The jet-disc connection in blazars & blazars at high redshift

Tullia Sbarrato

Universita' degli Studi dell'Insubria

INAF OABrera – Merate

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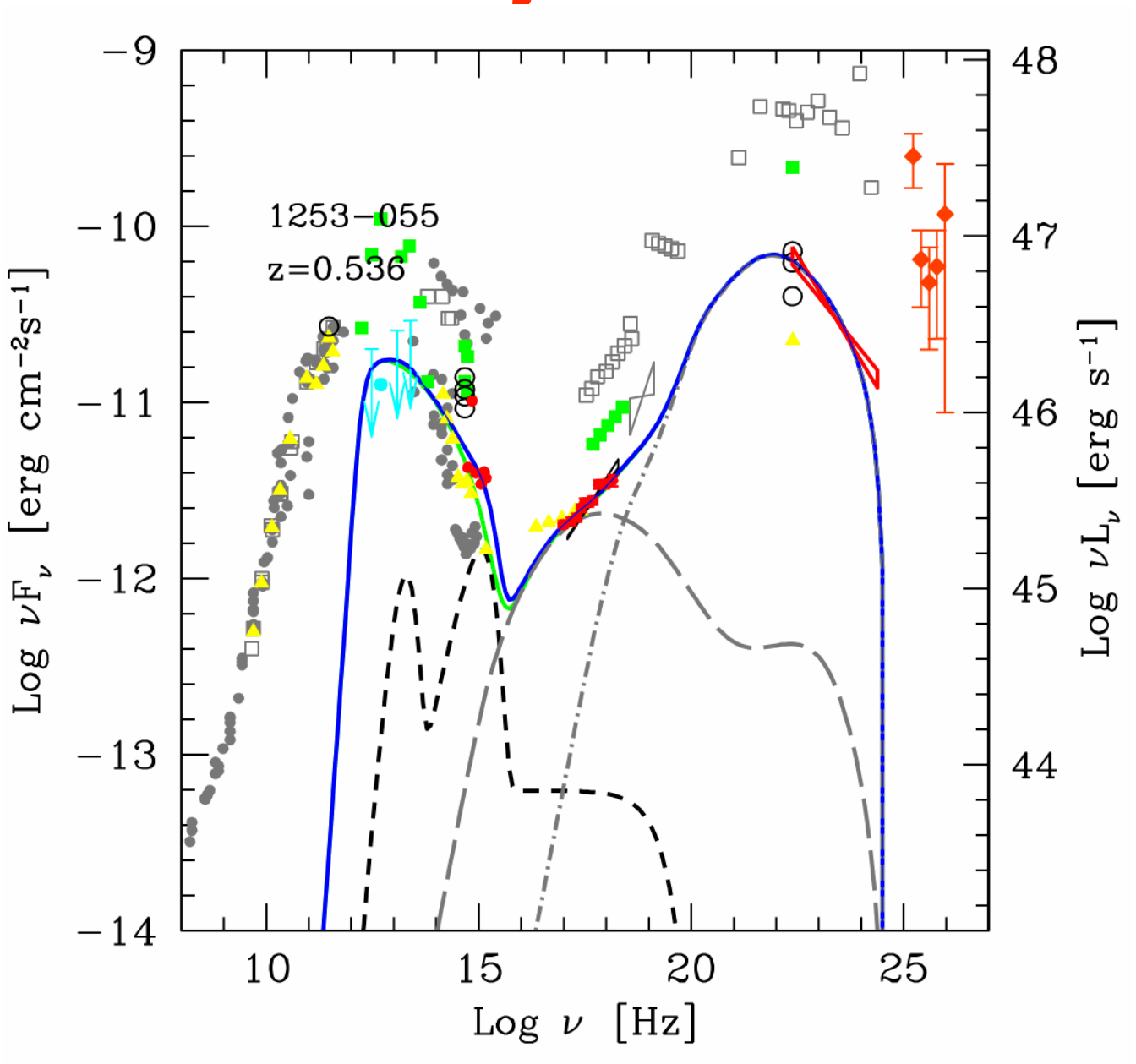
Jets and discs in blazars

G. Ghisellini, L. Maraschi, M. Colpi

Blazar SED: jet dominance



Jet and disc tracers

disc emission ($\dot{M}$, M_{BH}) ⟺ **jet power** (P_j)

