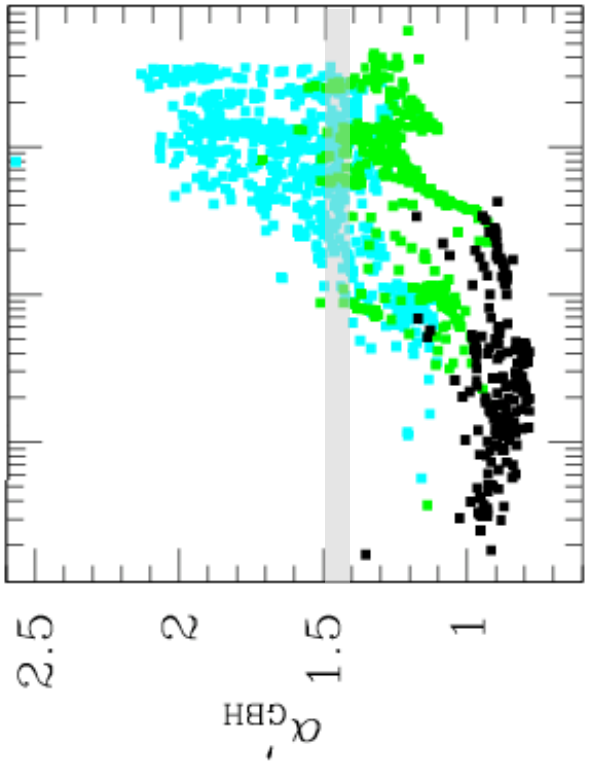
Jet line?



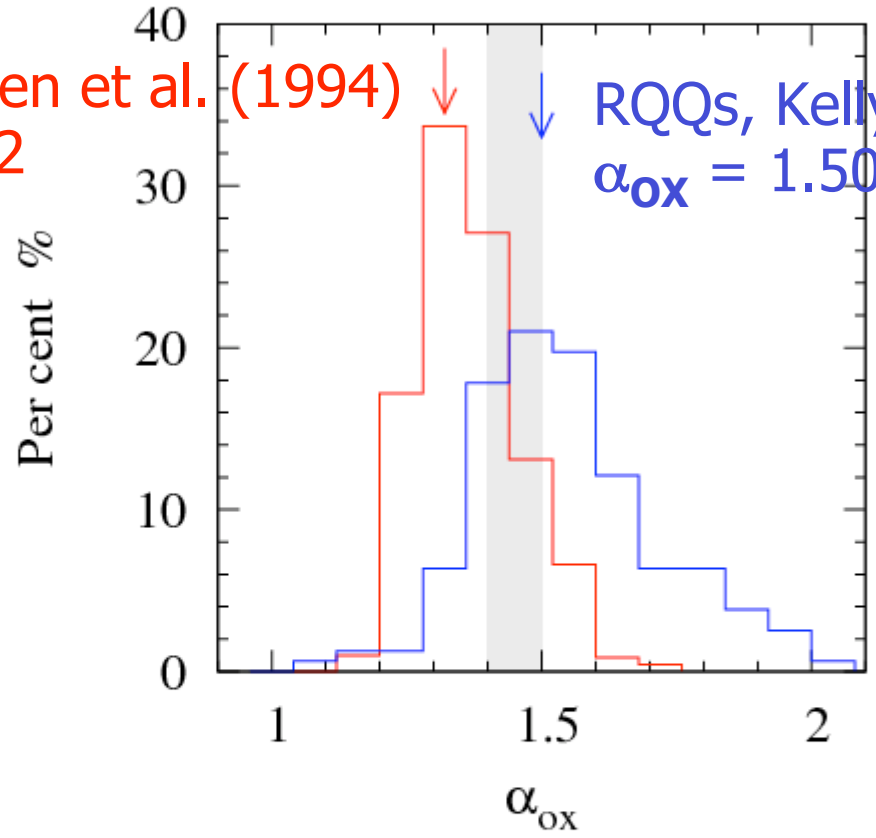
Comparison of α_{OX} in AGN and α'_{GBH} in GBHs

Comparison of α_{OX} in AGN and α'_{GBH} in GBHs

Transition between the intermediate/very high and typical soft spectral state corresponds to the 'jet line' with $\alpha'_{GBH} = 1.4 - 1.5$

