

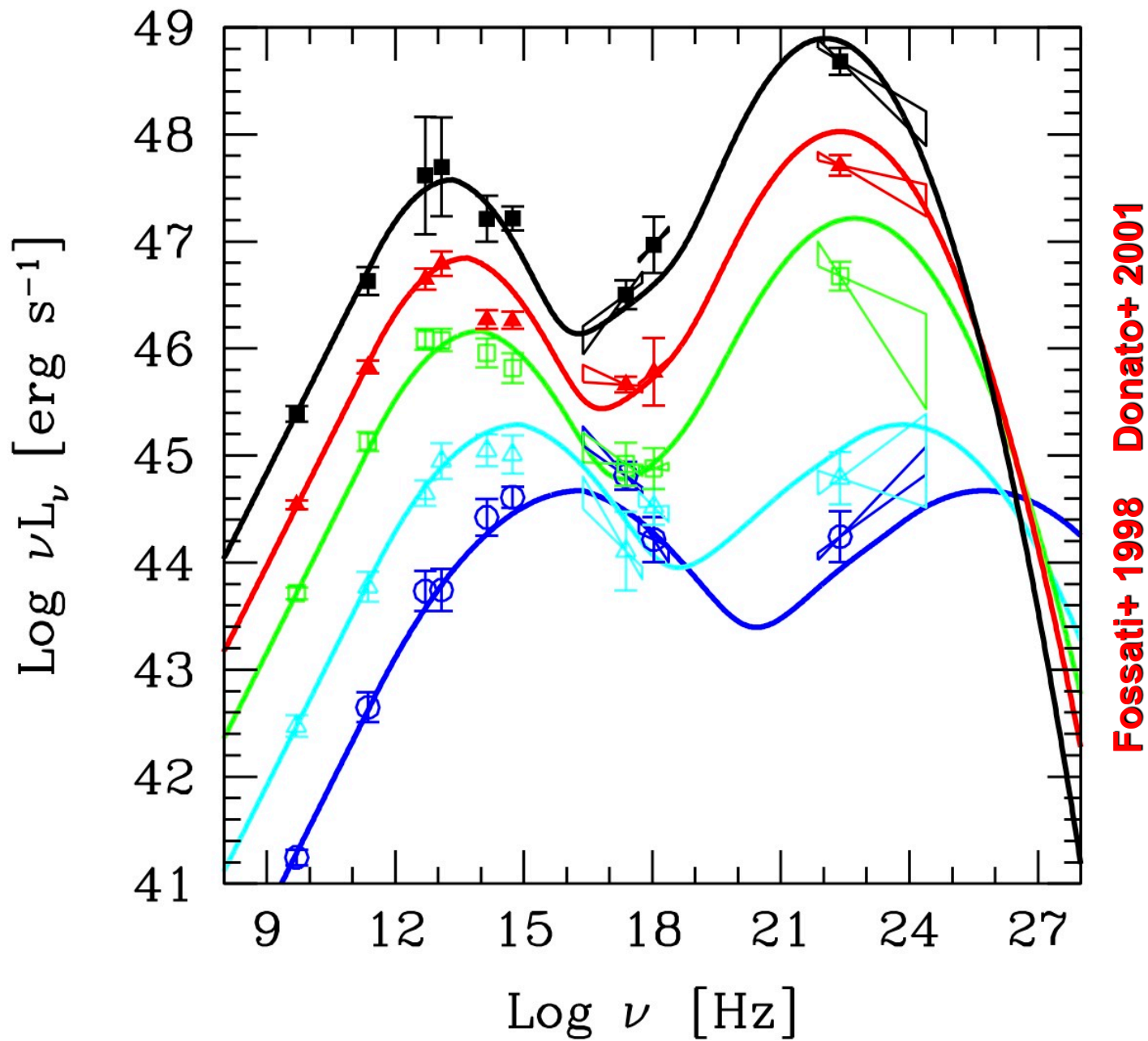
The blazar sequence is alive

Gabriele Ghisellini

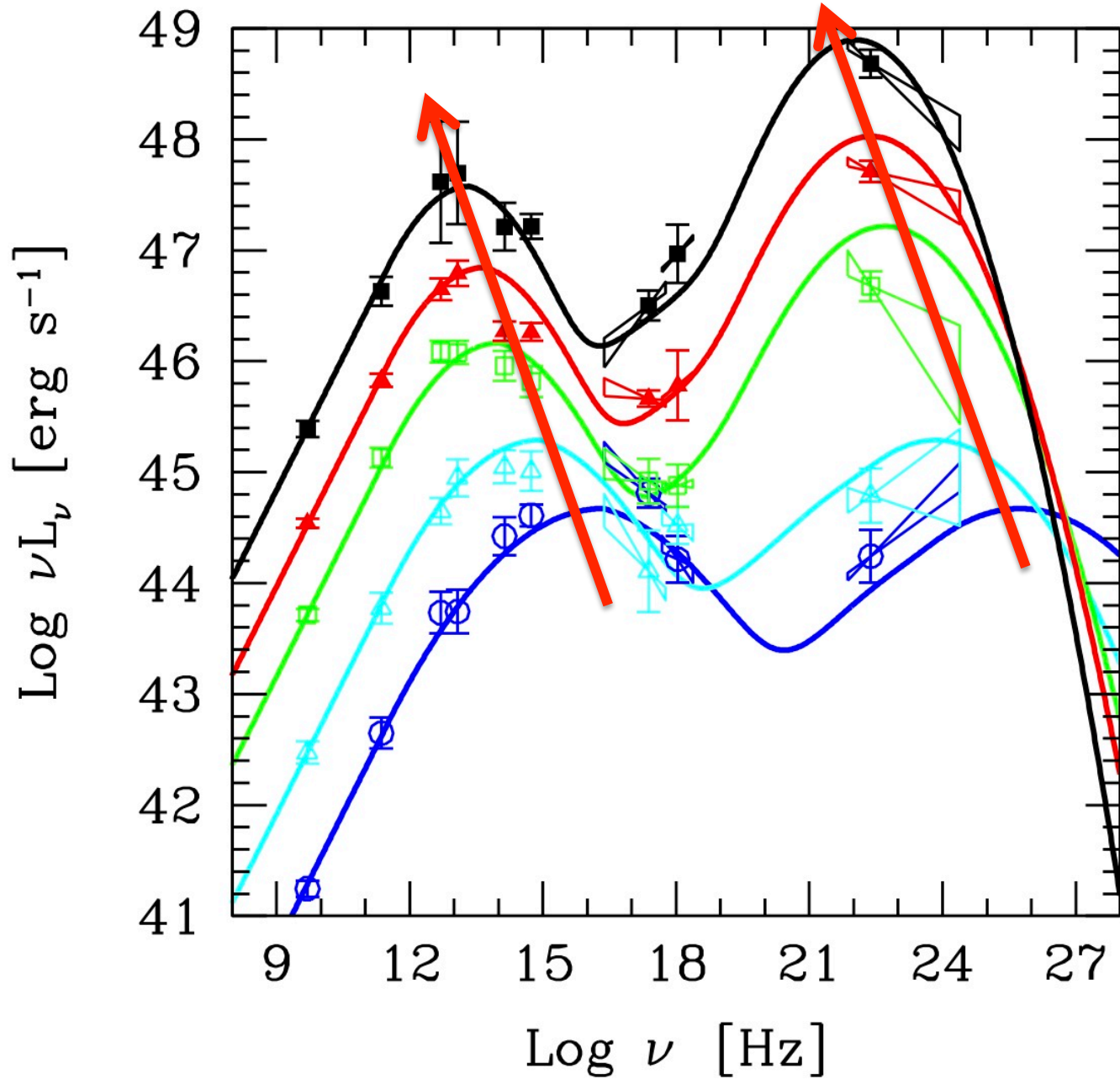
INAF - Osservatorio di Brera



The blazar sequence 1.0: 126 blazars, only 33 detected in γ

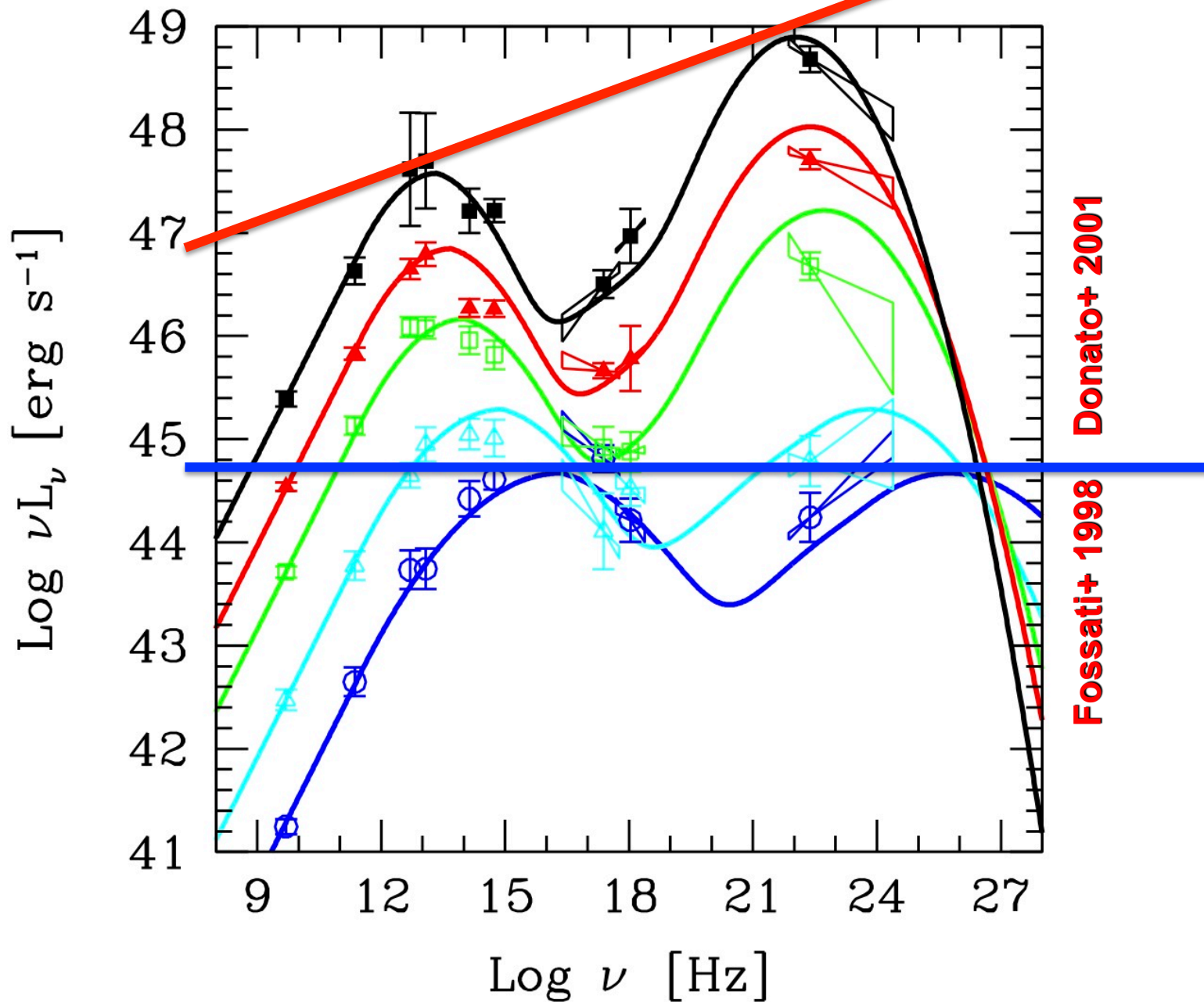


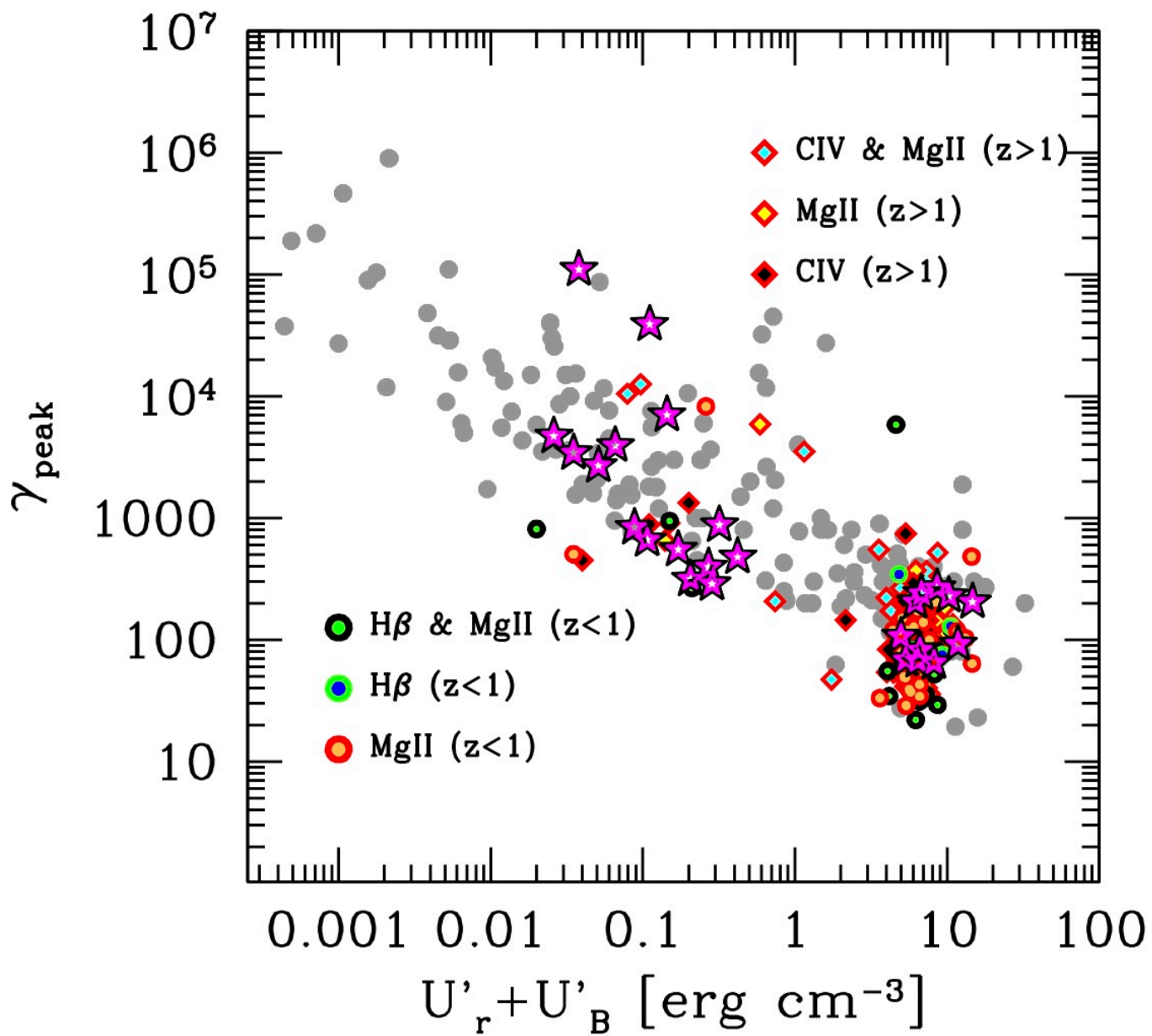
The brighter the redder

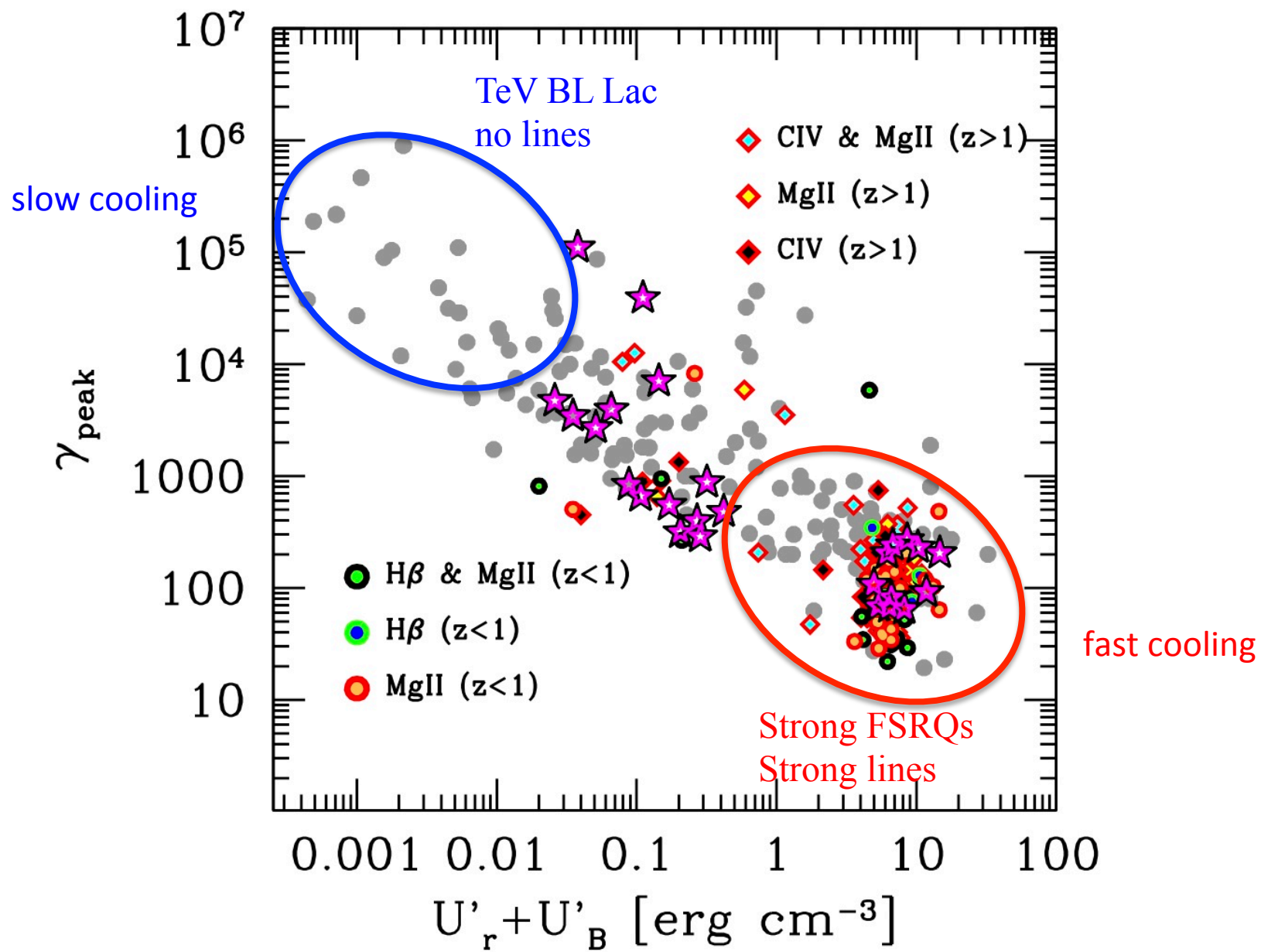


Fossati+1998 Donato+2001

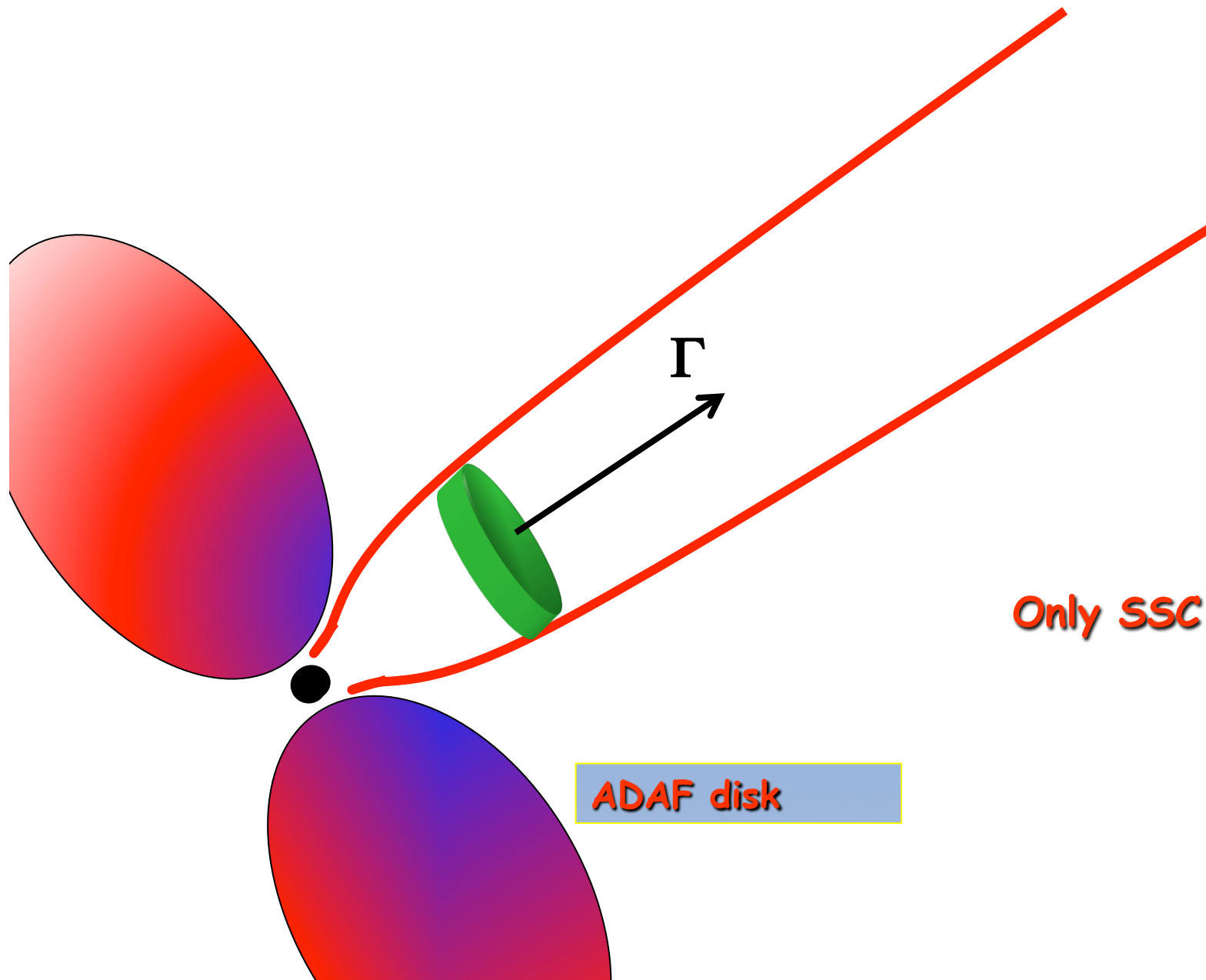
The brighter the more Compton dominated







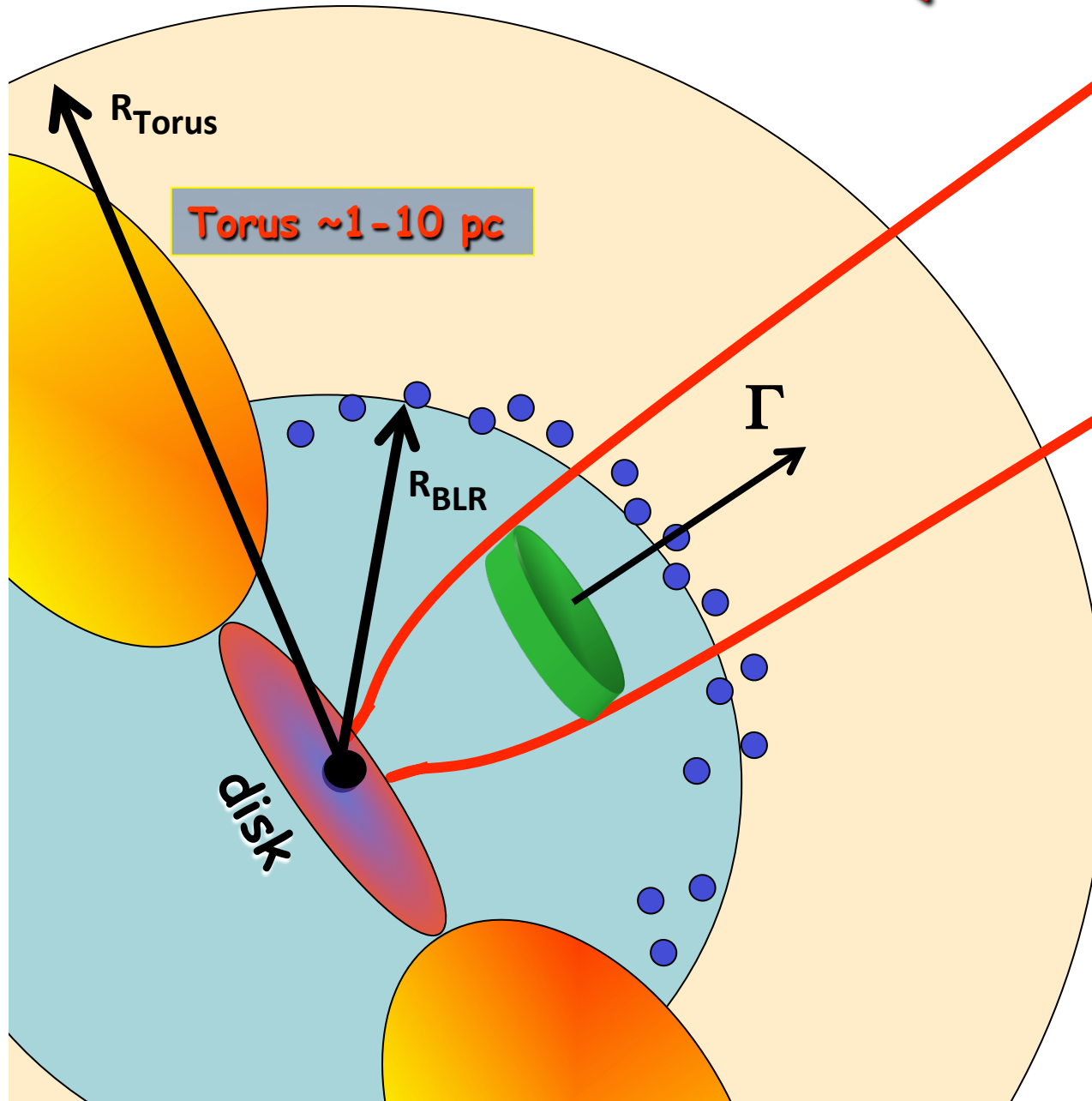
BL Lacs



Only SSC

ADAF disk

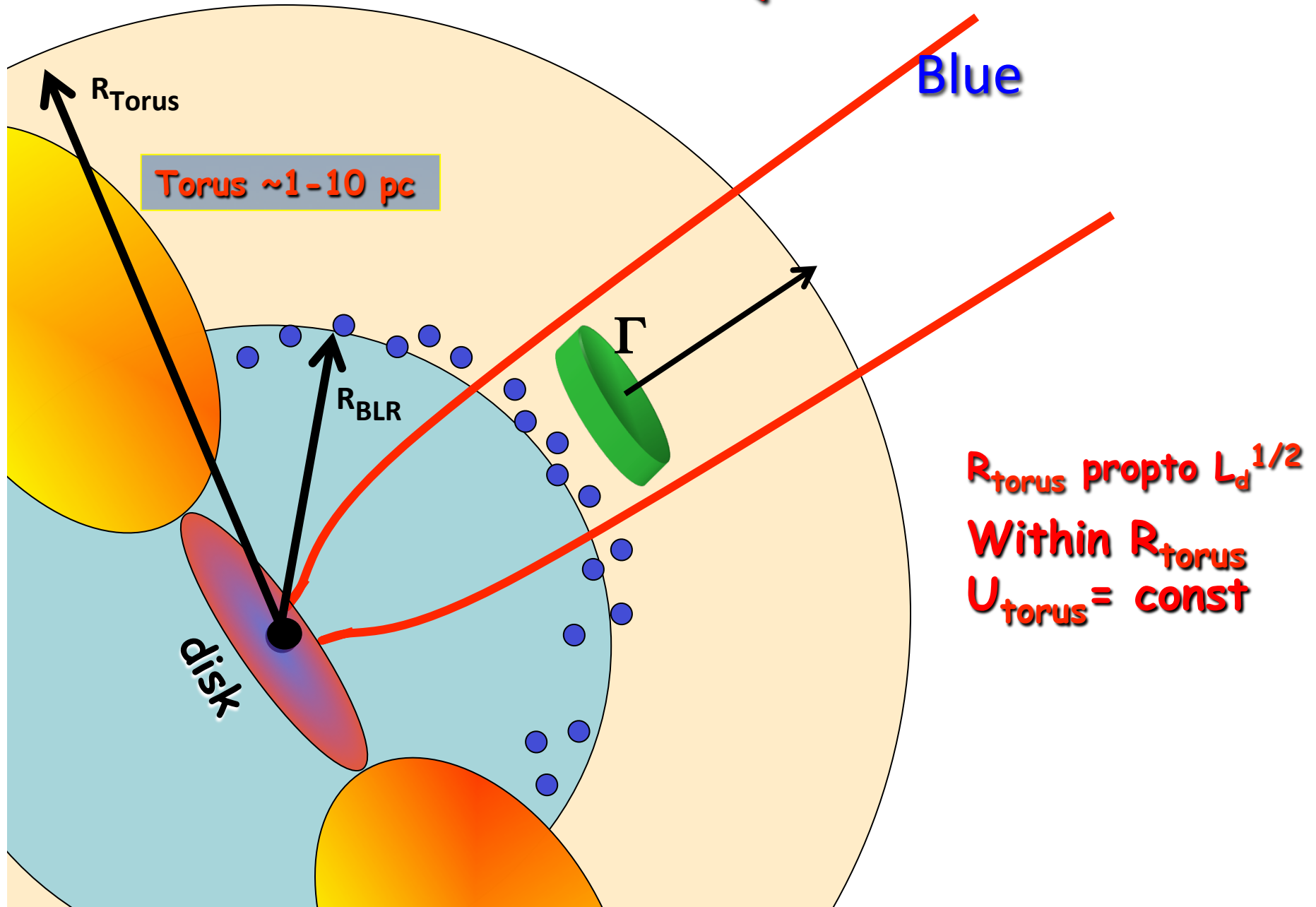
FSRQs