↓ ↓

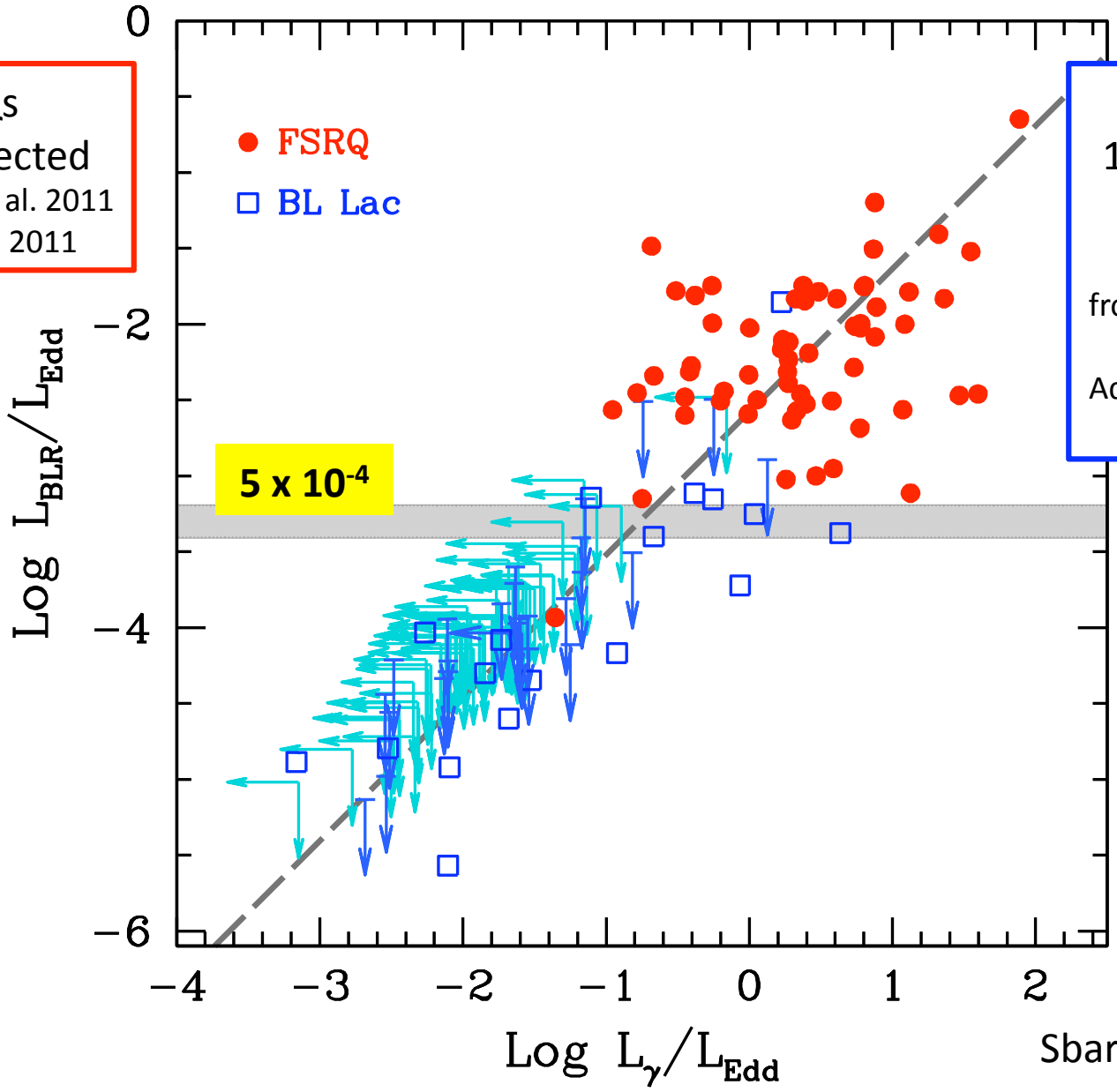
L_{BLR} L_γ

- SDSS DR7 Quasar Catalog (Schneider et al. 2010) analysed by Shen et al. (2011)
- Plotkin et al. (2011)
- SDSS DR6 (Adelman-McCarthy et al. 2008)

Clean 1LAC sample (Abdo et al. 2010)