RLQs, Green et al. (1994)
$\alpha_{ox} = 1.32$

RQQs, Kelly et al. (2007)
$\alpha_{ox} = 1.50$



MS et al. (2008)

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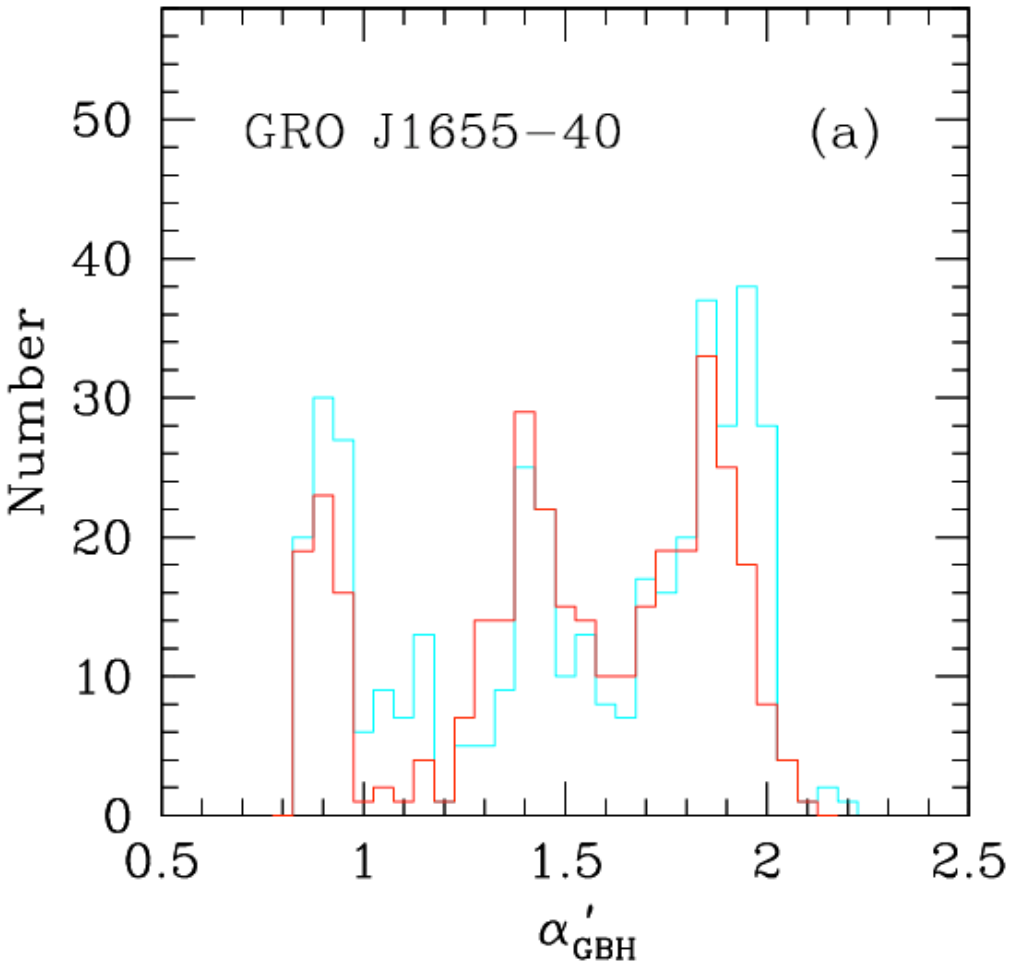


Method 1:

