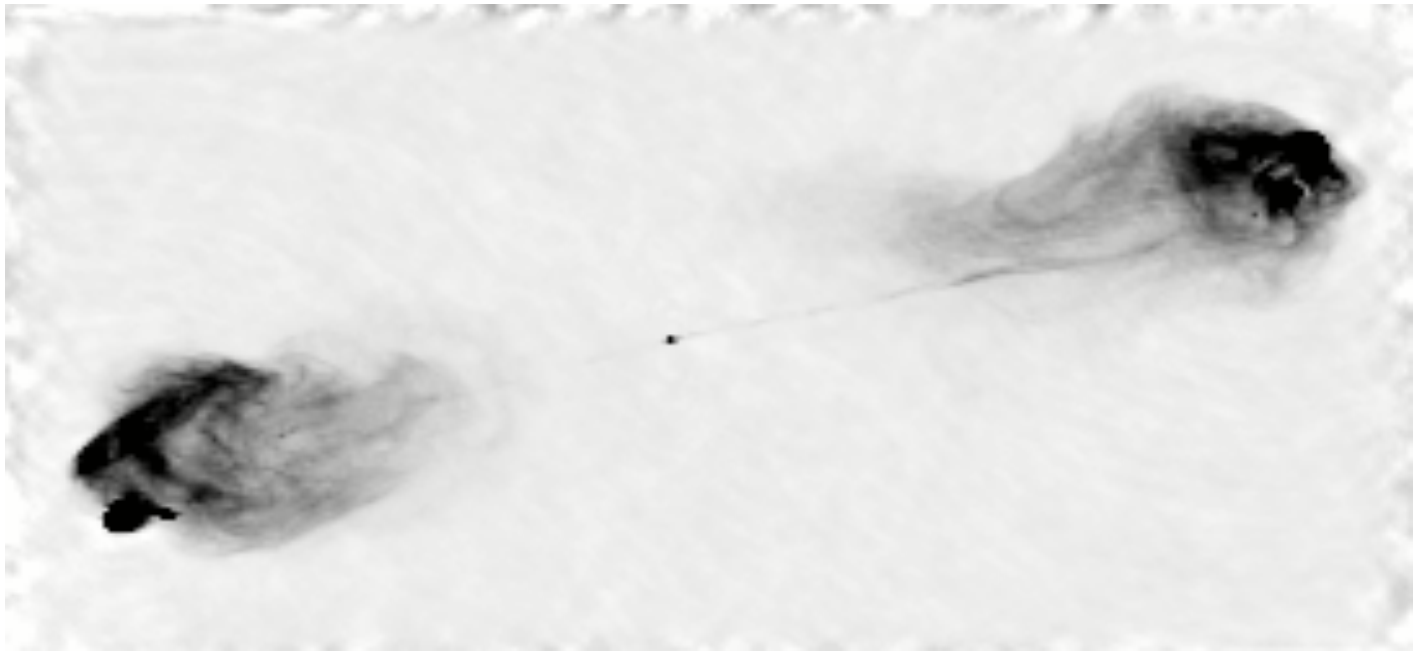
Hunting 'peculiar' Gamma-ray AGNs

1984 ApJ 285 35



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Collaborators: Y.Z. Fan, J.M. Bai, L. Chen etc.

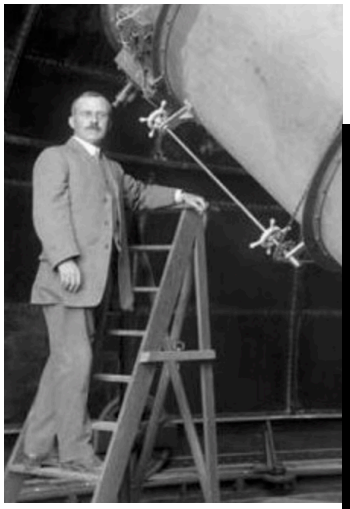
Key Laboratory of Dark Matter and Space Astronomy