Broad Line Region:
 $R_{\text{BLR}} \propto L_d^{1/2}$

Within R_{BLR}
 $U_{\text{BLR}} = L_d / R^2 c = \text{const}$

FSRQs



Criticism:

Giommi, Menna, Padovani 1999

Perlman + 2001

Padovani+ 2003

Caccianiga & Marcha 2004

Anton & Browne 2005

Giommi+ 2005

Nieppola, Tornikoski, Valtoja 2006

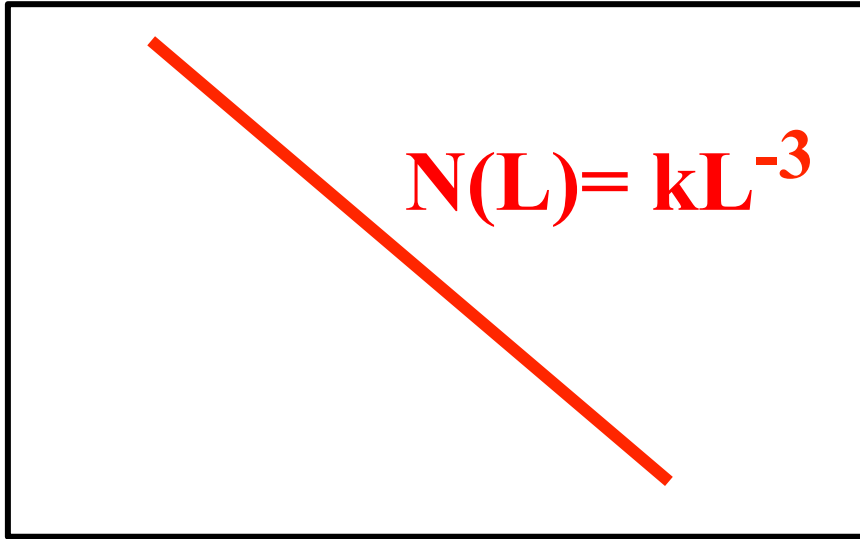
Padovani, Giommi, Rau 2012

For review Padovani 2007 and Ghisellini & Tavecchio 2008

Recently: **“Simplified blazar scenario”**

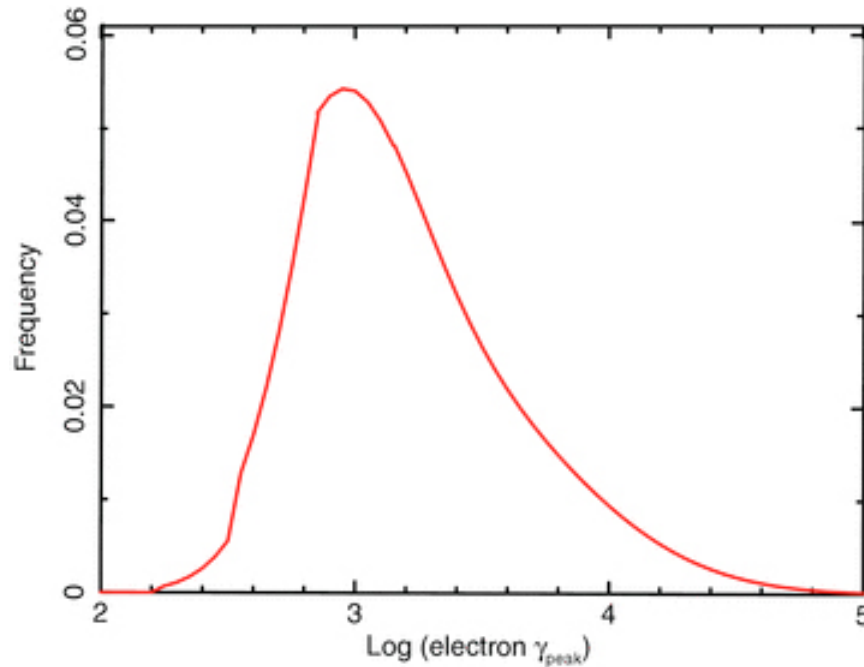
Giommi, Padovani et al. 2012: sequence is apparent, being the result of selection effects

Log N(L)