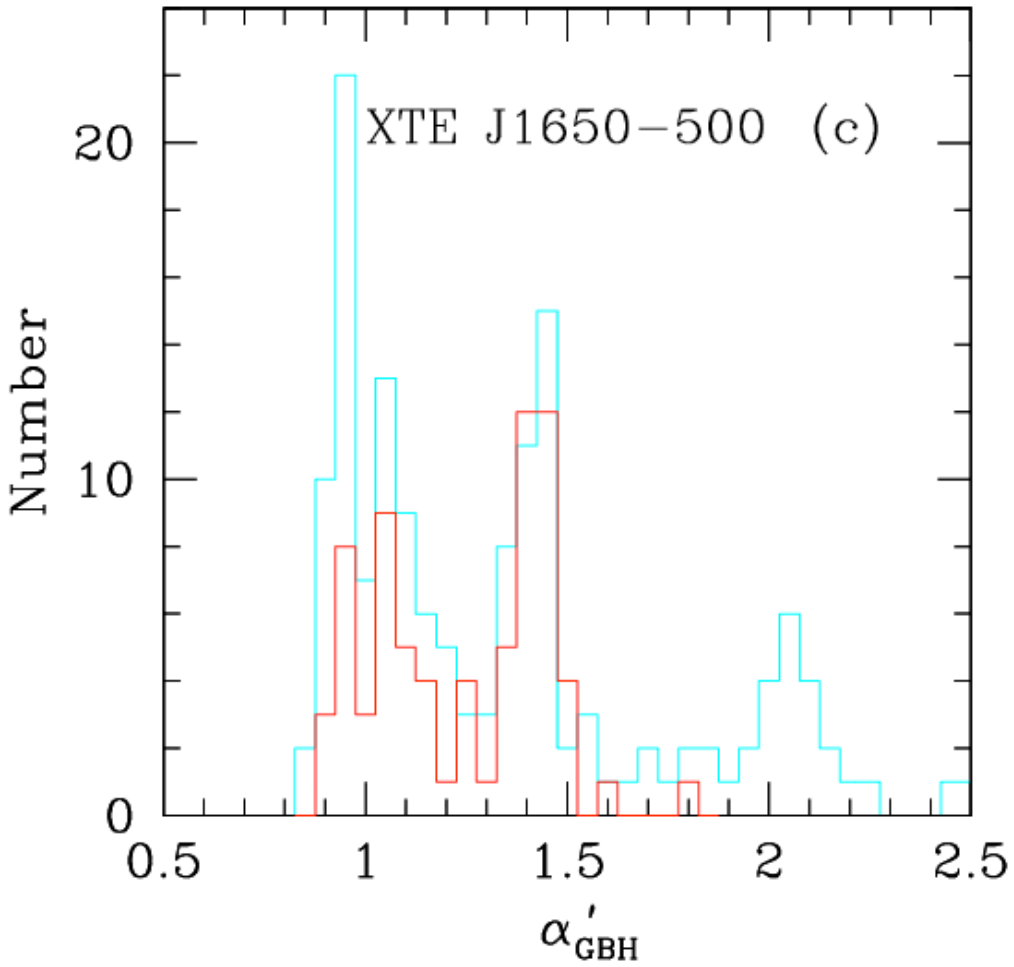
Fits to the 3–200 keV continuum

Method 2 (AGN-like):

Fits to the 20–40 keV hard X-ray band

MS et al. (2008)