BLR vs gamma-ray luminosity

60 FSRQs
optically selected
from Ghisellini et al. 2011
and Shen et al. 2011

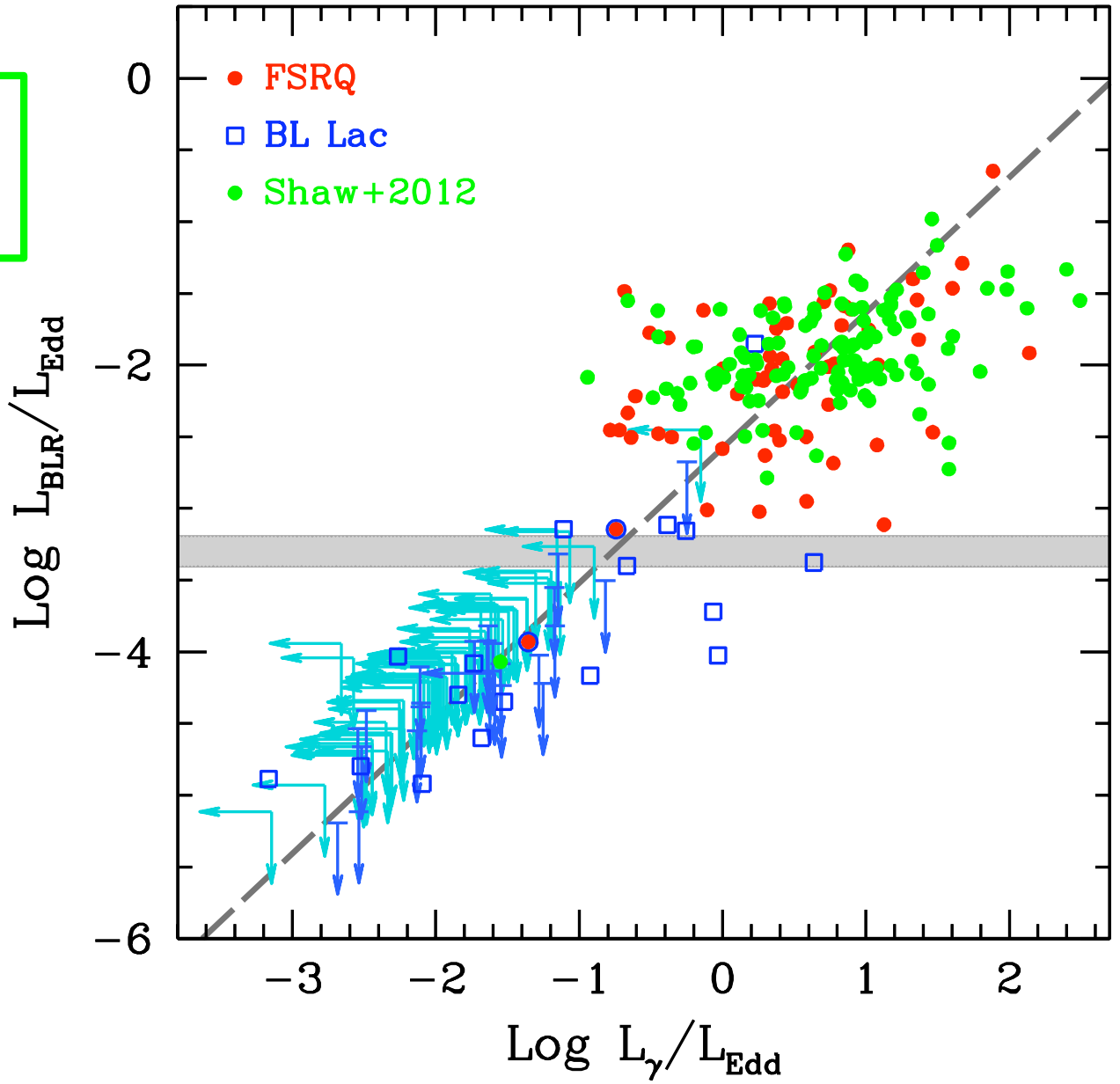


103 BL Lacs:
18 with both L det,
23 UL on L_{BLR},
62 UL on both L
from Ghisellini et al. 2011,
Plotkin et al. 2011 and
Adelmann-McCarthy et al.
2008

Sbarrato et al. (2012a)

BLR vs gamma-ray luminosity

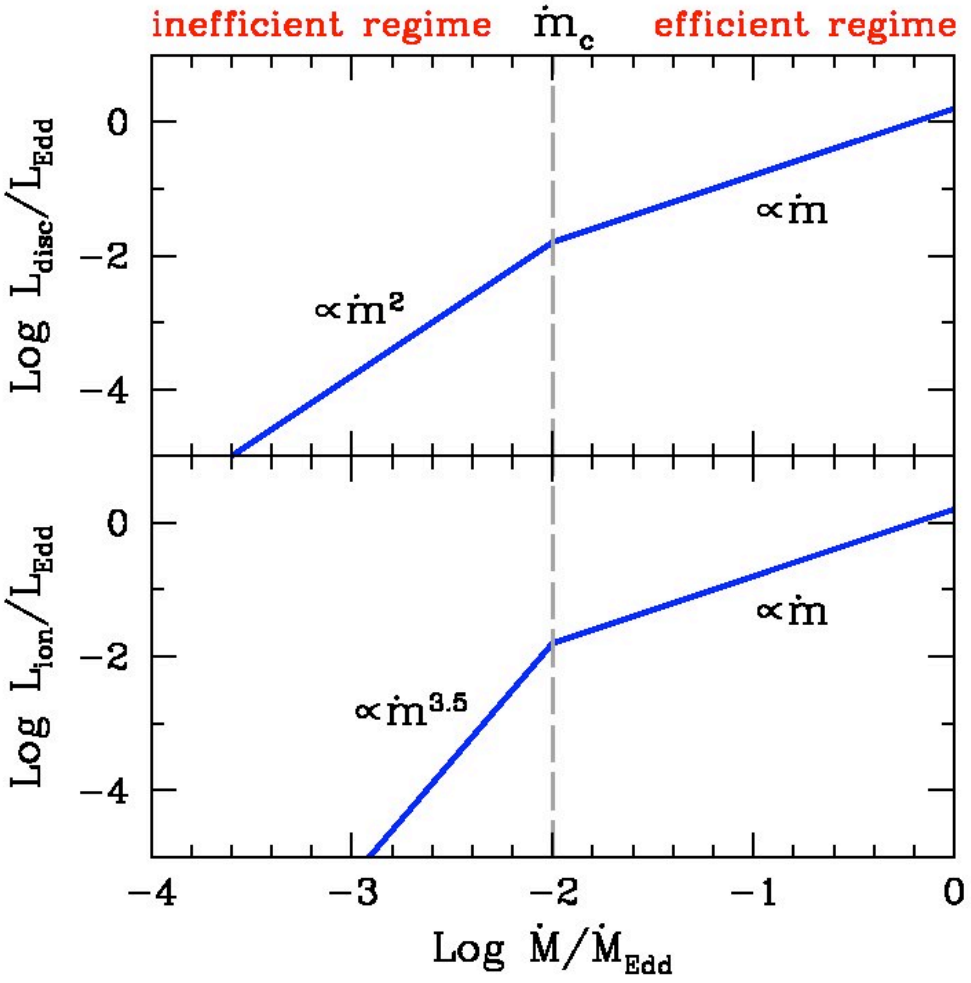
+ 124 Fermi selected FSRQs spectroscopically analysed by Shaw et al. 2012



Is this correlation expected?

Good correlation: → Inverse Compton on BLR photons?