Purple Mountain Observatory of CAS

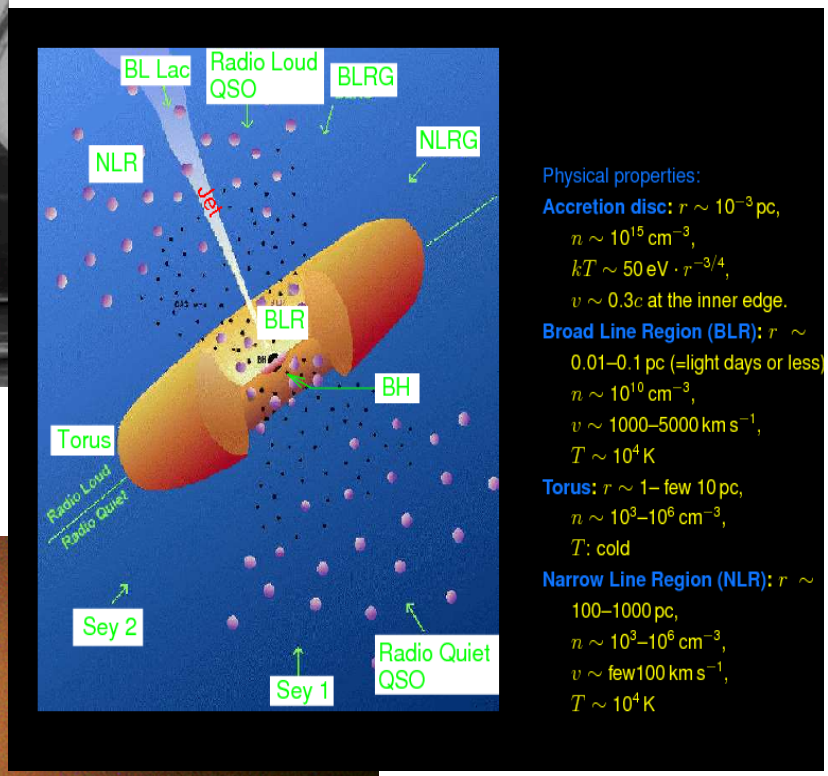
Outline

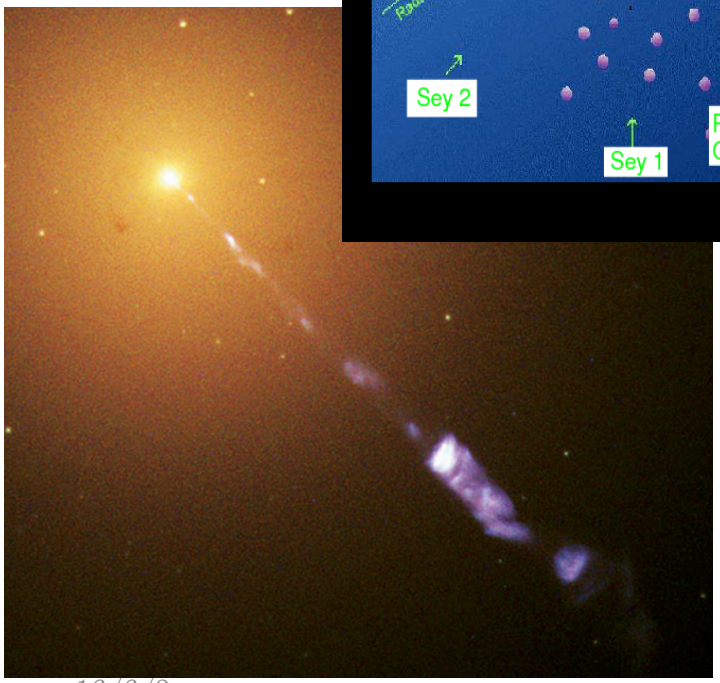
- Background
- Extreme lobe-dominated quasar 3C 275.1
- Steep radio spectrum NLS1 B3 1443+476
- Radio inter-mediate quasar III Zw2
- Summary