Comparison of α_{OX} in AGN and α'_{GBH} in GBHs



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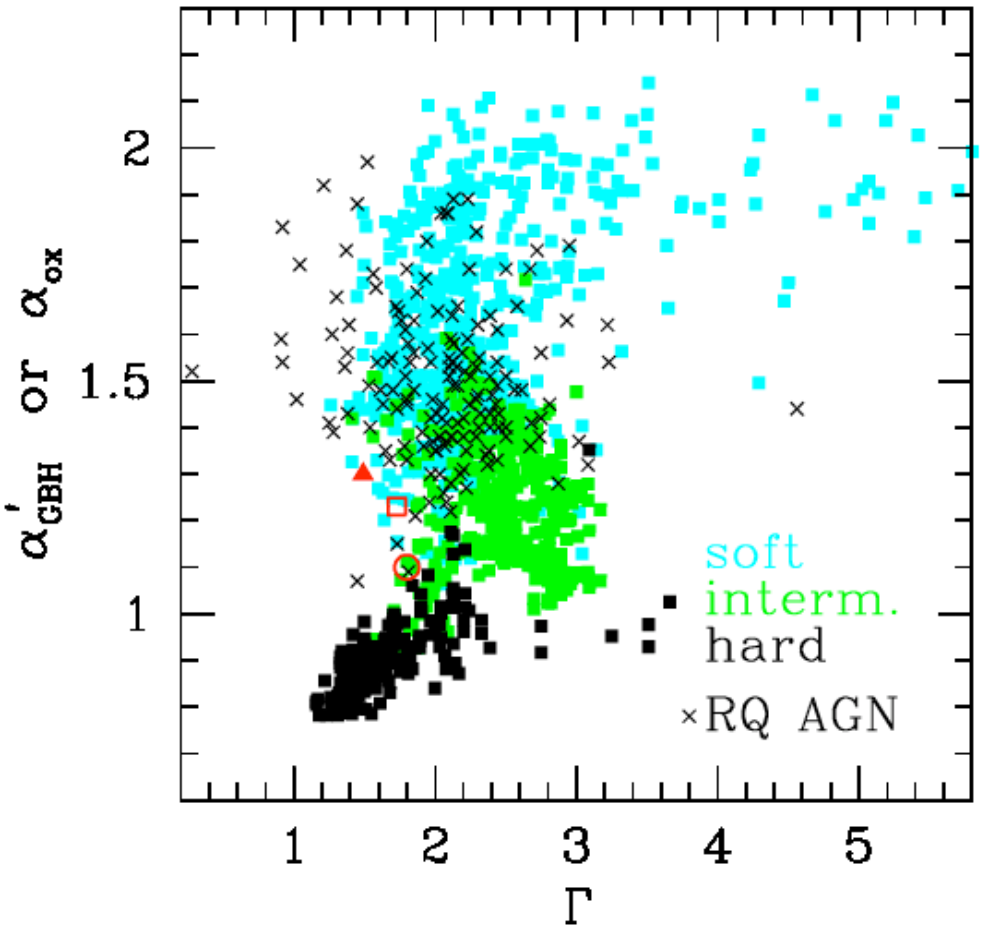

Kelly et al. 2007

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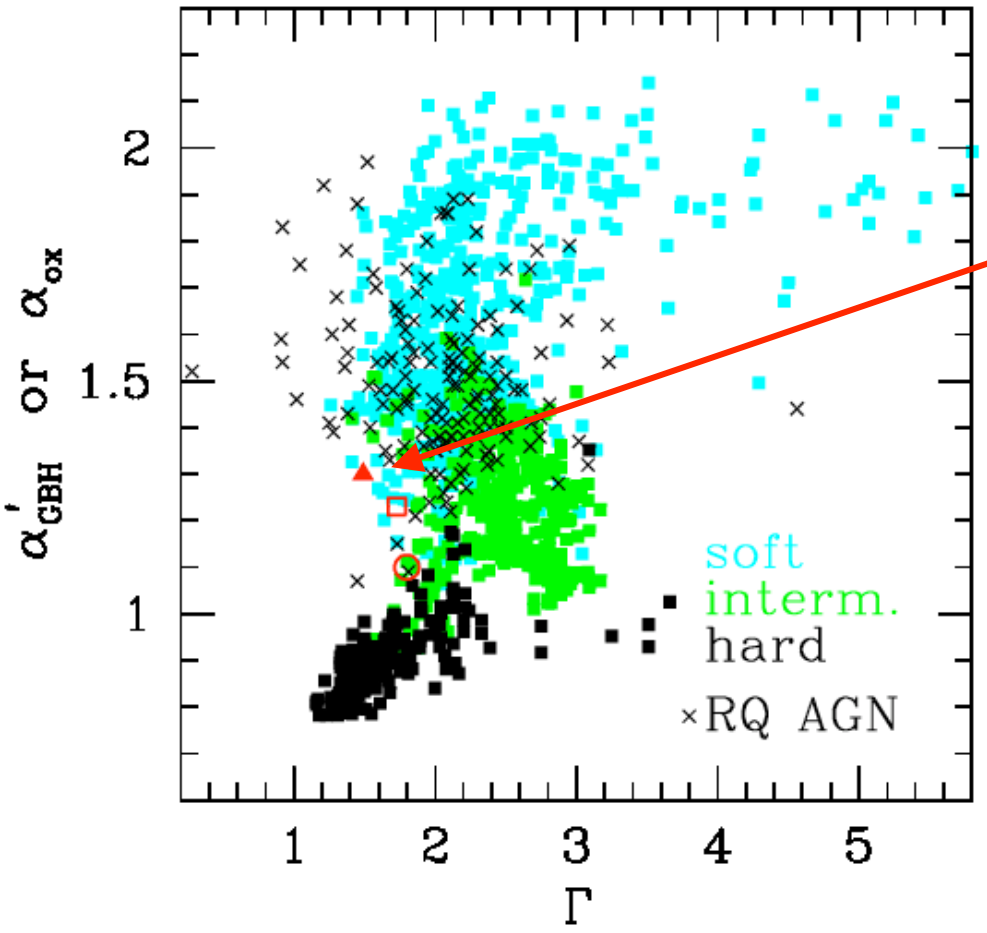