→ deeper connection? **accretion?**



$$L_d = \eta \dot{M} c^2$$

Mahadevan (1997)

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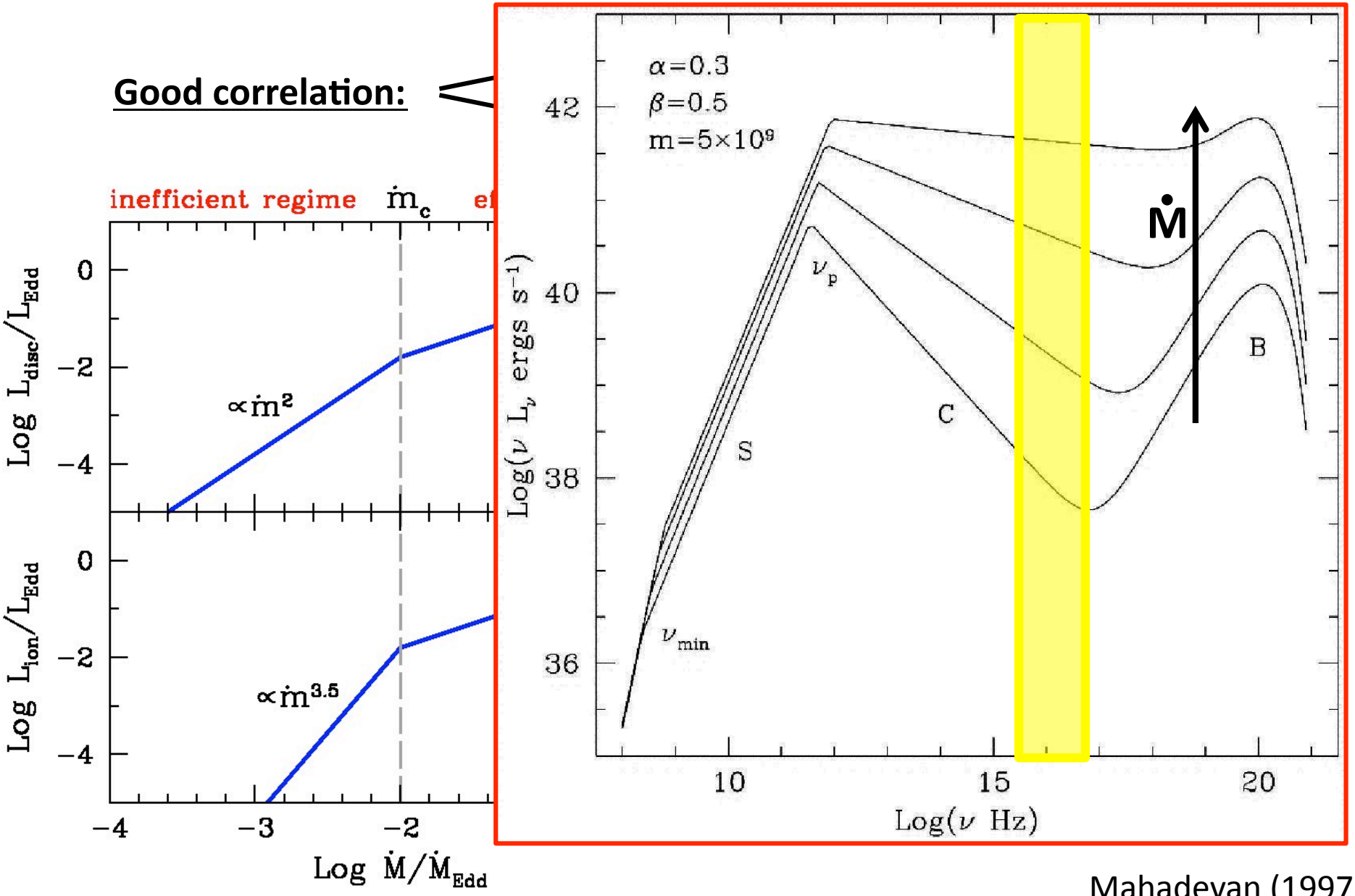
Good correlation:



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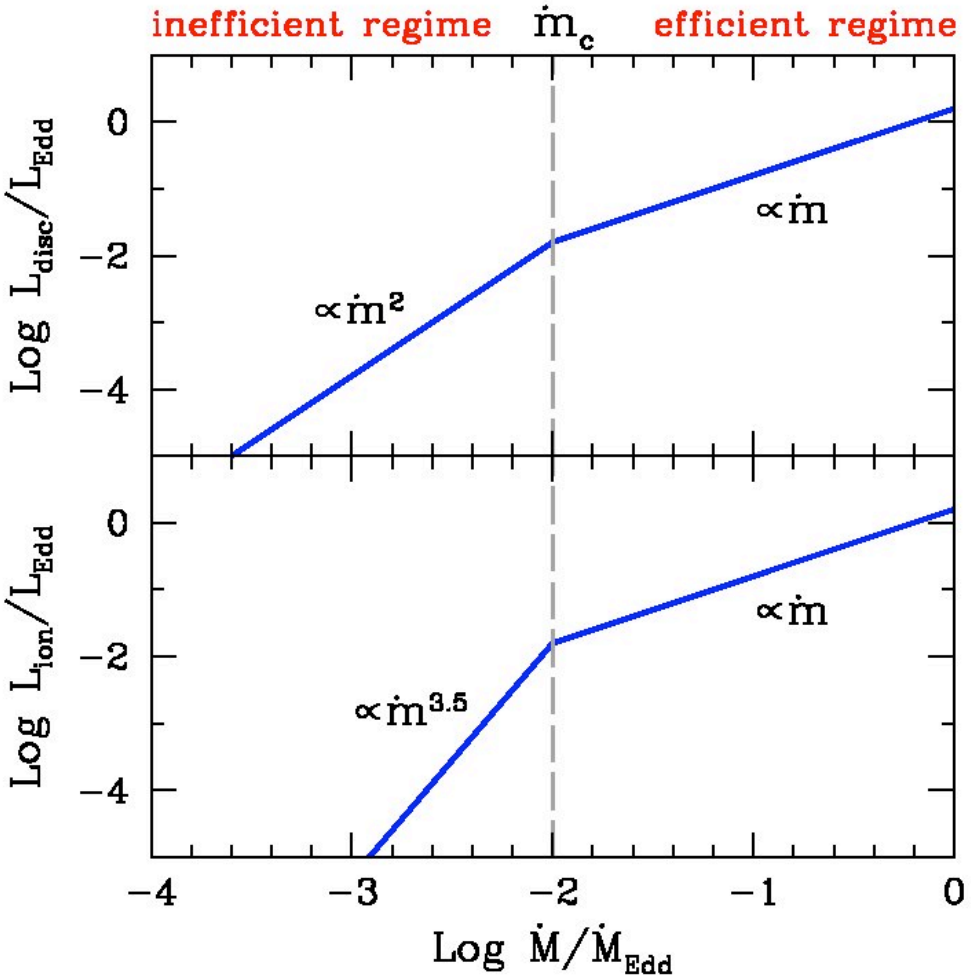
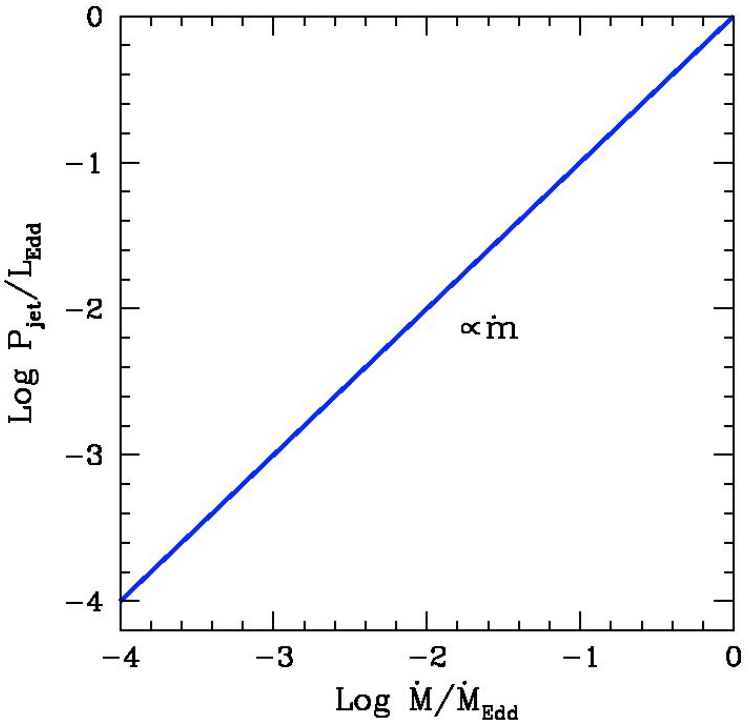