Jets in AGNs



Heber D. Curtis





Photons are from WIKI

Kellerman et al. 1989

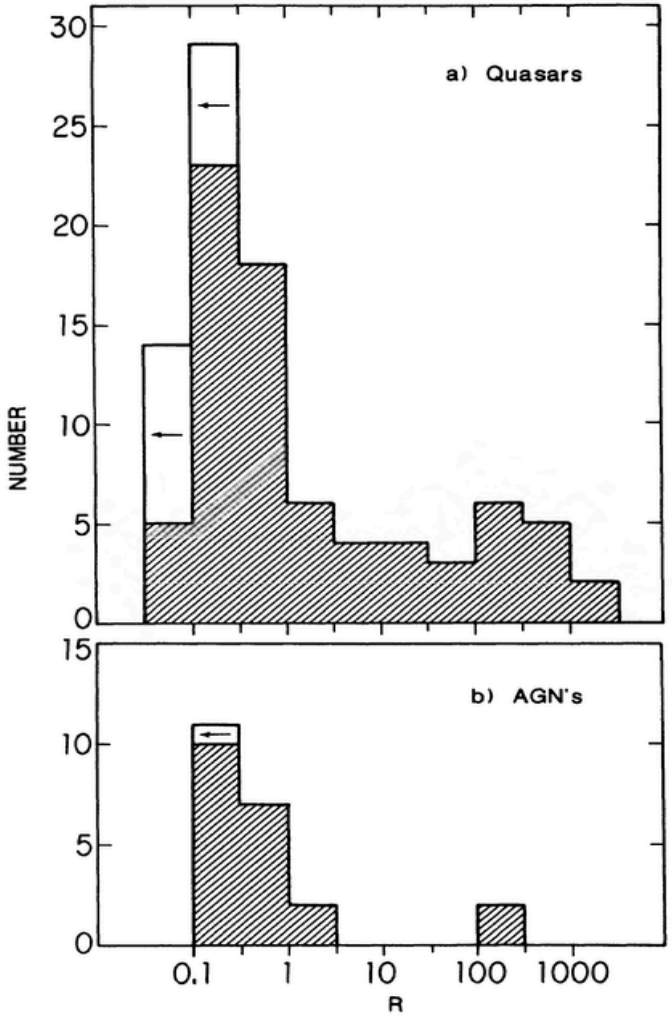


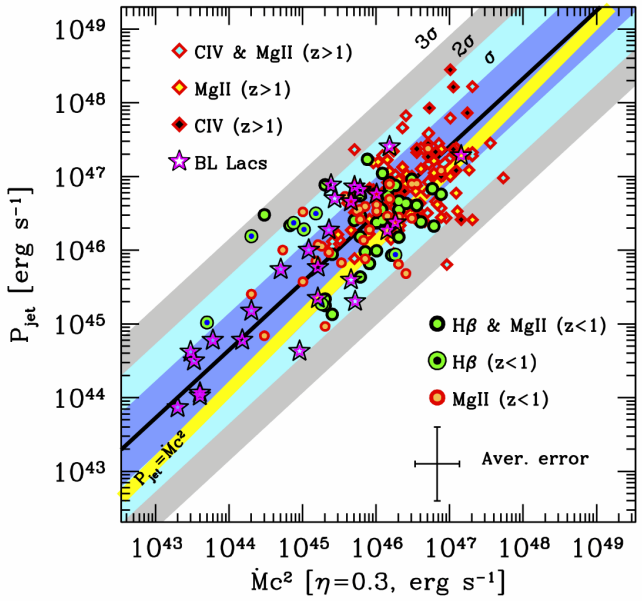
FIG. 5. Distribution of R for (a) 91 quasars in the BQS sample and (b) the 22 AGNs.

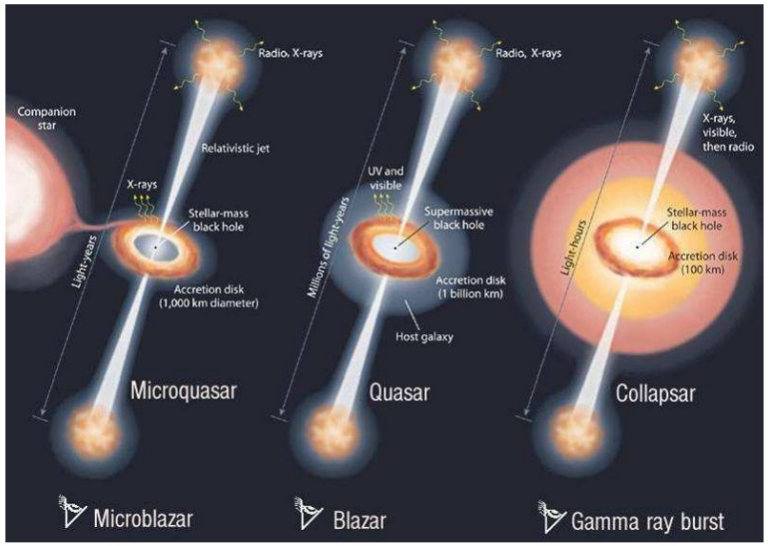
Actually, we still know little about AGN jets!

Why study AGN jets

- Probably the most energetic persistent phenomena in the universe.
- Jet coupled with accretion process is rather common seen in diverse scales
- Jet likely deeply involved with the evolution of the universe.