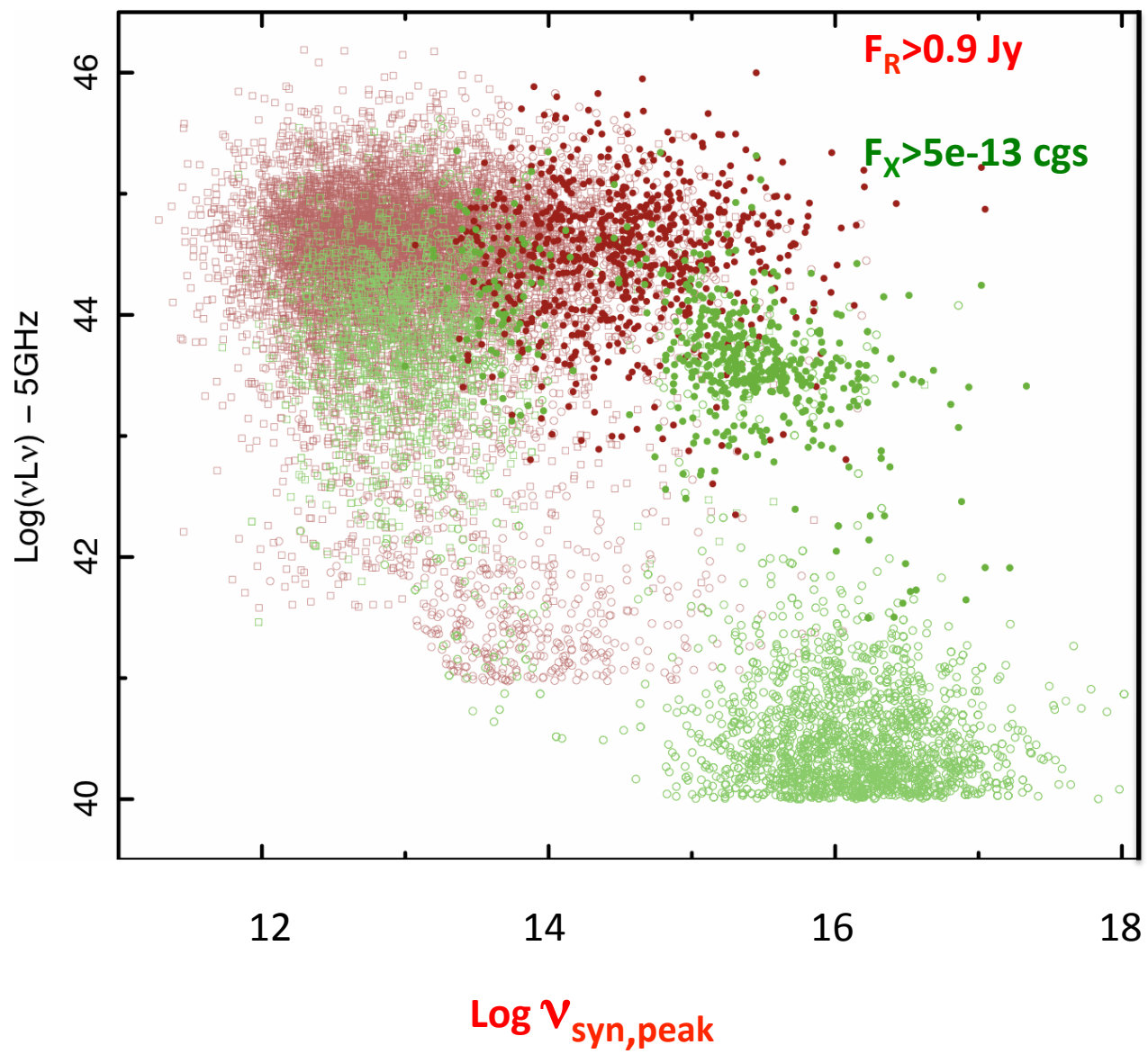
**Radio Luminosity
function @ 41 GHz**

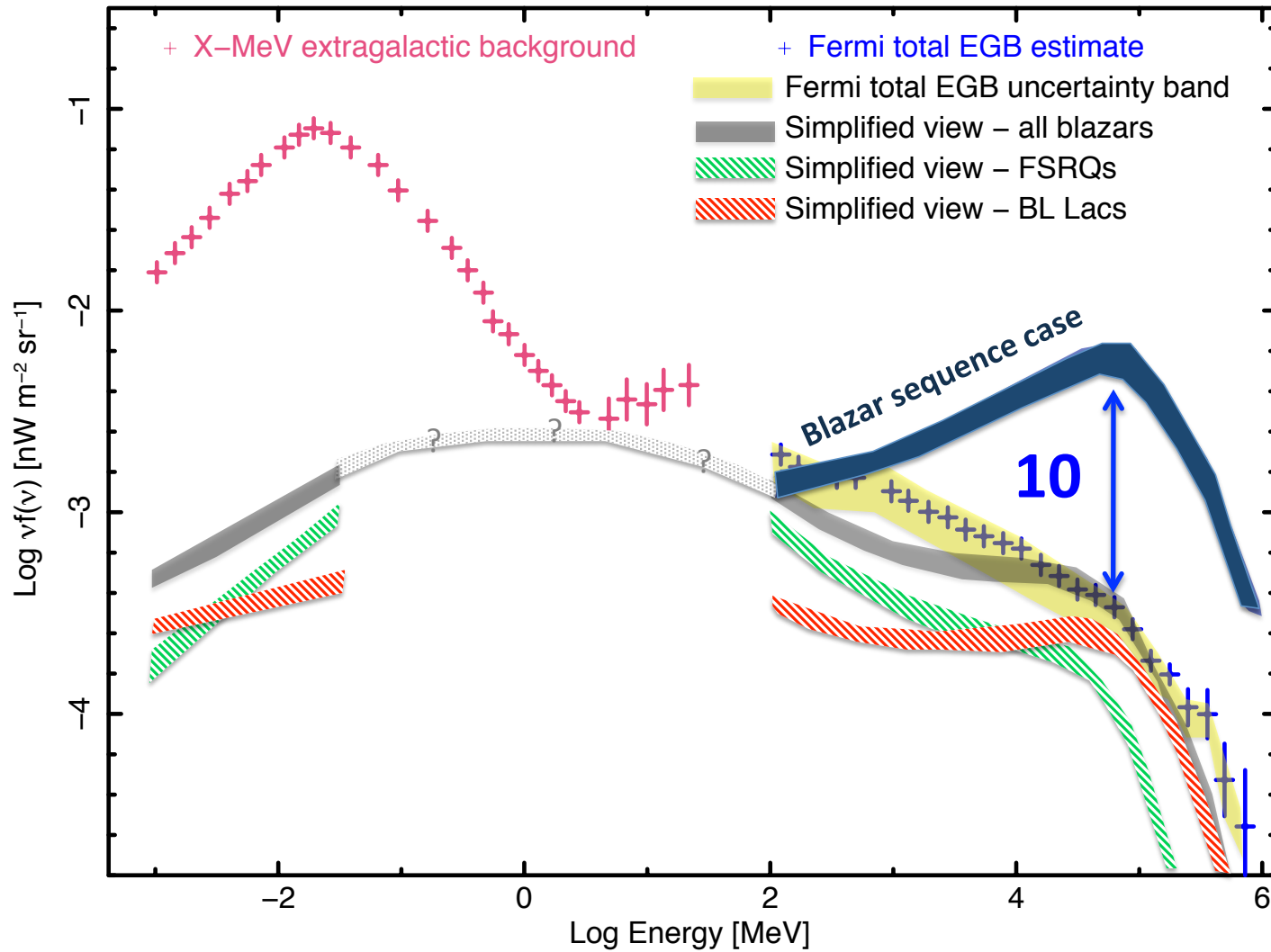
Log L



Distribution of γ_{peak}

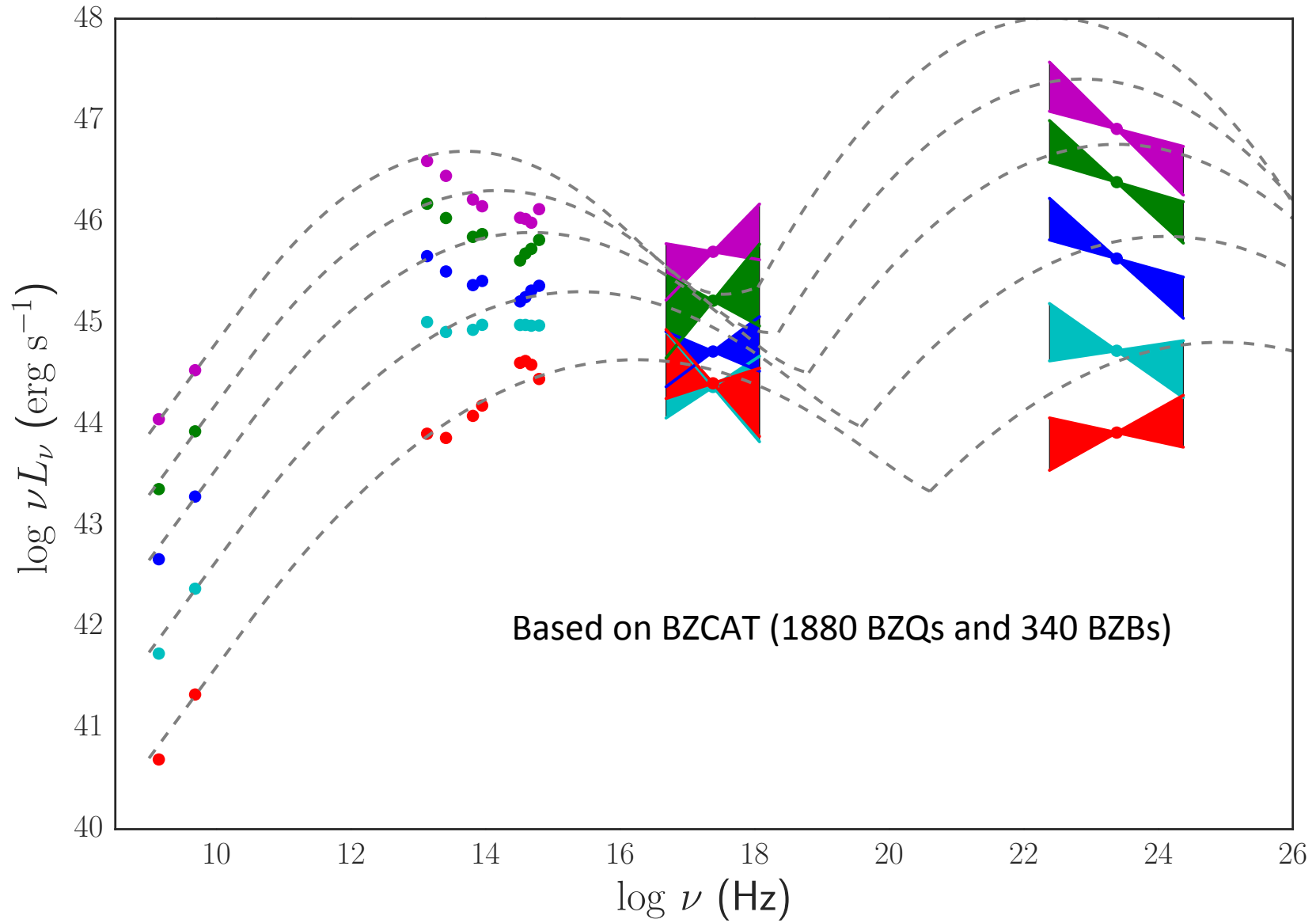
Giommi, Padovani+ 2012



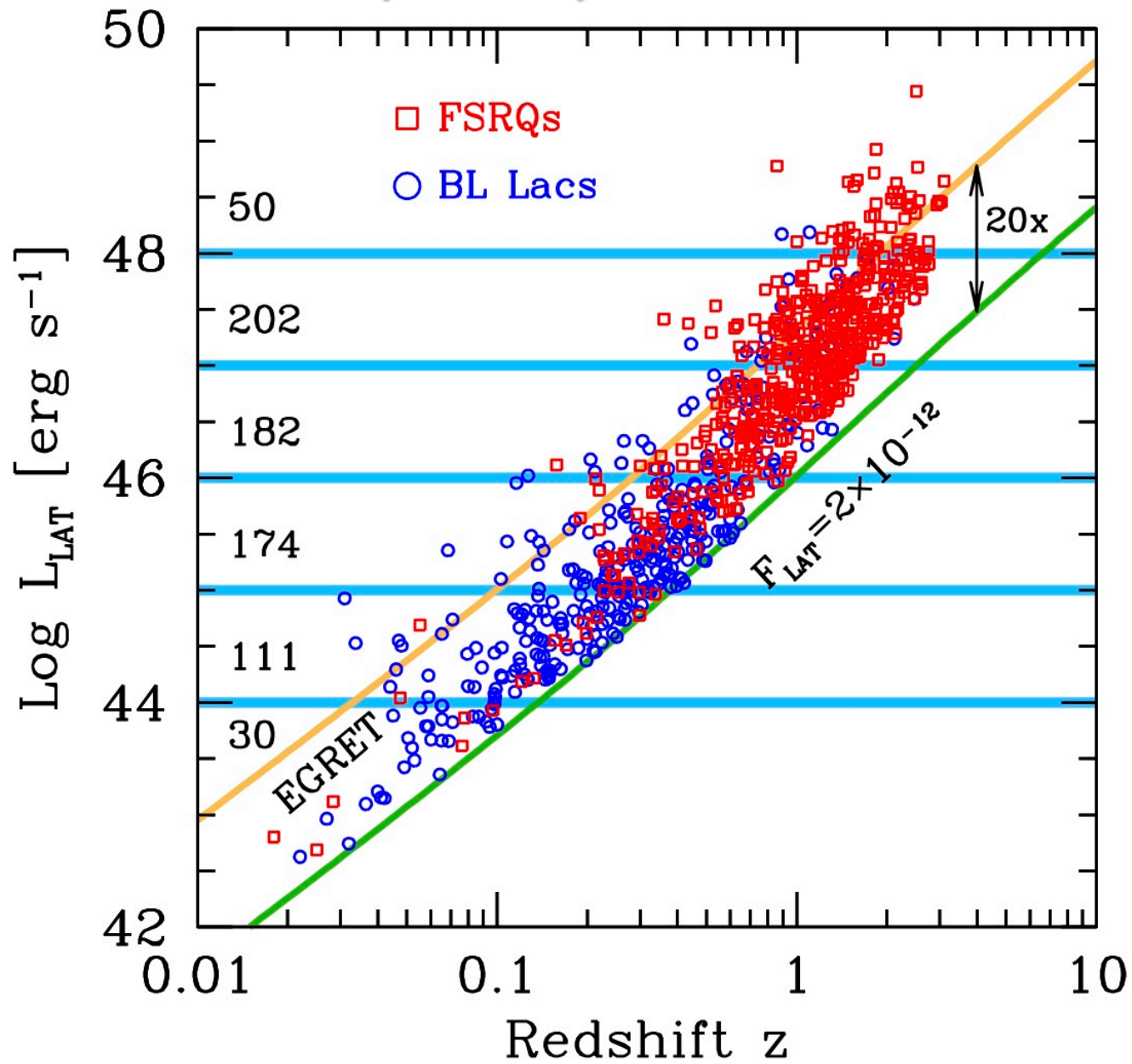


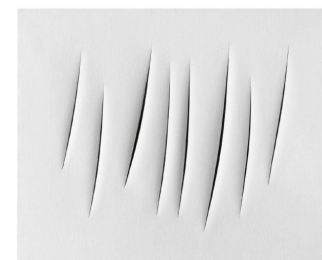
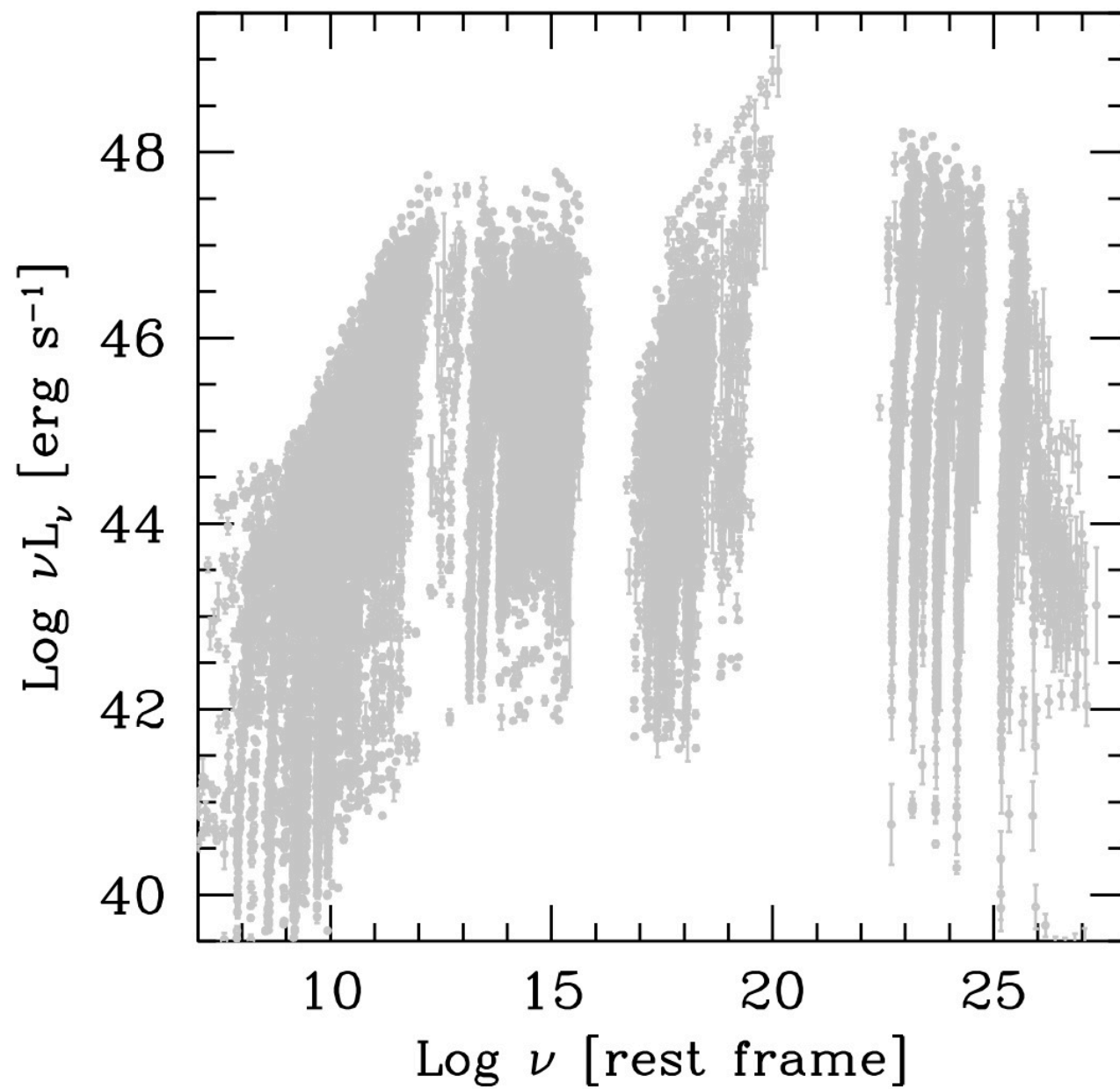
Munch