Ghisellini et al. 2010



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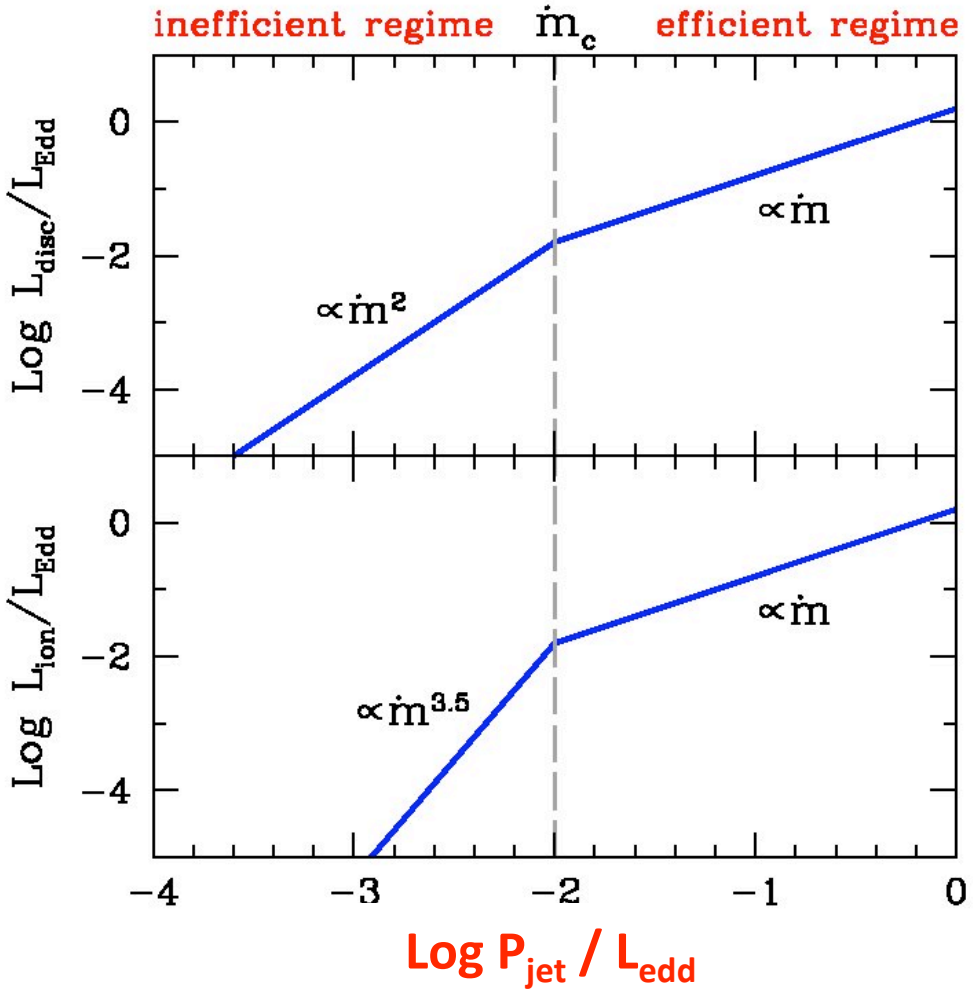
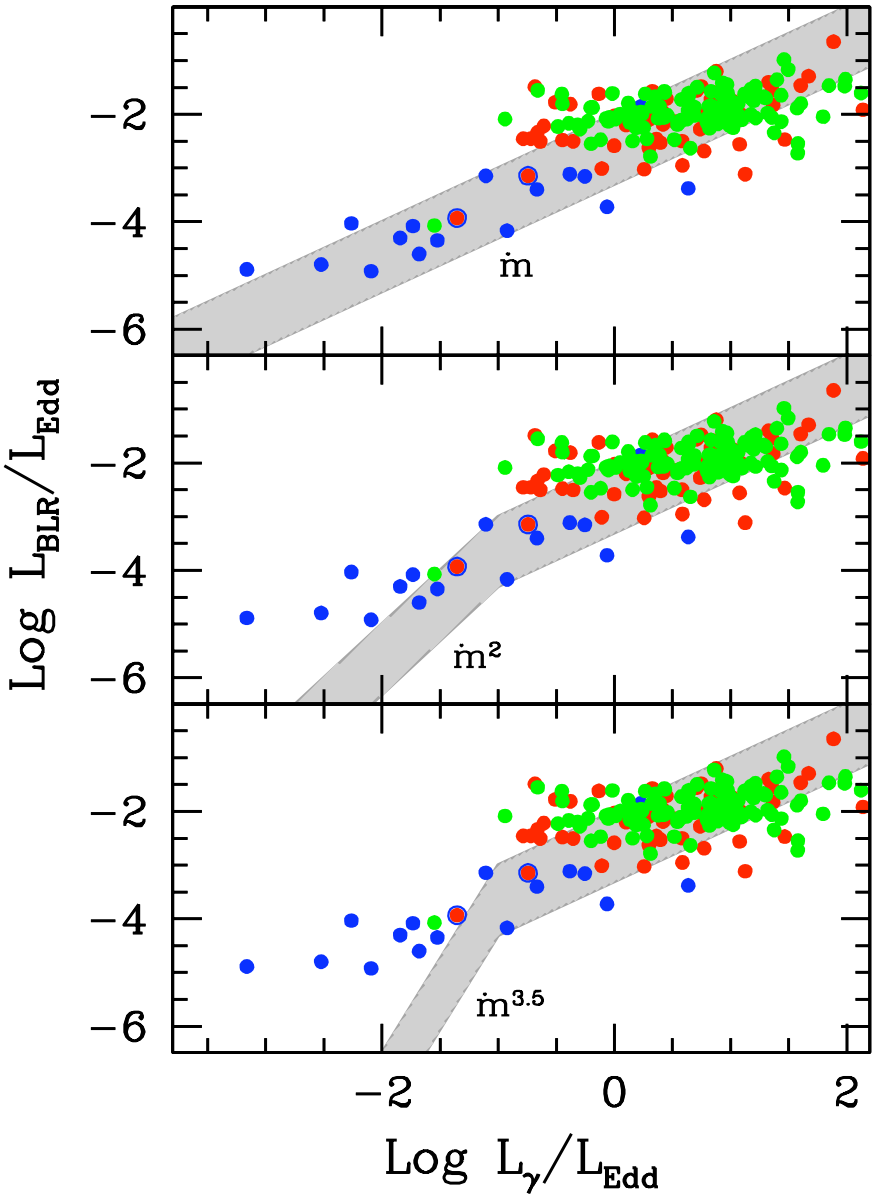