Average properties of RLQs:

Elvis et al. 1994

Kelly et al. 2007

SGS 2008

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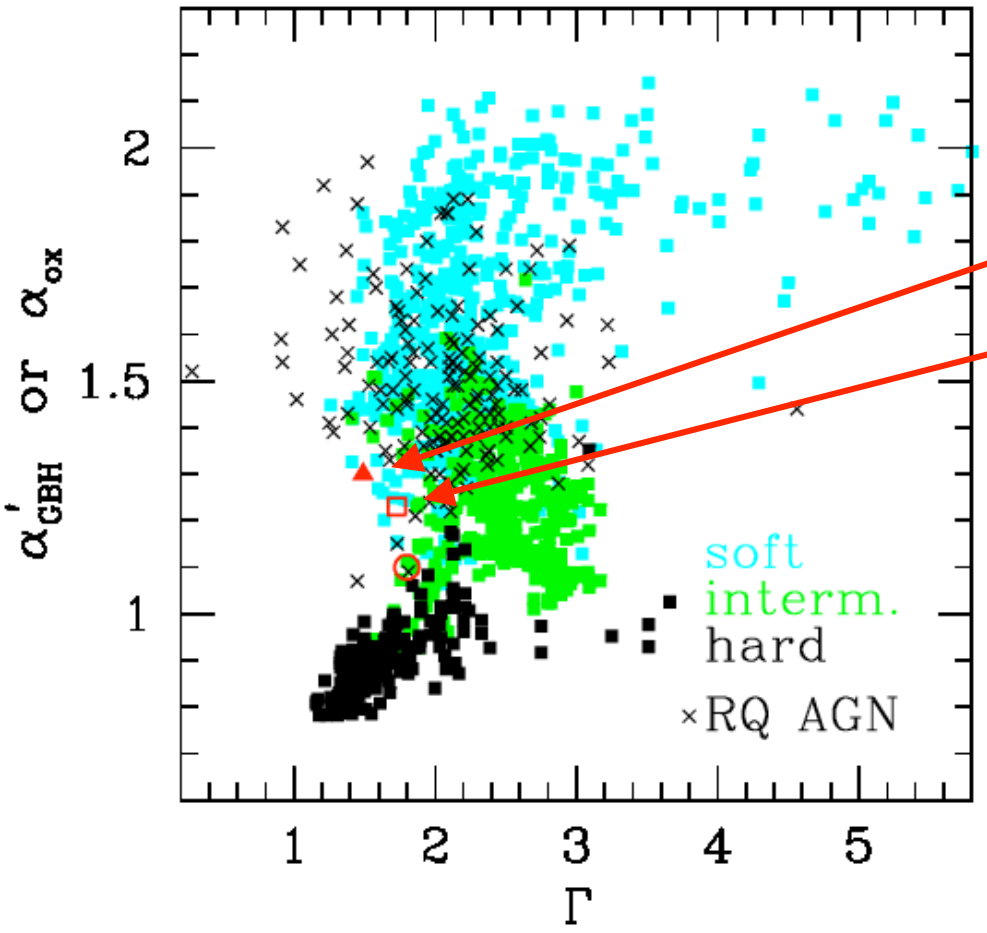