Giommi & Padovani 2015

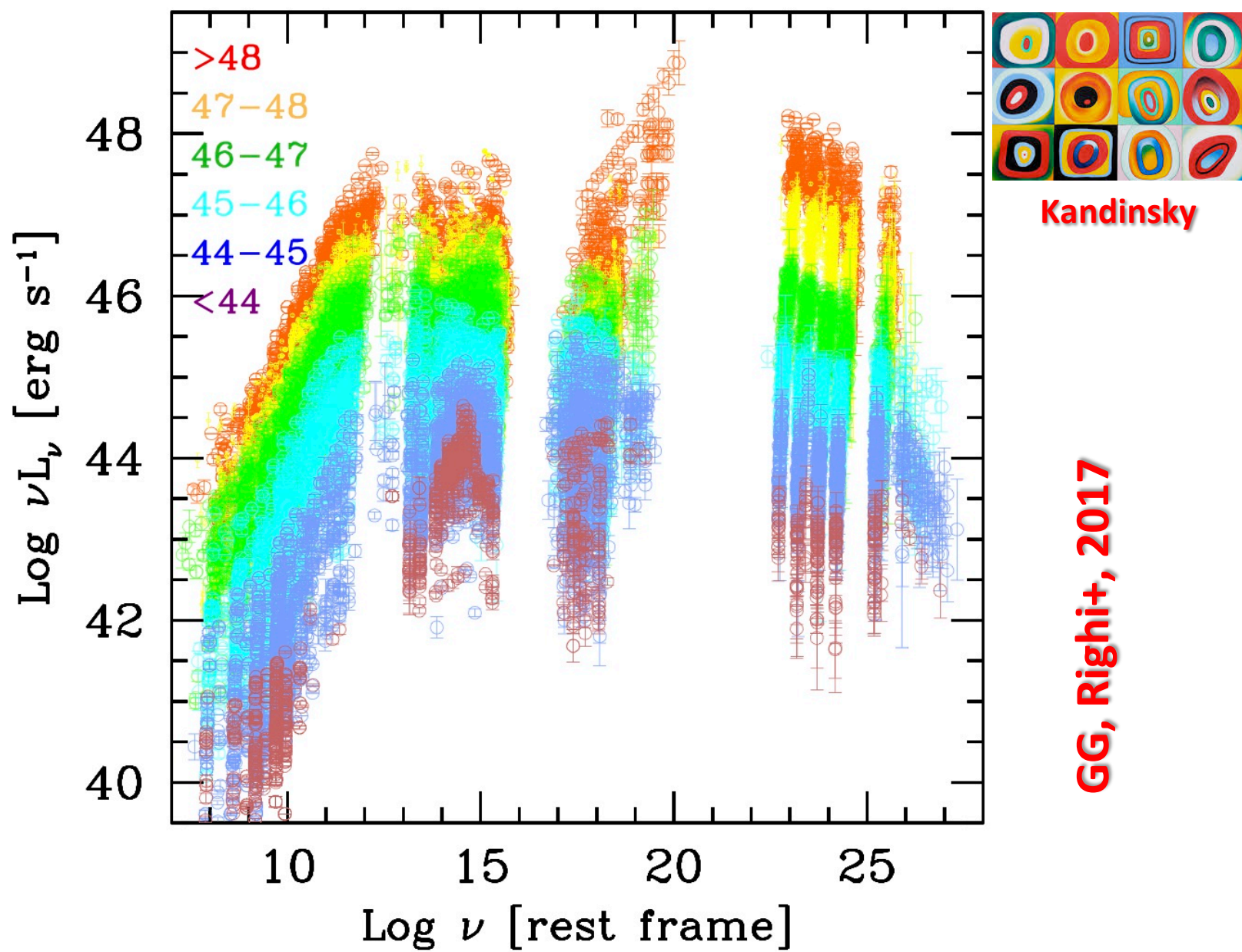


3LAC, "clean", with z: 749 blazars

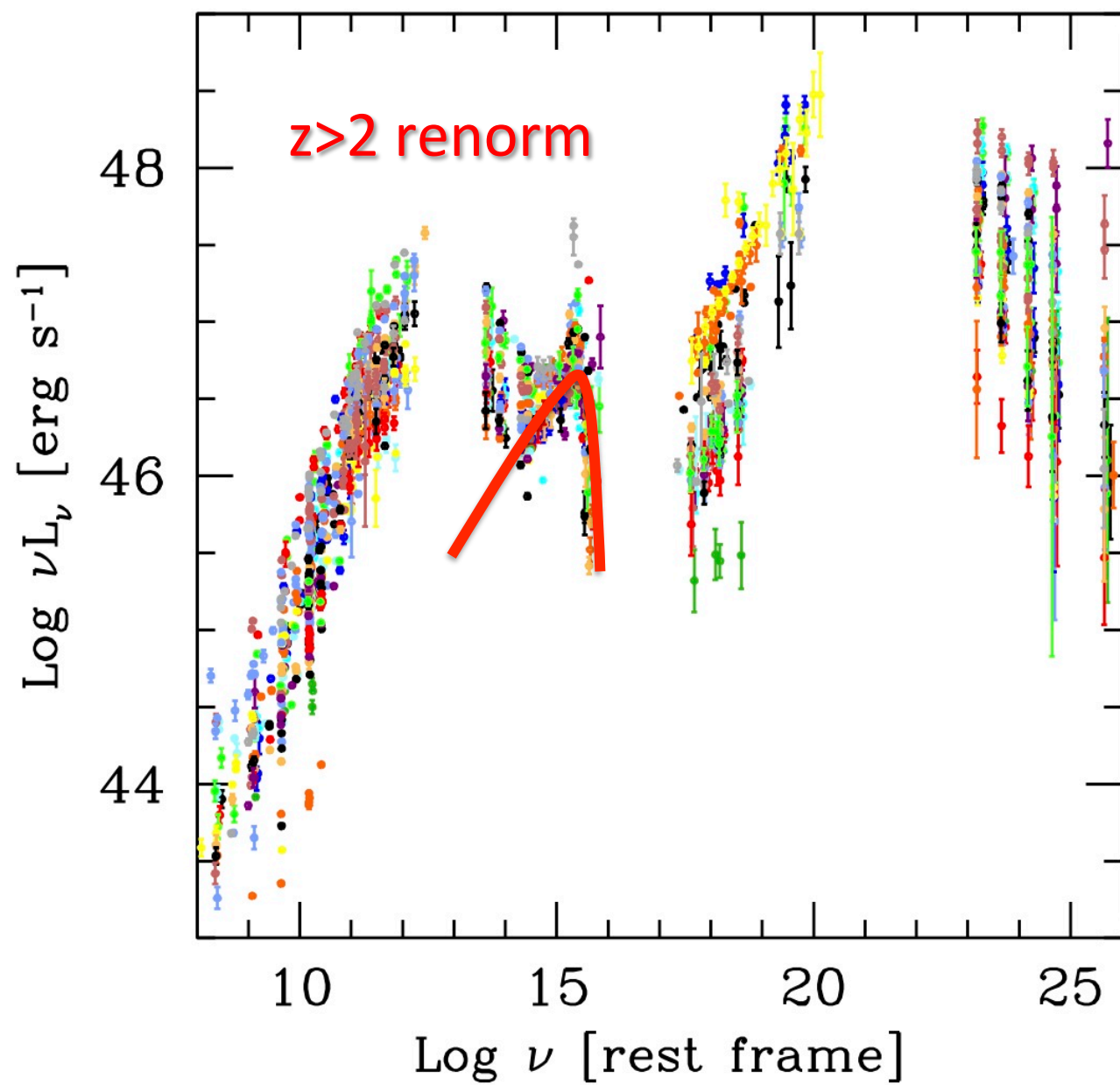




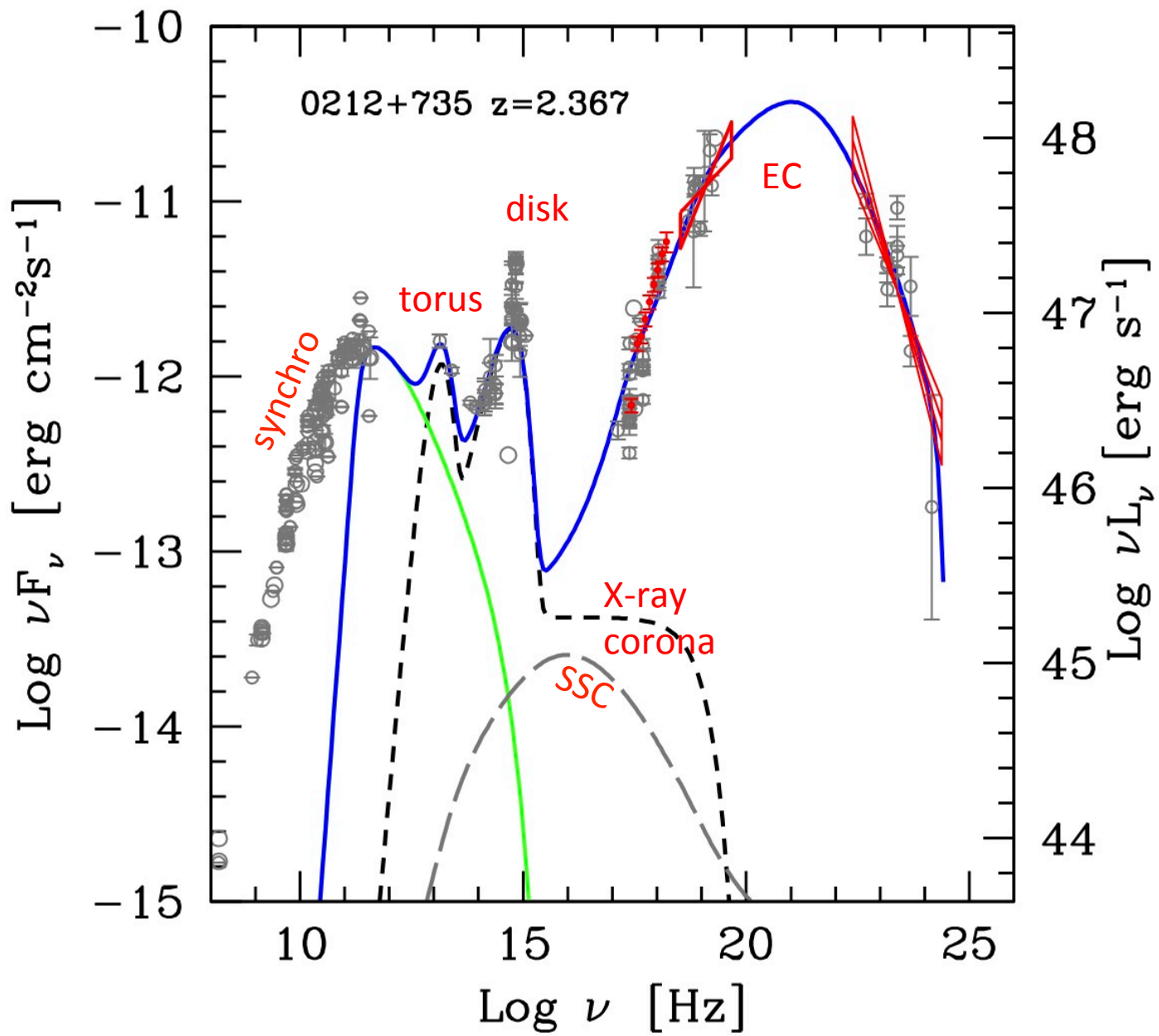
Fontana

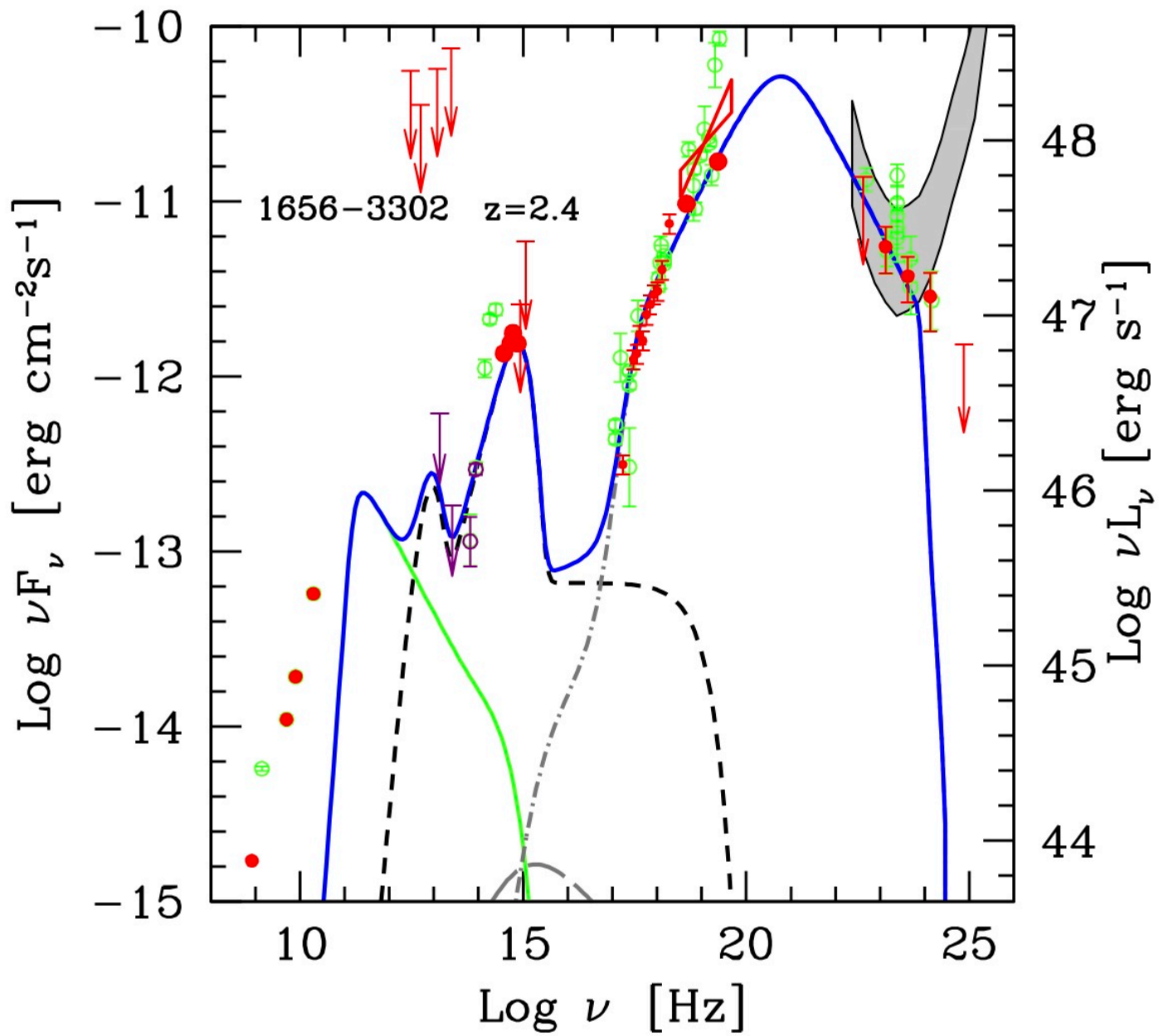


In powerful blazars a $z > 2$ the accretion disk is well visible. Also the torus is visible.