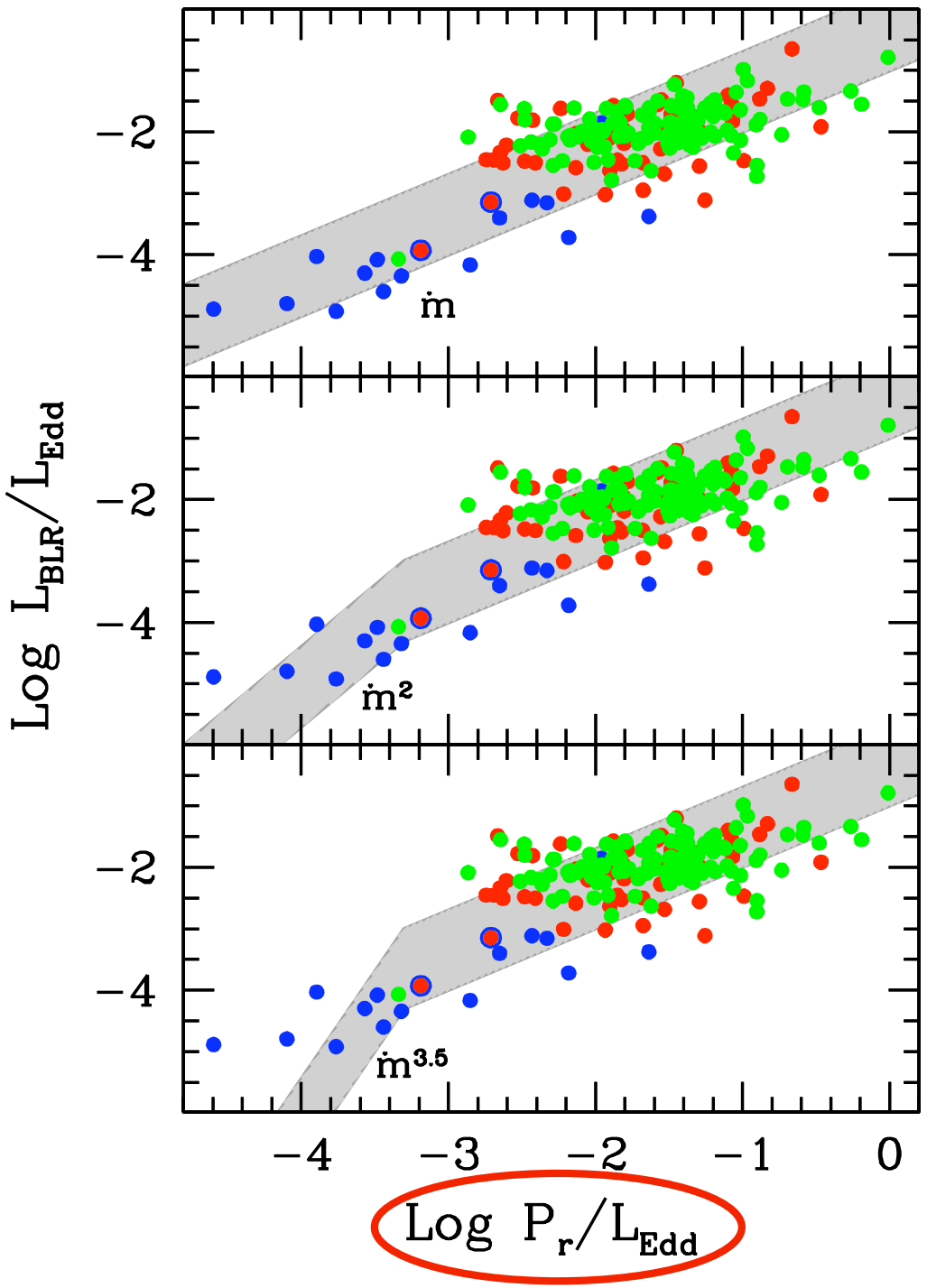
we expect a break!

Is this correlation expected?



No Break!