Ghisellini et al. 2014

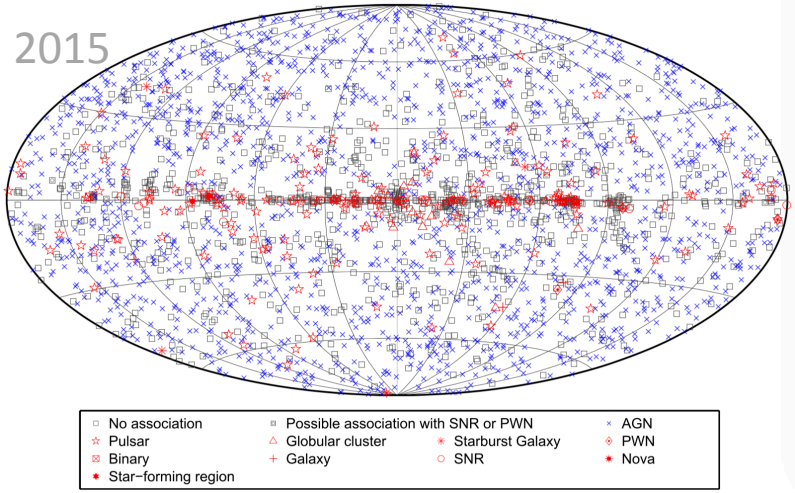




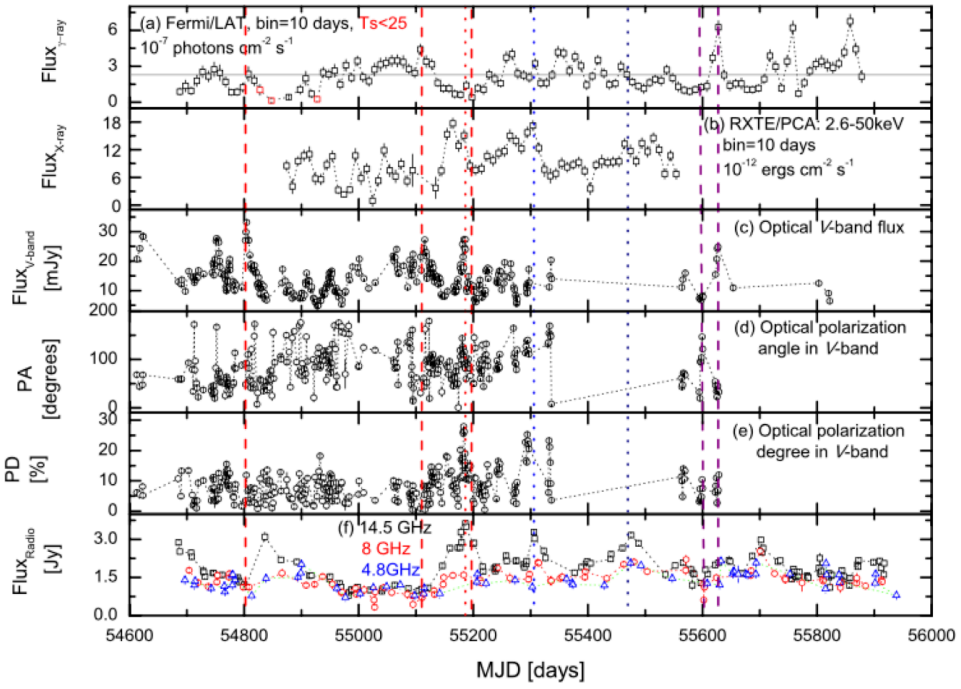
Mirabel, I. F., (2010)

In a gamma-ray perspective

Acero et al. 2015



- RL AGN still dominated the extragalactic sky.
- Majority of them remains to be blazars.
- Number of Mis-aligned AGNs is increasing, extended gamma-ray emission from Cen A.
- New subclass of gamma-ray AGNs, RL-NLS1s



S5 0716+714, Liao et al. 2014, ApJ, 783, 83

Re: Fw: Re: Re: [Fermi #1757] some problems from dealing the LATdataof a Blazar

发件人： Jeremy S. Perkins <jeremy.s.perkins@nasa.gov> 全部添加到个人通讯录 查看邮件往来

时　间： 2011年06月28日 22:16:49 (星期二)

收件人： liaonh

抄　送： Corbet, Robin (GSFC-662.0)[UNIVERSITY OF MARYLAND BALTIMORE CO], fermihelp@milkyway.gsfc.nasa.gov