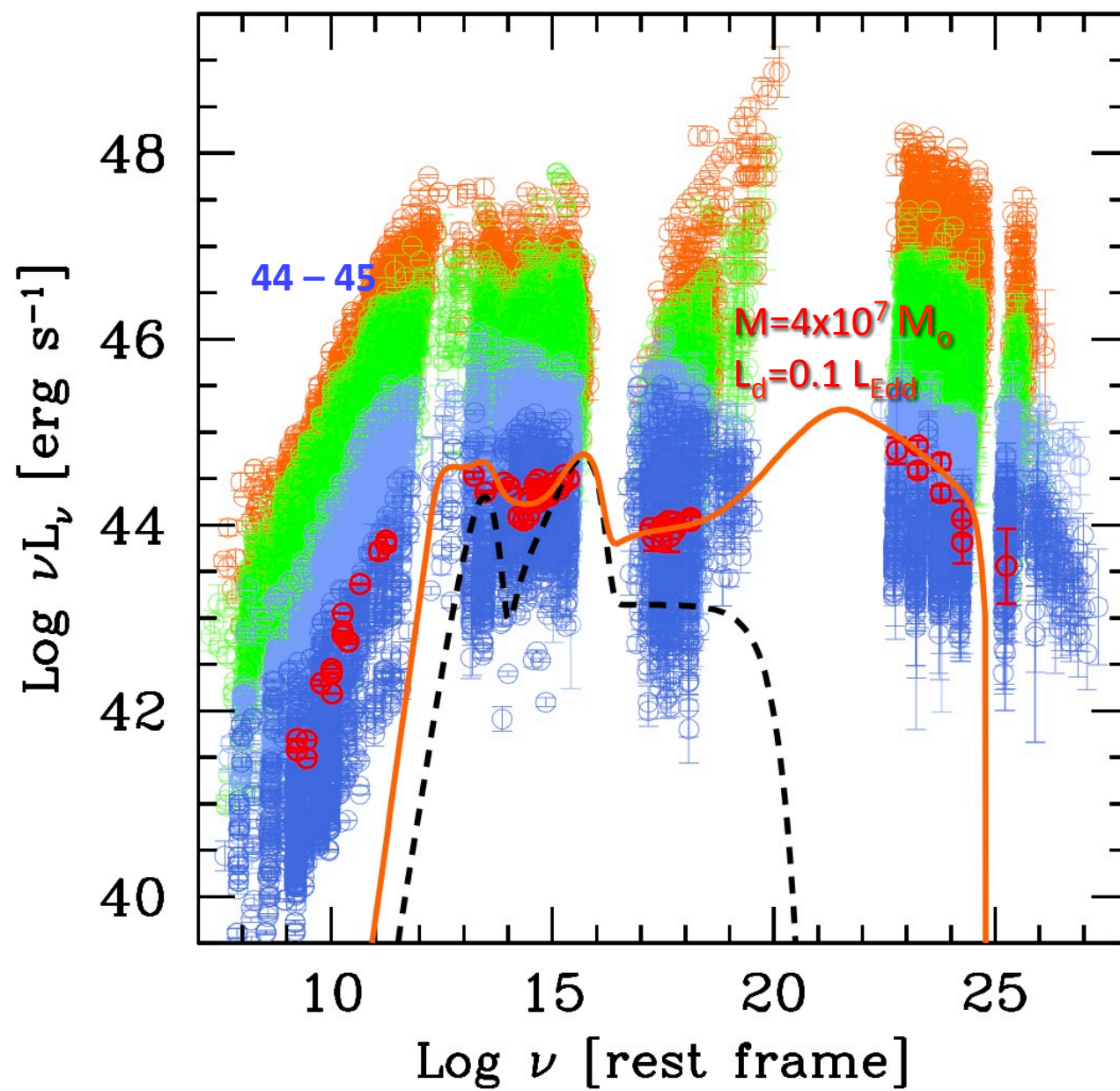


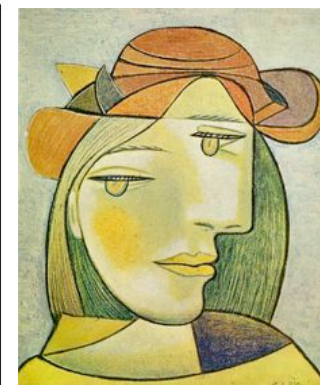
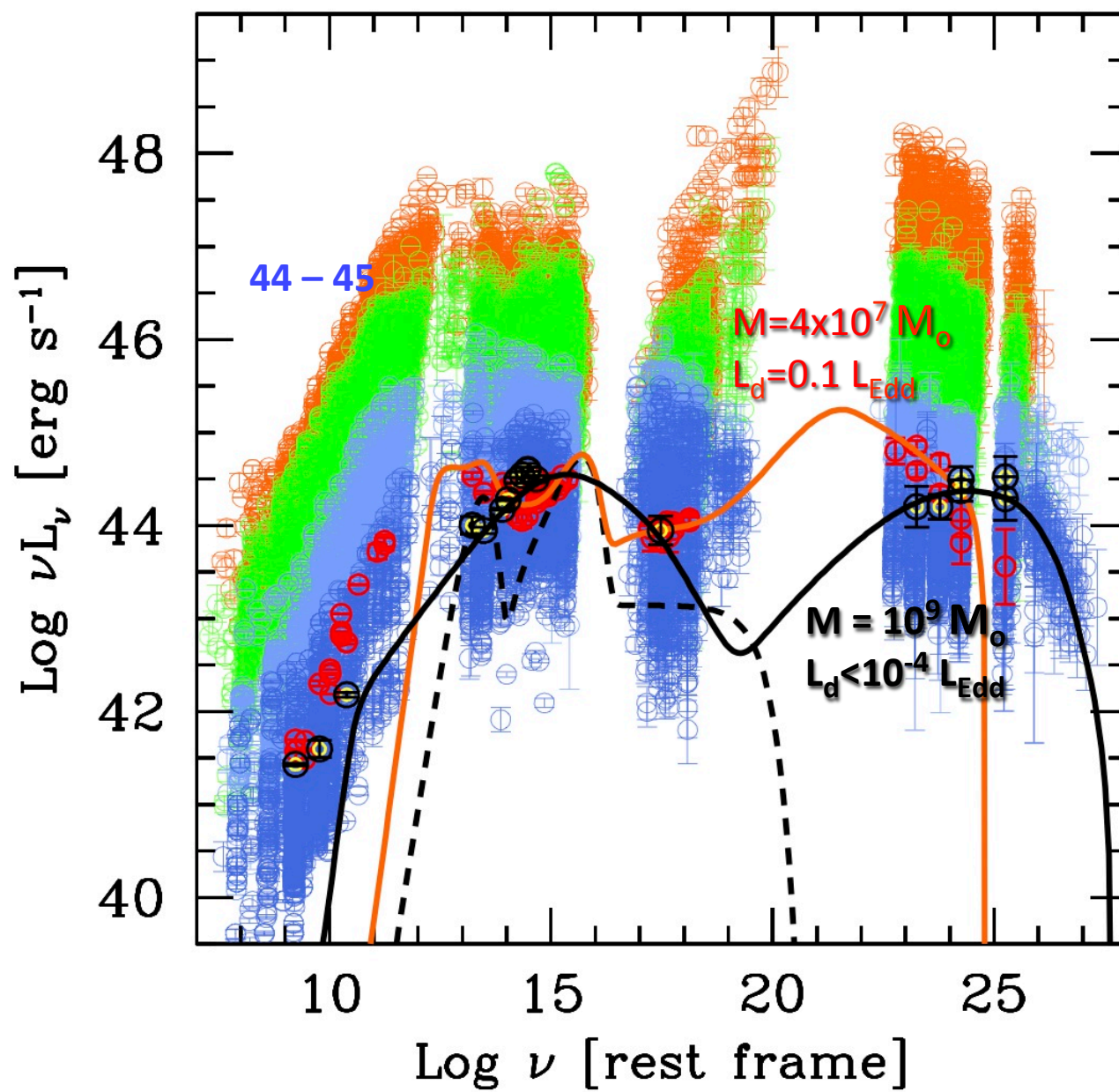
Pollock