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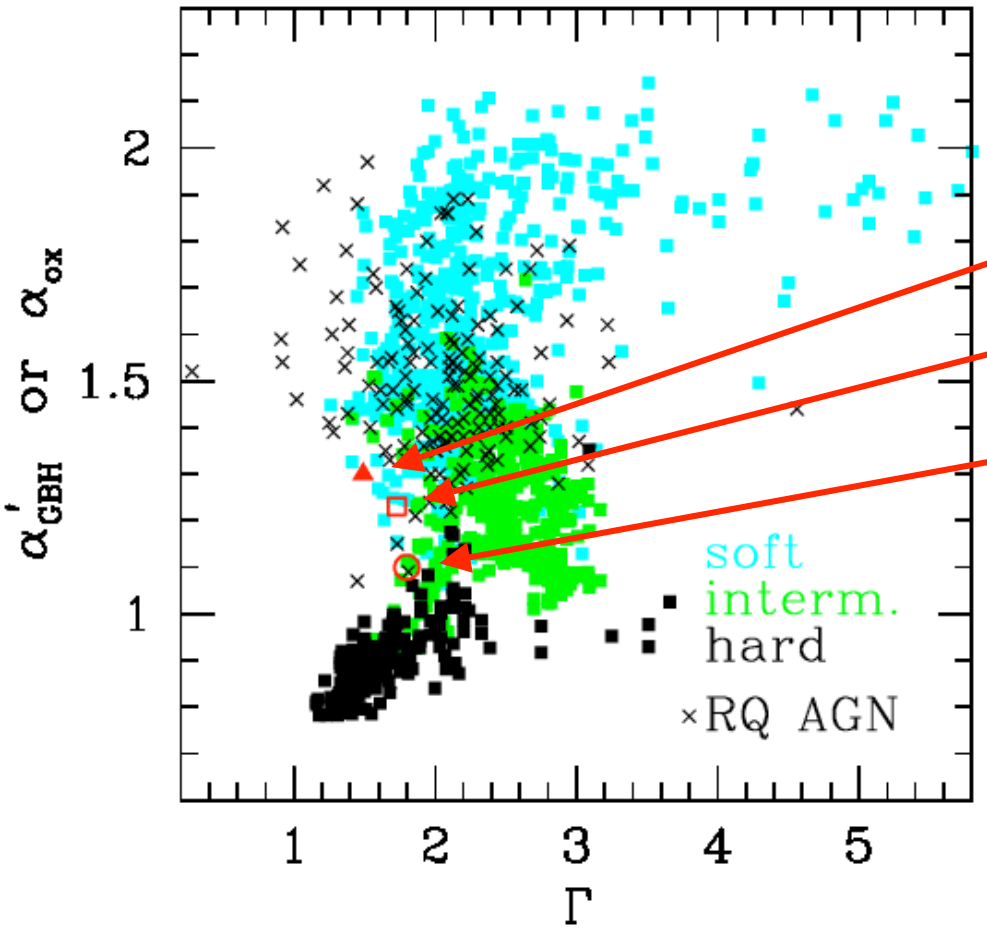

Average properties of RLQs:

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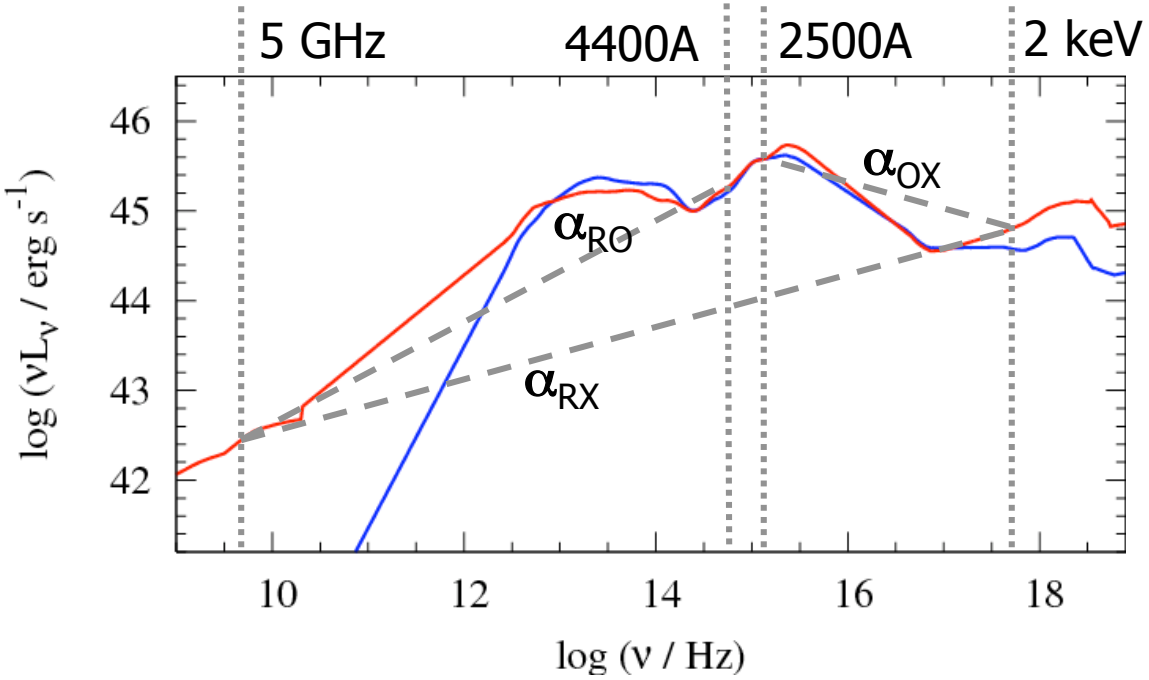
Maoz 2007 (LINERs)