P_r = better proxy for P_j


−2
−4
ṁ
−2
−4
ṁ²
−2
−4
ṁ3.5
−4
−3
−2
−1
0
Log L_BLR/L_Edd
Log P_r/L_Edd

Jets and discs at high redshift

G. Ghisellini, M. Nardini, G. Tagliaferri, L. Foschini, G. Ghirlanda, F. Tavecchio, J. Greiner, A. Rau, N. Gehrels

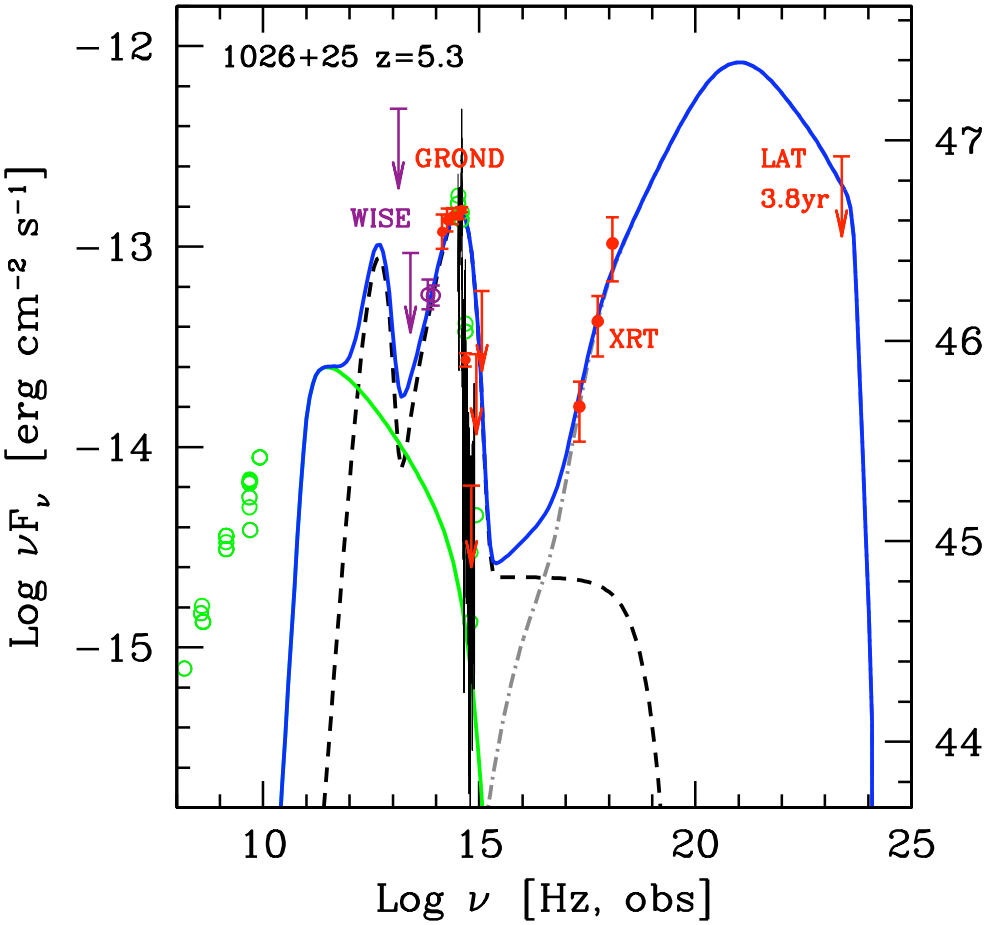
Blazars at high redshift

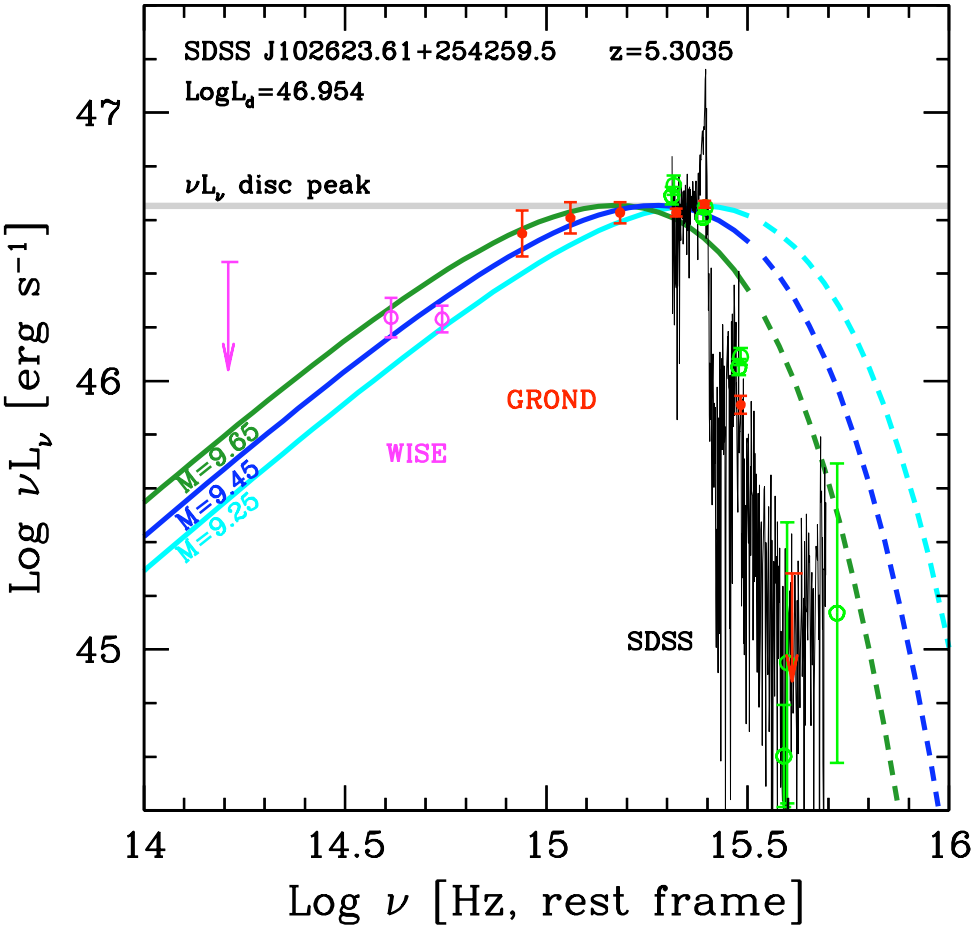
- intrinsic high luminosity & beaming of jet
  - → likely visible at very high redshift
- each blazar counts for $2\Gamma^2$ (~400) analogous AGN not aligned
- most powerful quasars host most massive BH

search of high-z blazars
is competitive with
search of high-z radio-quiet AGN
to study most massive early BH

The discovery of a blazar at z=5.3

M_{BH} estimate: see talk by Giorgio Calderone!





Sbarrato et al. (2012b)

Conclusions

- ✓ $L_{BLR} \propto L_{\gamma}$ (normalized to L_{Edd})
- ✓ **blazars' divide:** $L_{BLR}=5x10^{-4}L_{Edd}$ (new classification!)
- ✓ **different accretion regimes** responsible for the **blazars' divide?**
- ✓ search of **high-z blazars** ⟶ search of **very massive early BH**
- ✓ we found a **blazar at z=5.3** with a **systematic approach**