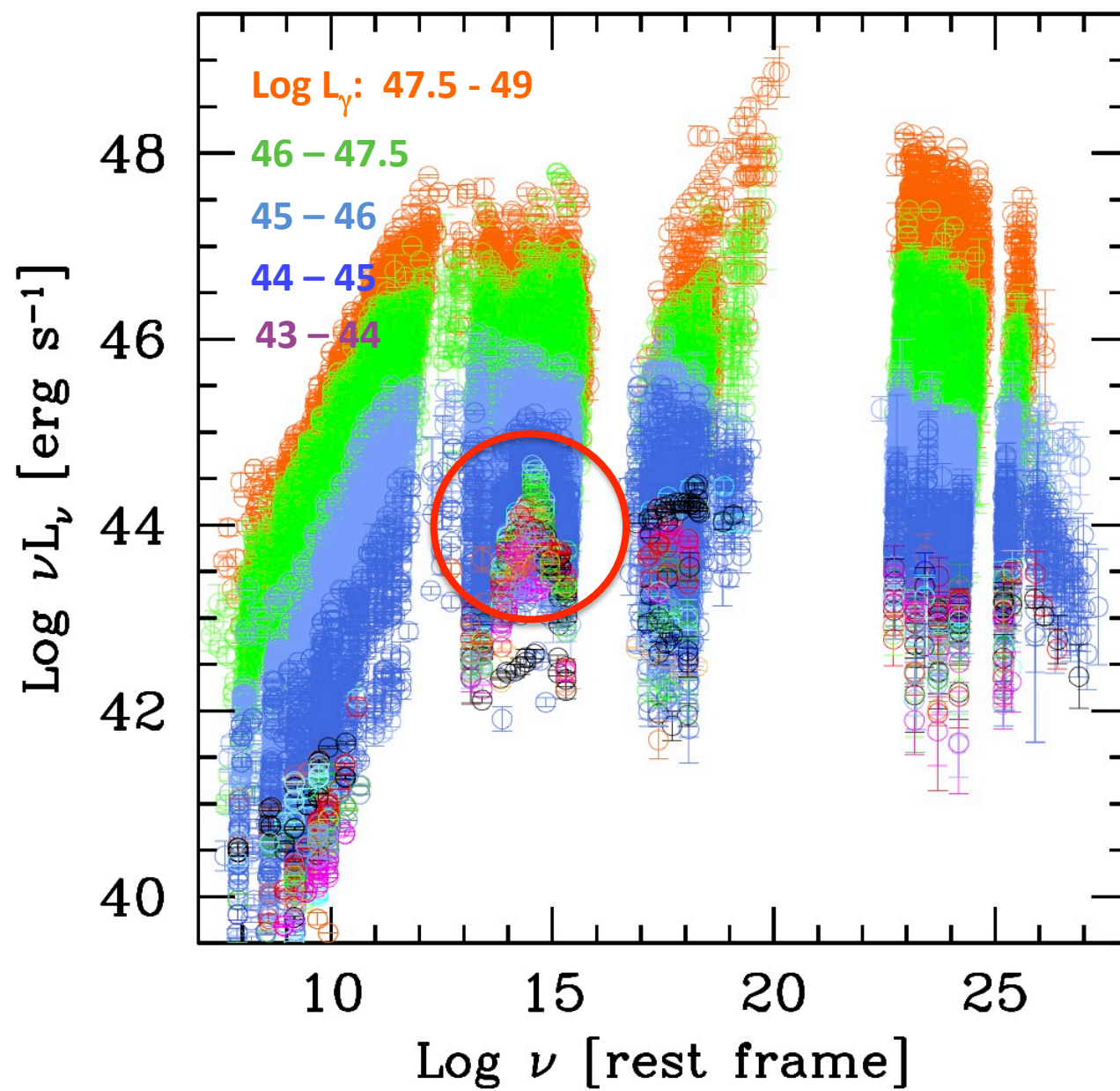
Intermediate luminosities: a mess



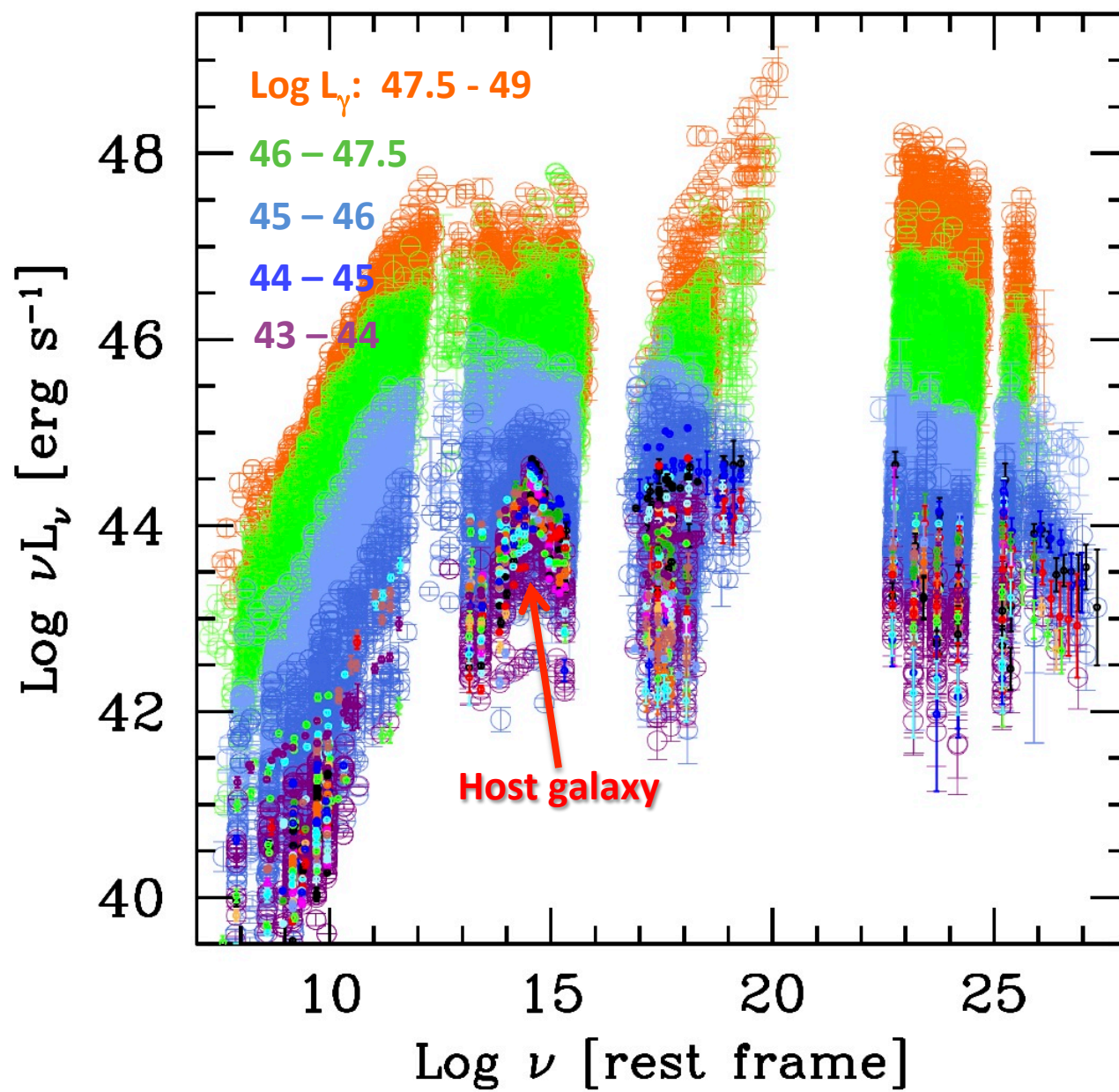


Picasso

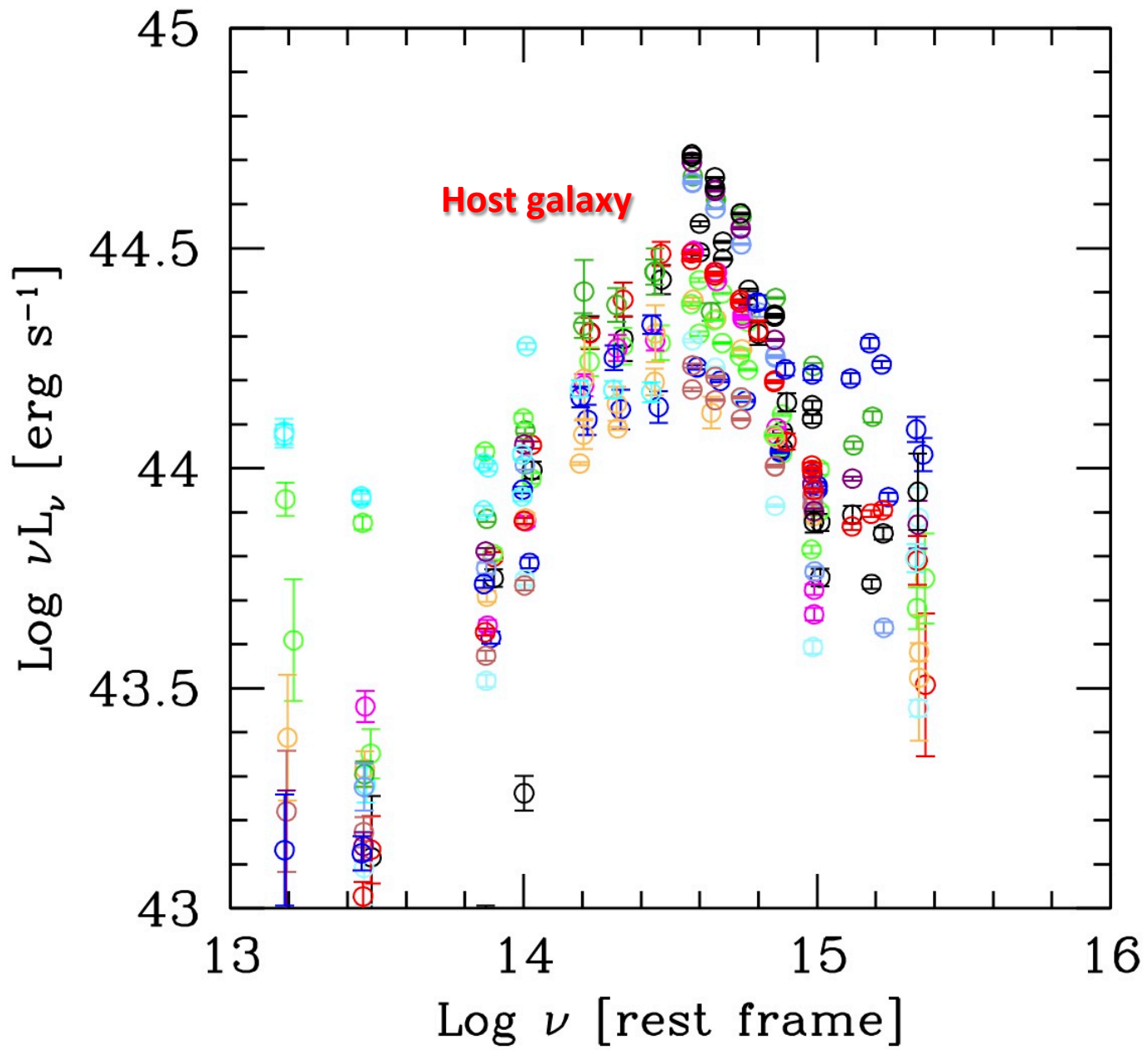
**Low luminosities:
the host galaxy**



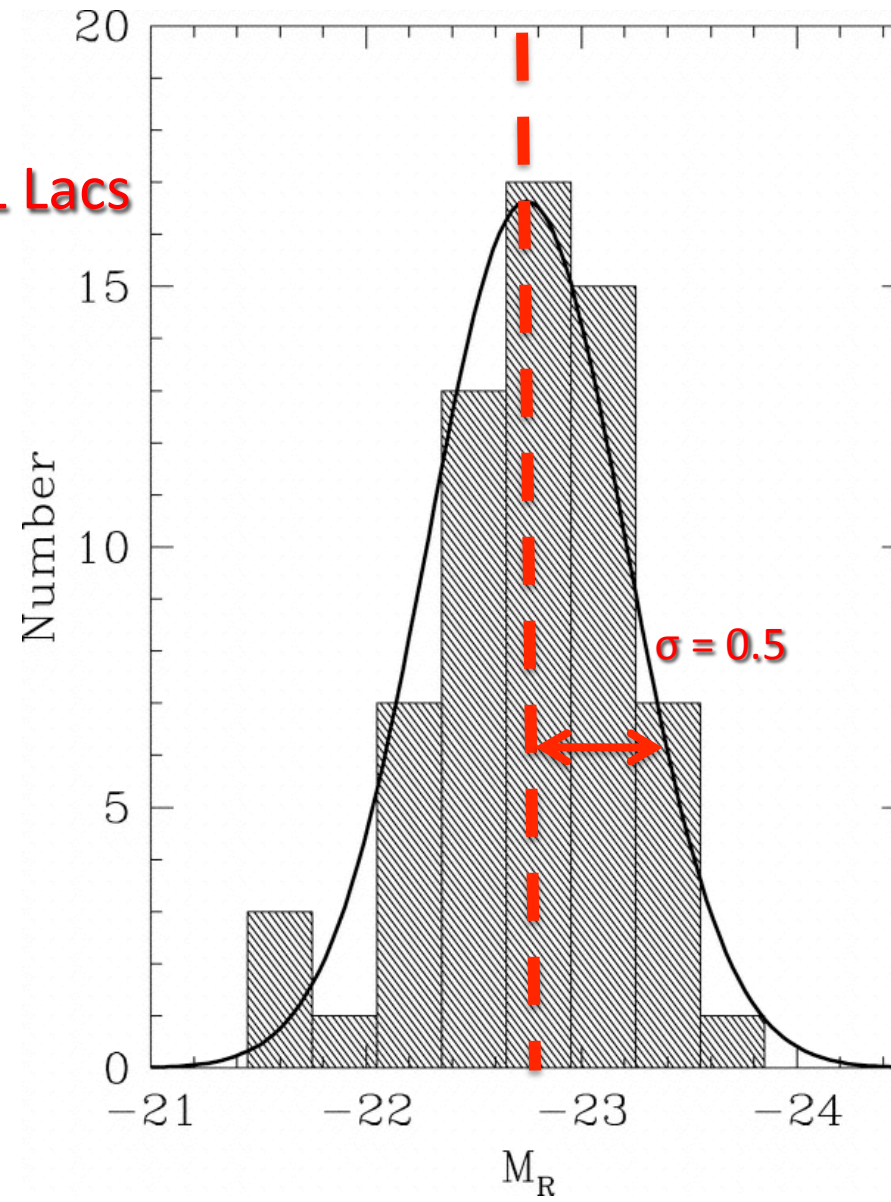
Van Gogh



Van Gogh

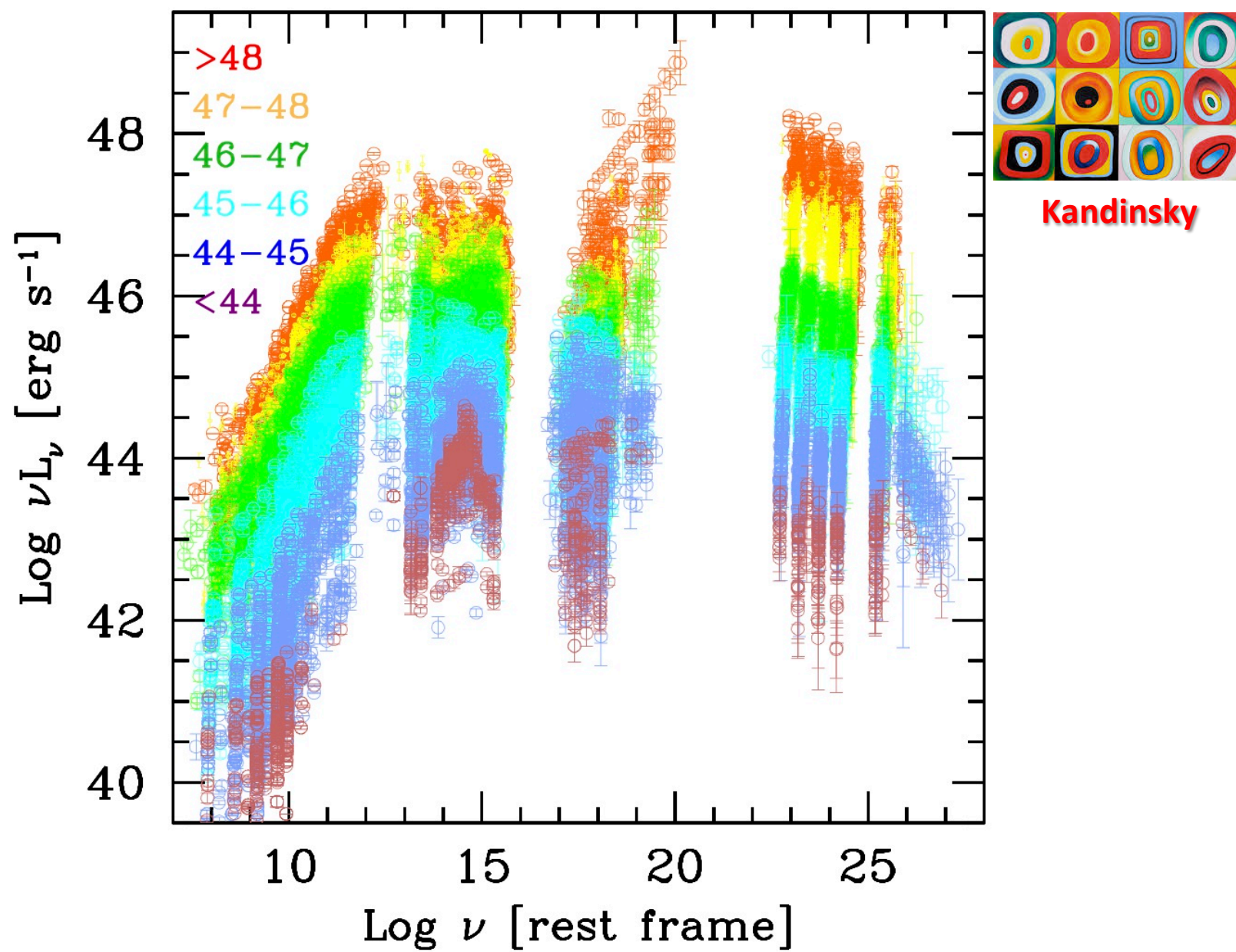


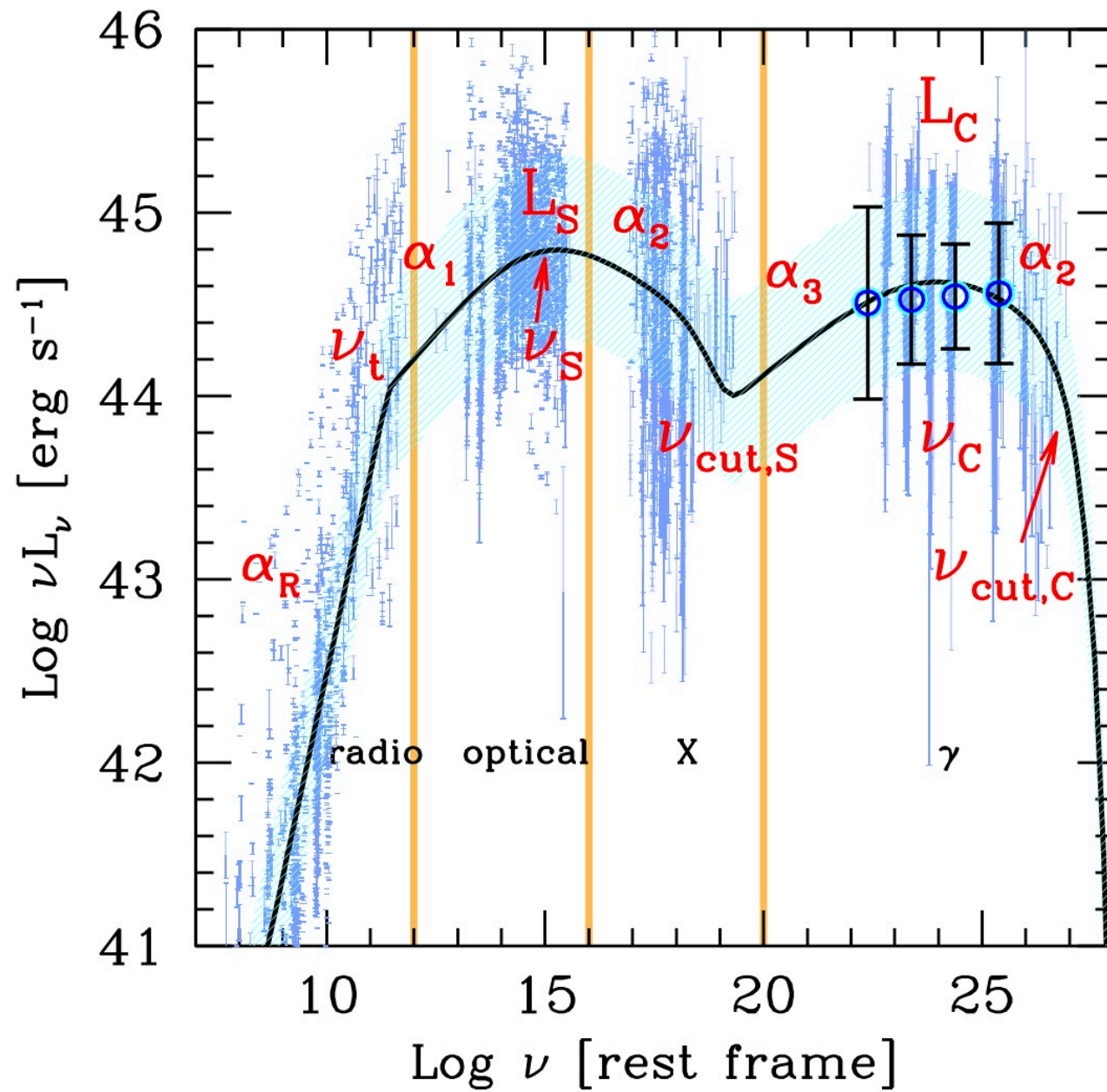
Host galaxies of BL Lacs

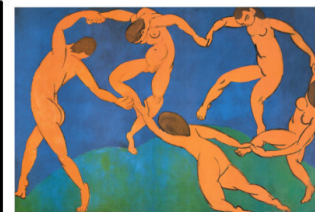
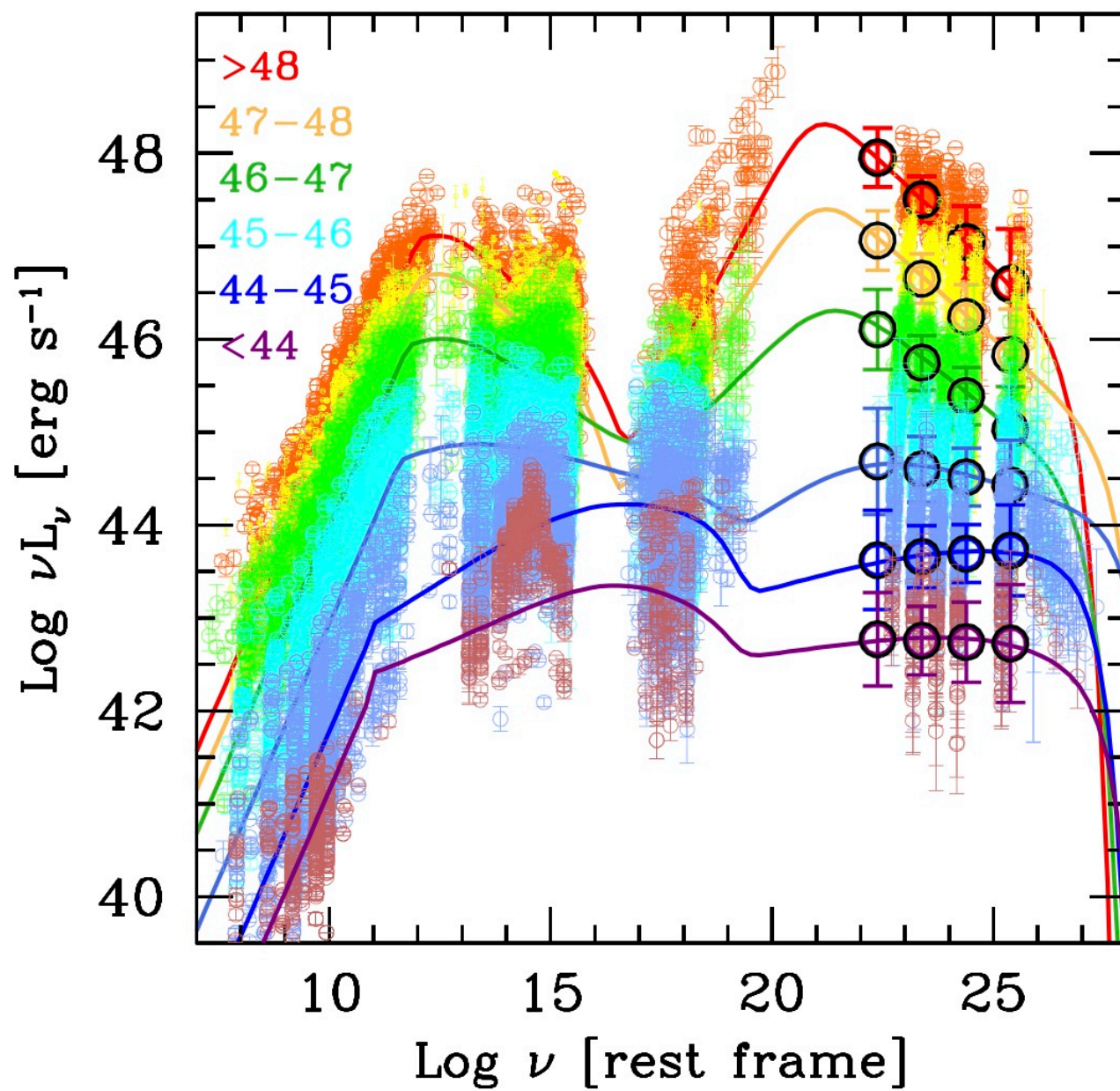