Kelly et al. 2007

SGS 2008

What about α_{RO} and α_{RX} in AGN and GBHs?



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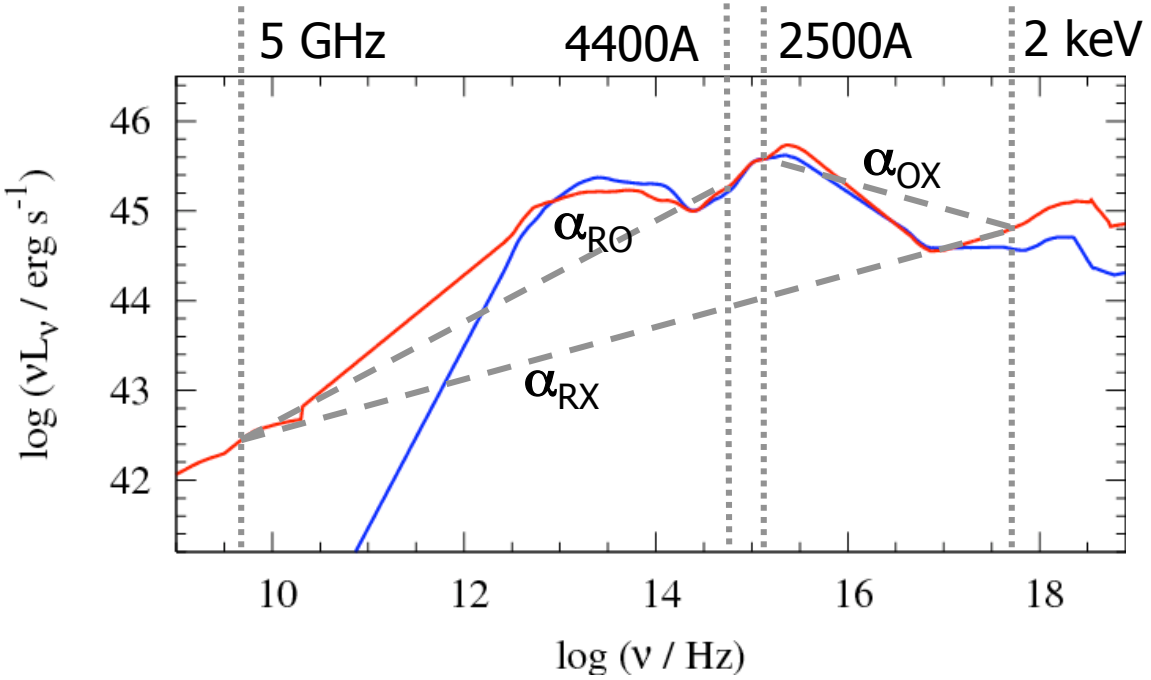
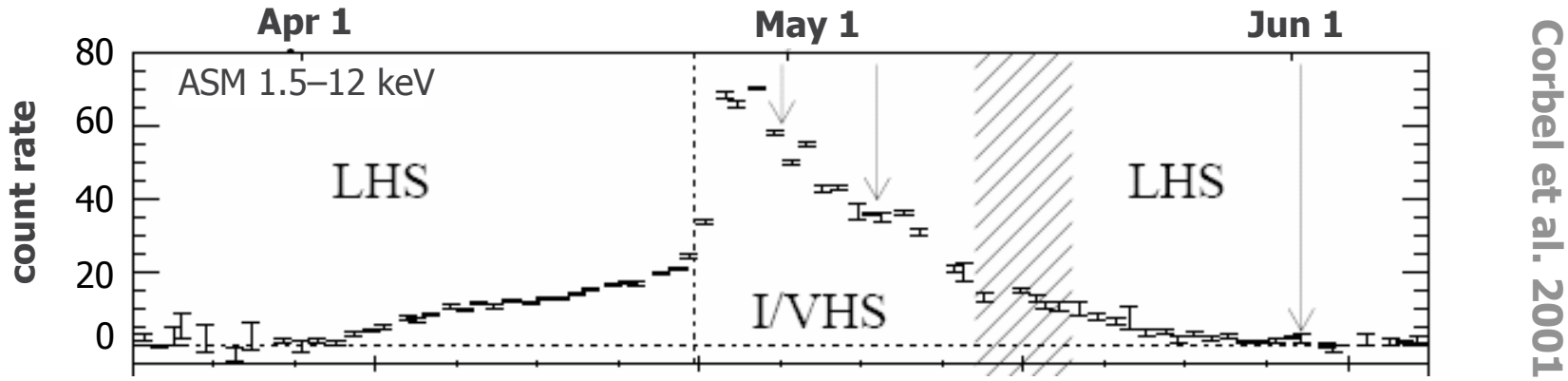
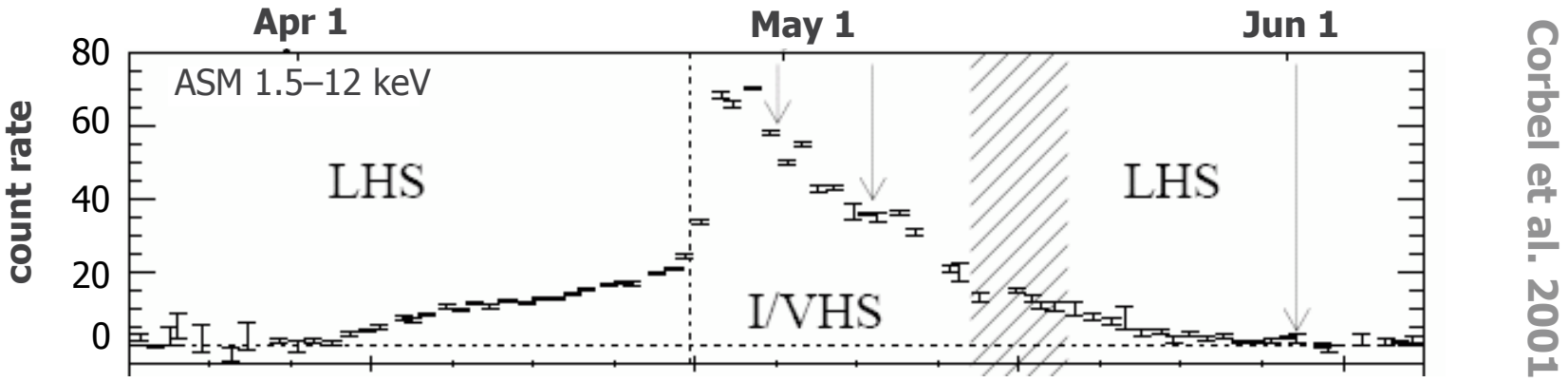




Corbel et al. 2001

What about α_{RO} and α_{RX} in AGN and GBHs?

		α_{RX}	α_{RO}	
RLQs		-0.71	-0.44	
XTE J1550-564	o1	-0.52	-0.10	radio detection
XTE J1550-564	o2	> -0.32	>0.23	no detection
XTE J1550-564	o3	-0.50	-0.29	radio detection
RQQs		-0.28	0.26	



Conclusions

Radio-loudness and X-ray loudness can be scaled between AGN and Galactic Black Hole binaries

In particular α'_{GBH} provides an adequate analogy for α_{OX}

Both RQQs and RLQs are in a spectral state similar to a very high/intermediate state of GBHs

Some RLQs may correspond to a hard state GBHs

Are we missing AGN with α_{OX} clustered around 1 and 2?