Sbarufatti, Treves & Falomo, 2005

altogether

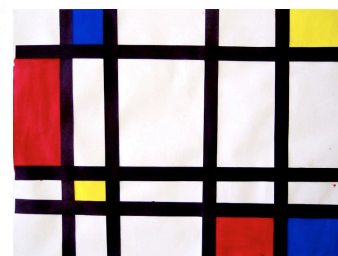
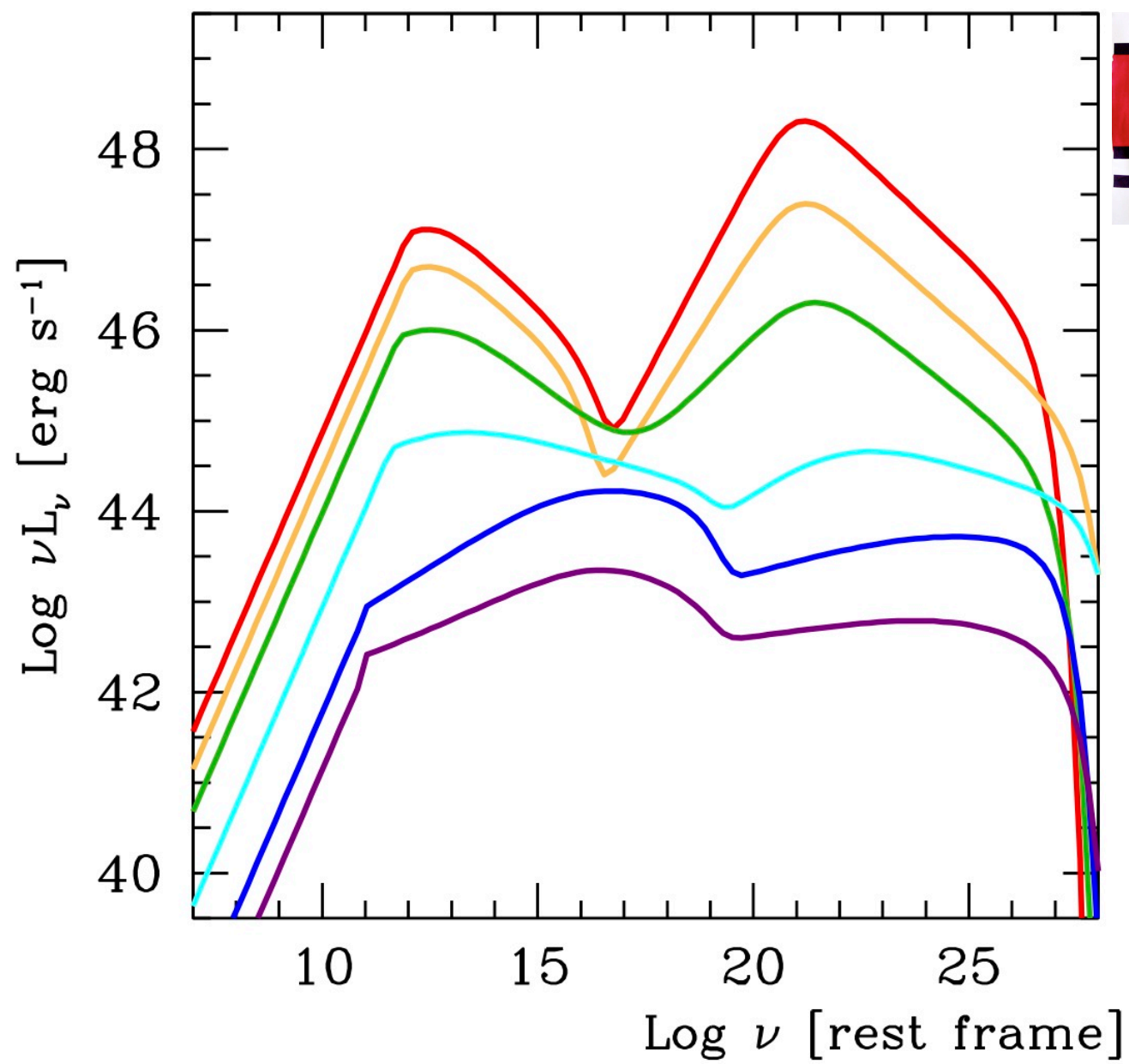




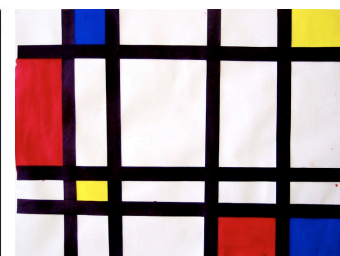
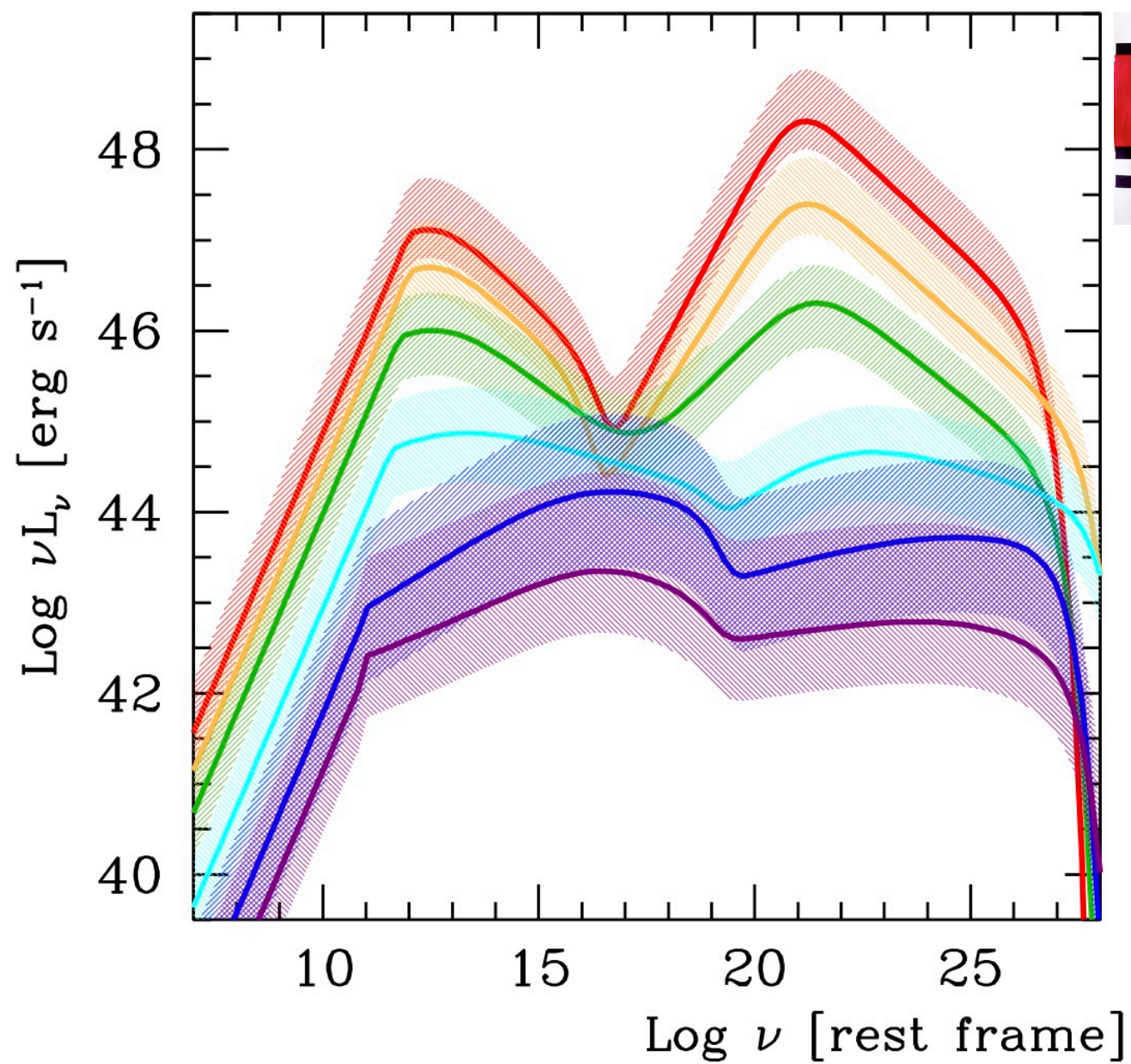


Matisse

GG, Right+, 2017

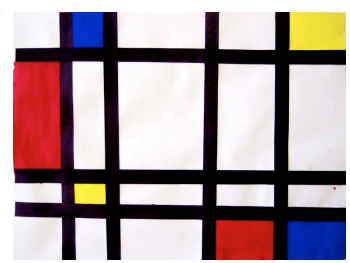
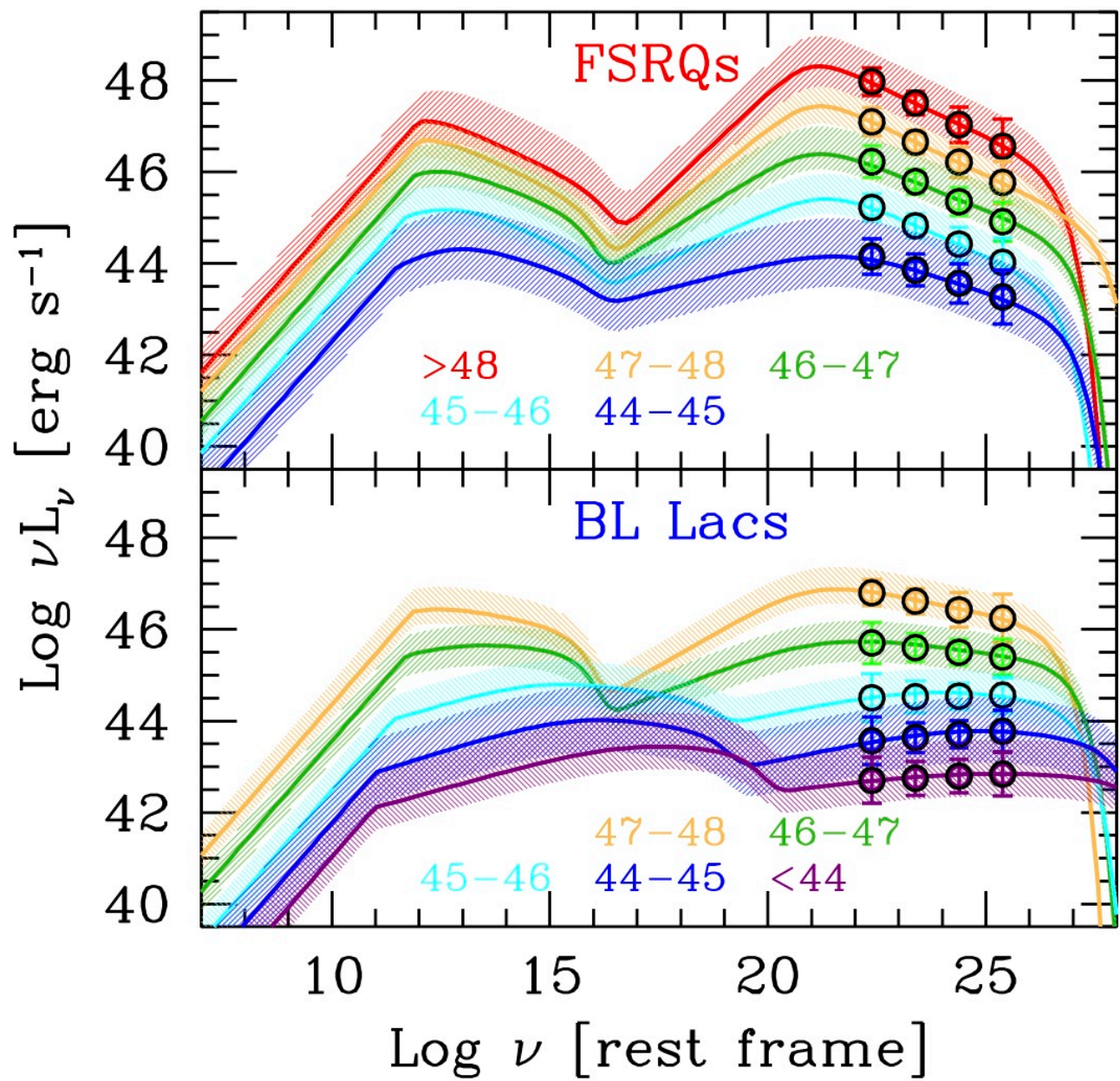


Mondrian



Mondrian

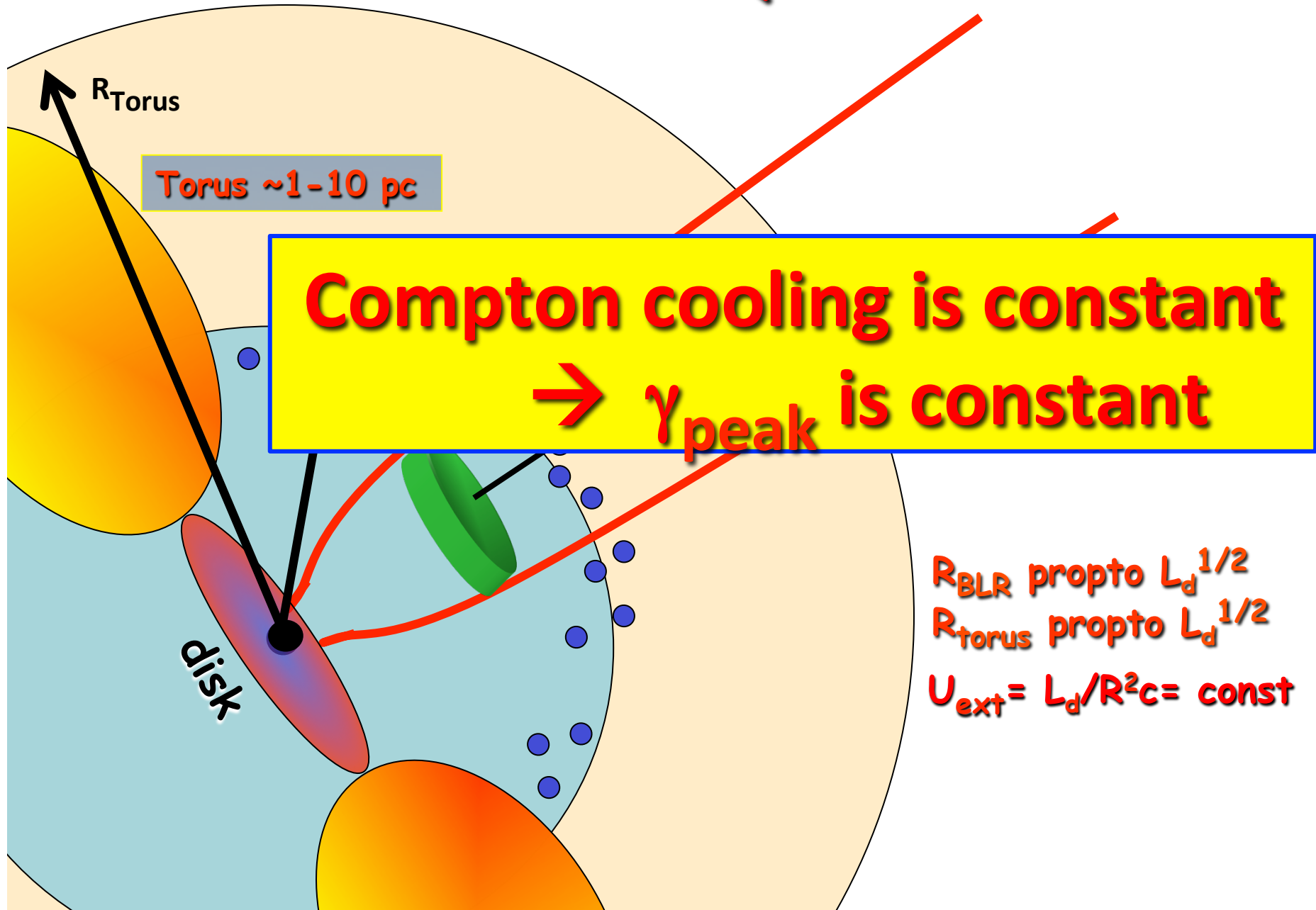
GG, Right+, 2017

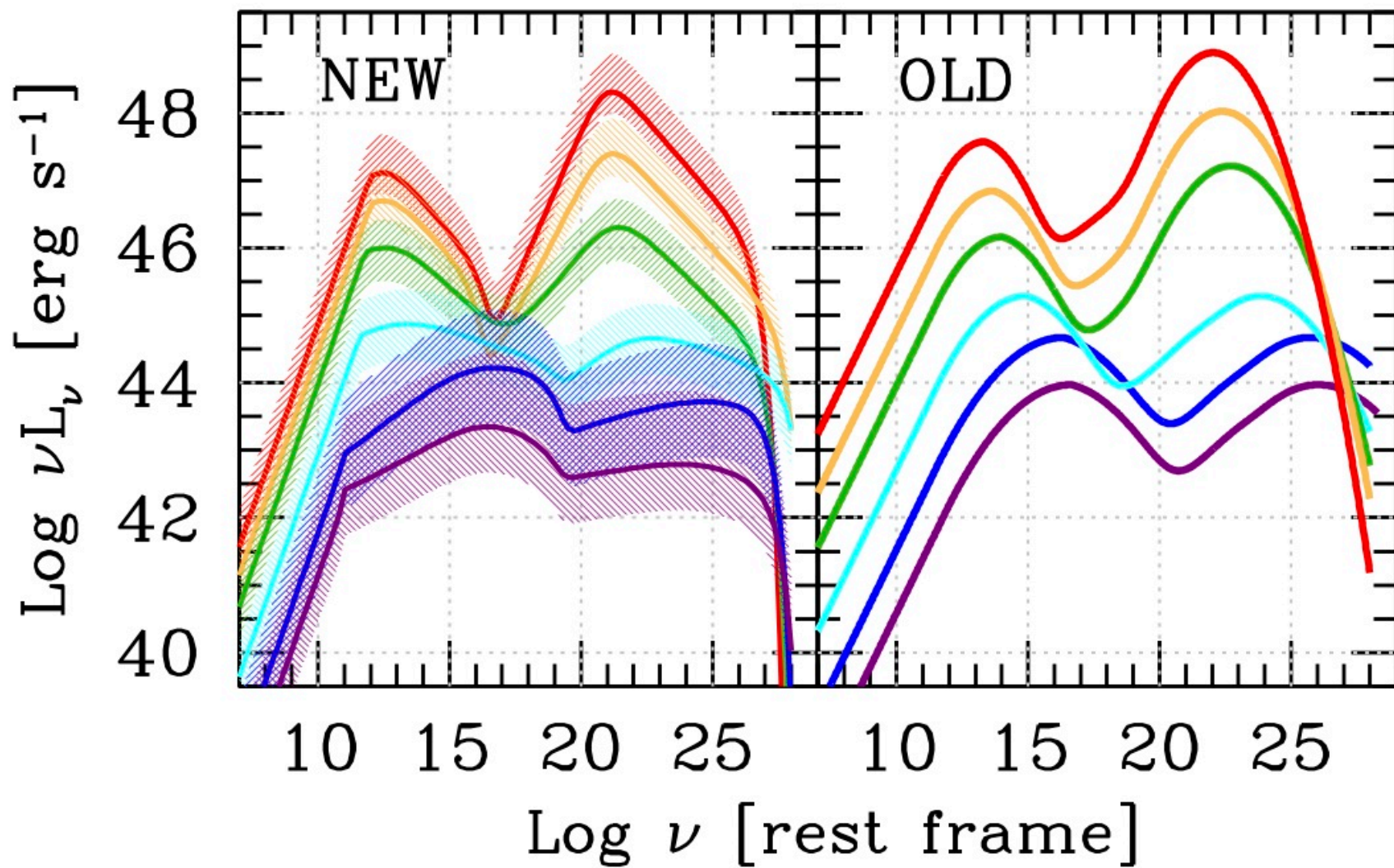


Mondrian

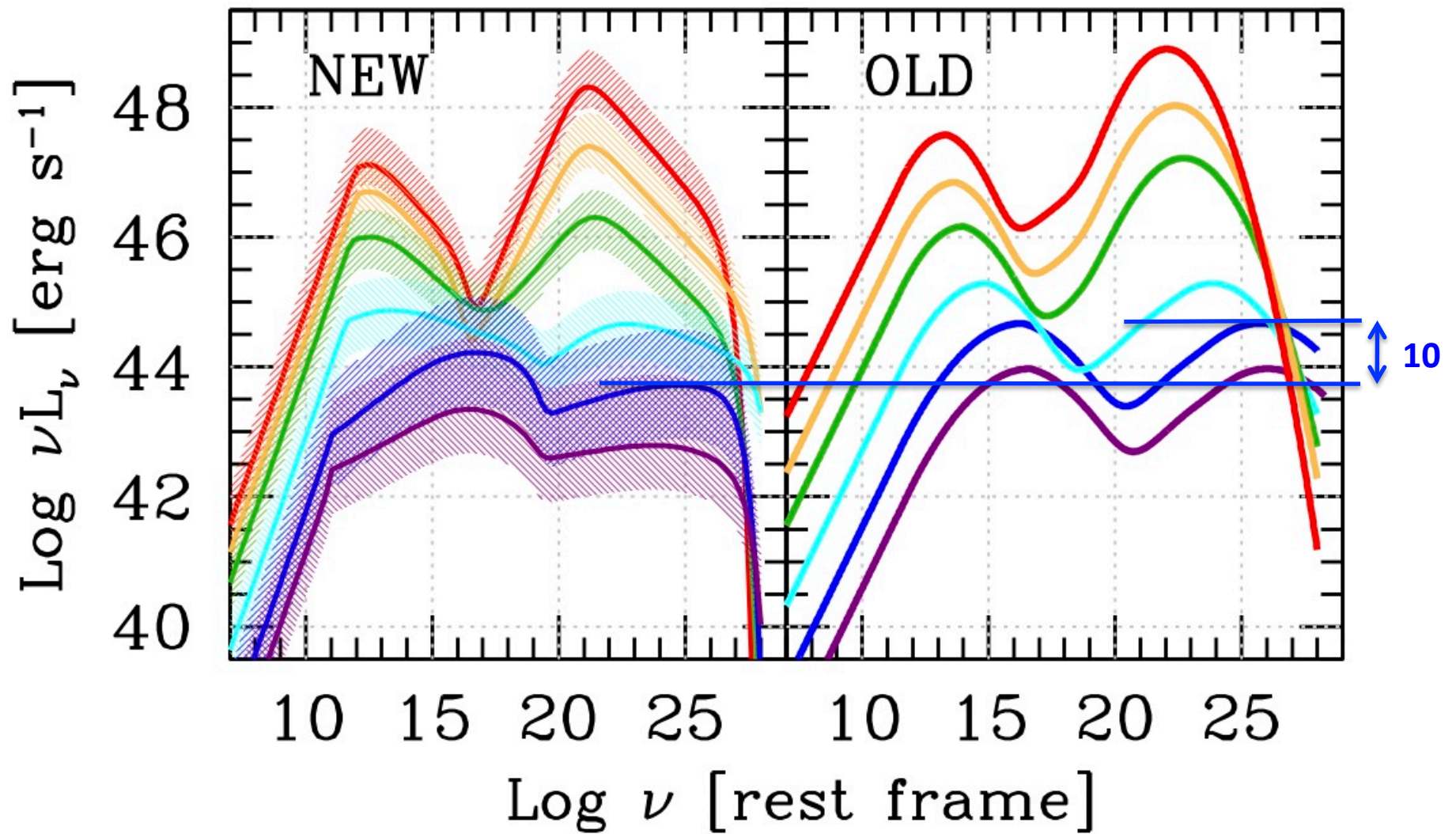
GG, Right+, 2017

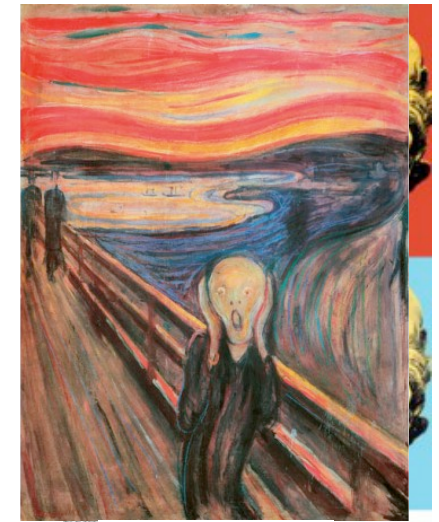
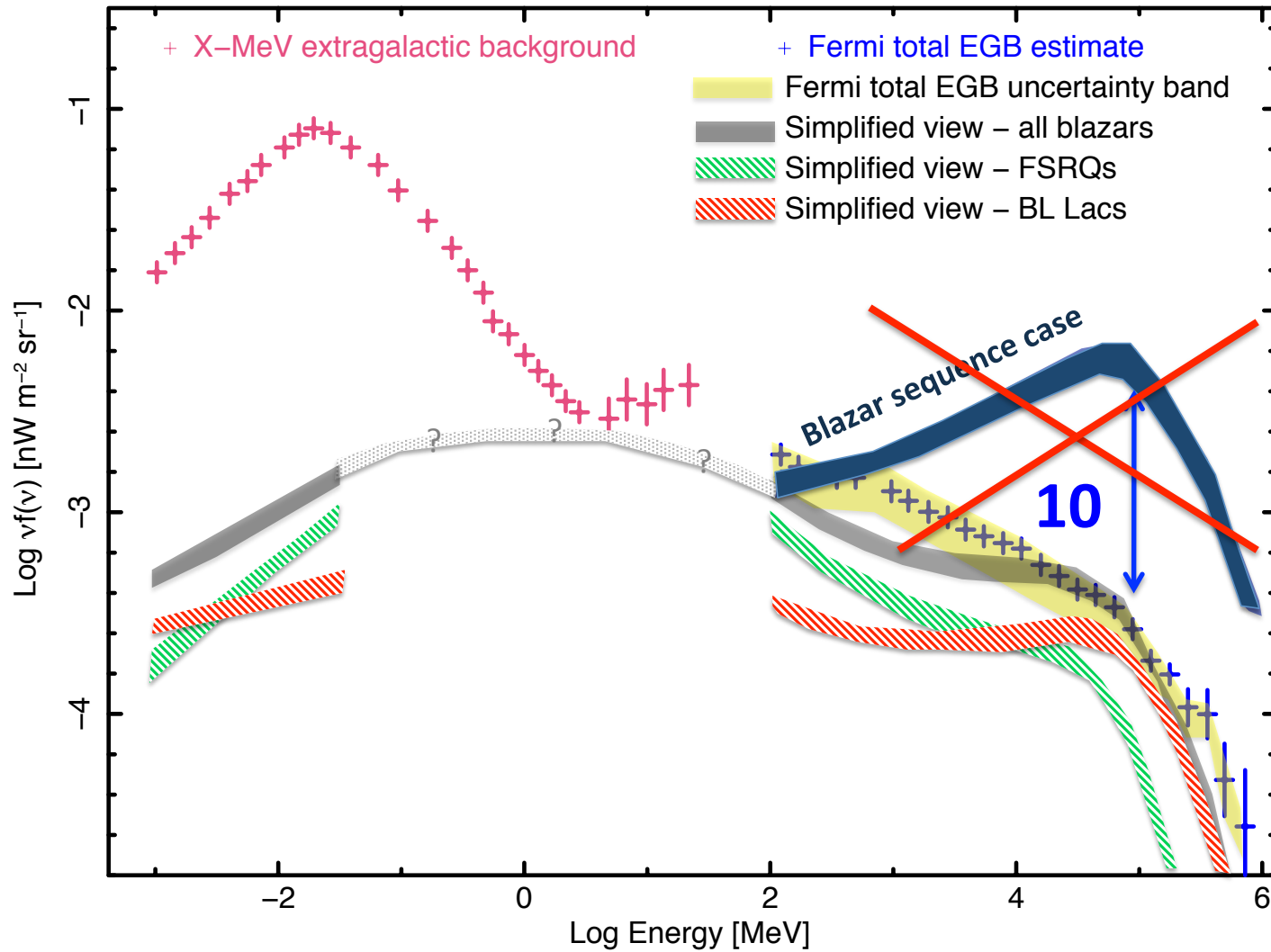
FSRQs





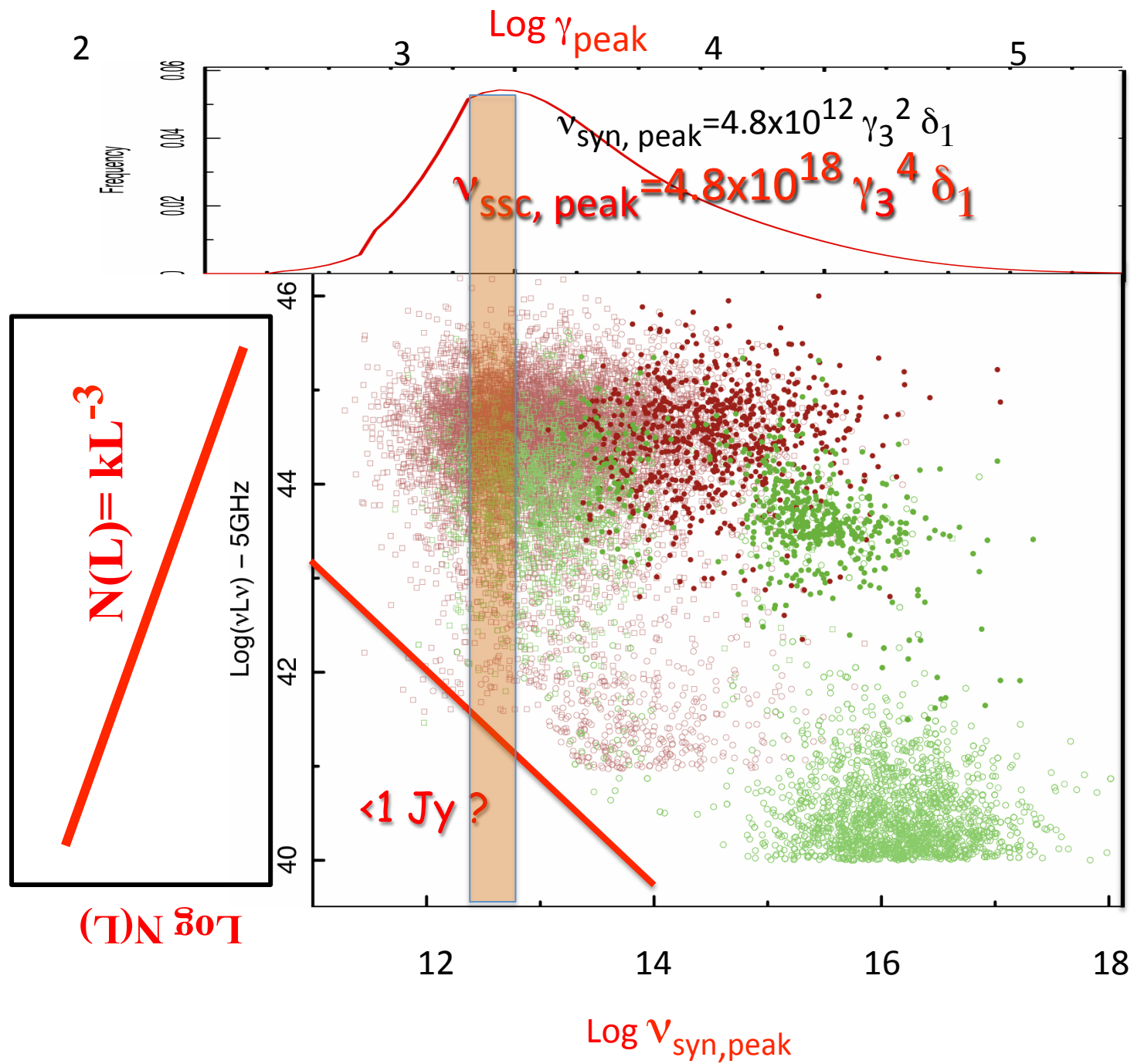
Redder when brighter

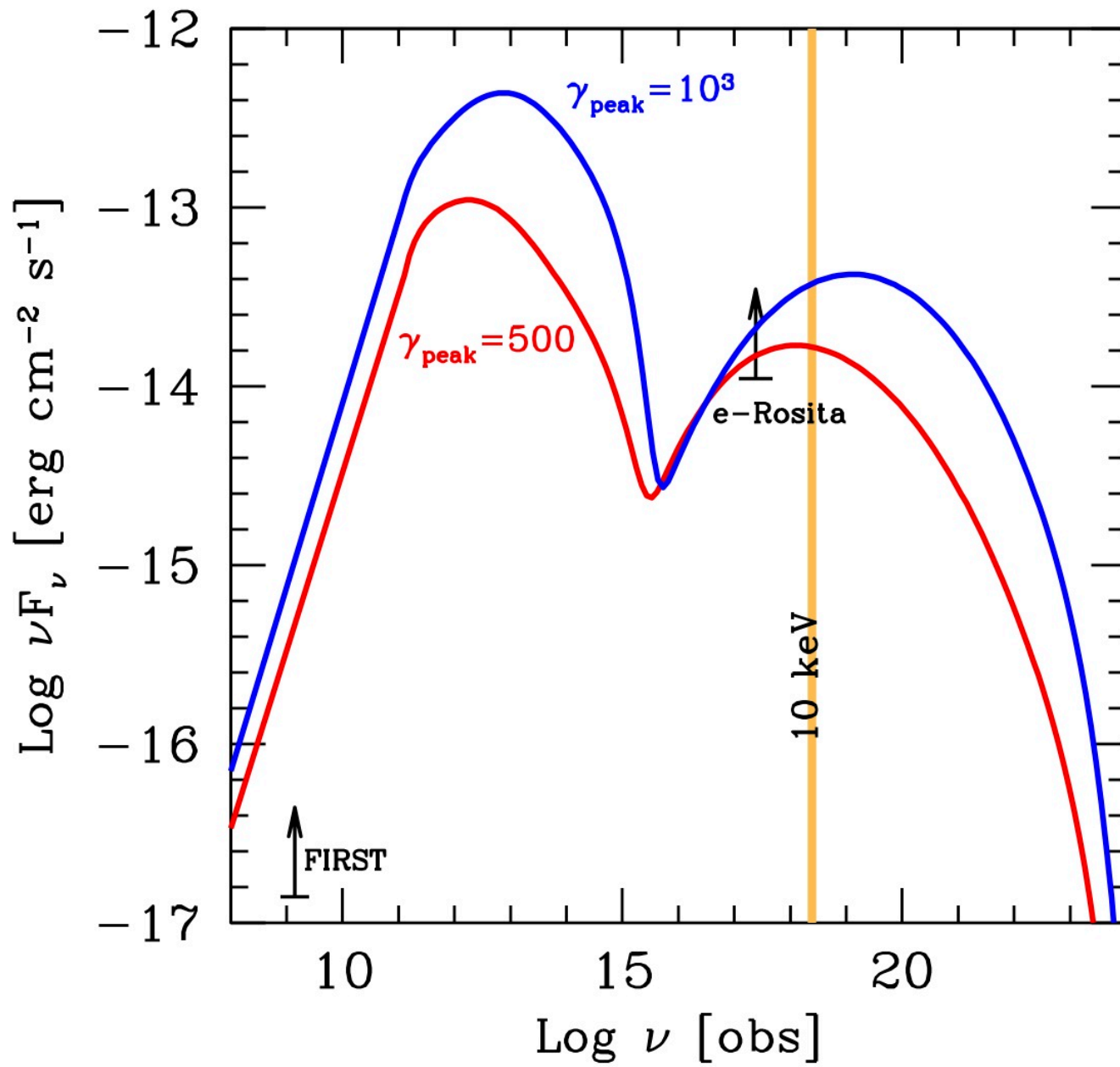




Munch

Giommi & Padovani 2015





Conclusions

- ◆ The blazar sequence describes well the trend of the SED of the observed blazars
- ◆ It has a physical, simple, explanation
- ◆ BL Lacs and FSRQs behave differently
- ◆ This supports radiative cooling as an explanation for the sequence