Hello Liao,

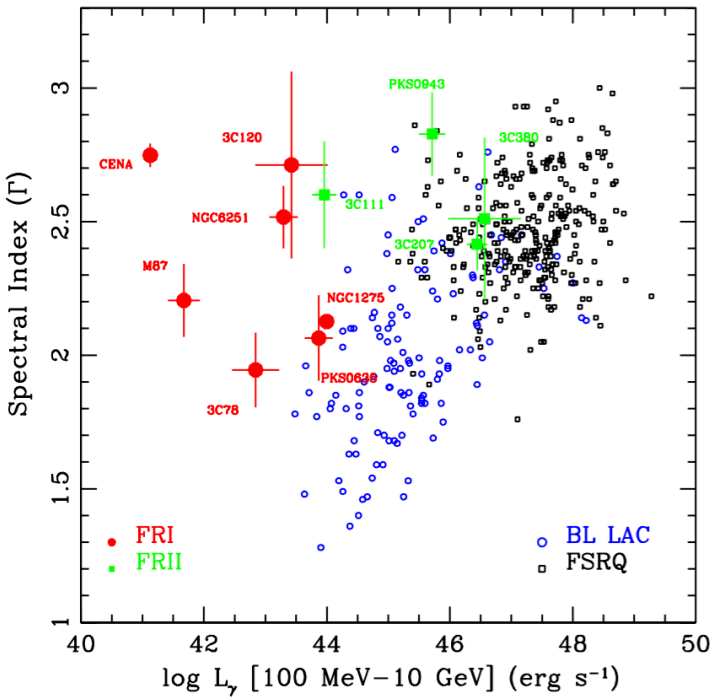
Robin is not available so I'll try to help you this week.

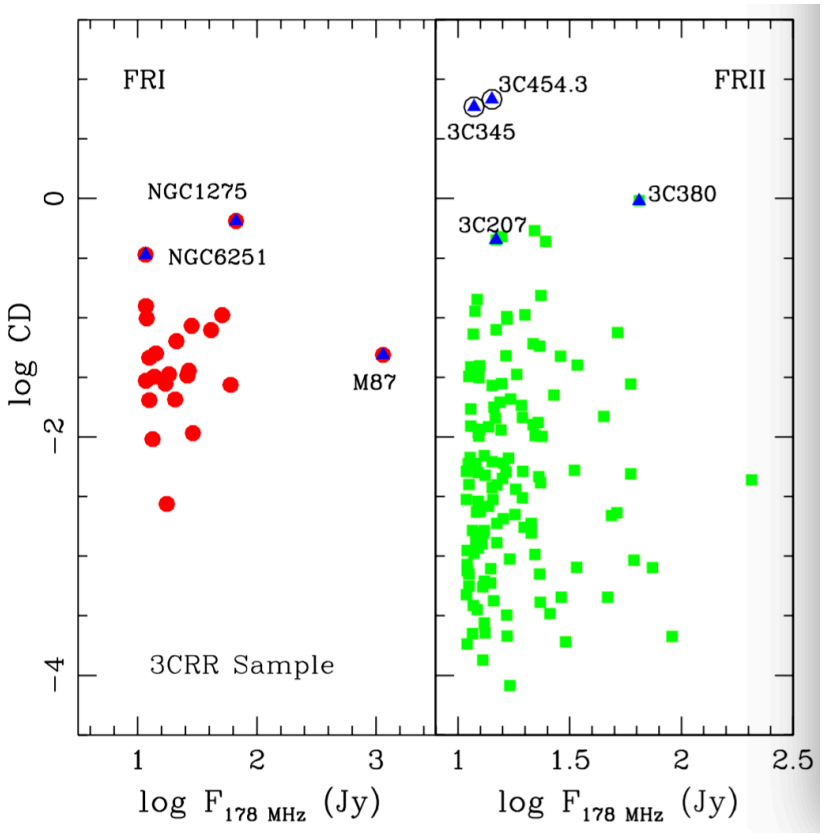
It's good that your fit converges over the whole data set and for the data set divided by two. That means that you are most likely getting your model right and are adequately modeling the sources in your ROI.

I have a question: did you remove the negative TS sources from your model before you try to make your light curve or did you just freeze them?

Fan are thanked for their observations at the 1 m and 2.4 m telescopes of Yunnan Observatories. Yi Bo Wang is thanked for his suggestions of statistical analysis. The *Fermi* help group, especially Robin Corbet and Jeremy S. Perkins, are thanked for their advice for the data analysis of *Fermi*/LAT.

Mis-aligned AGNs

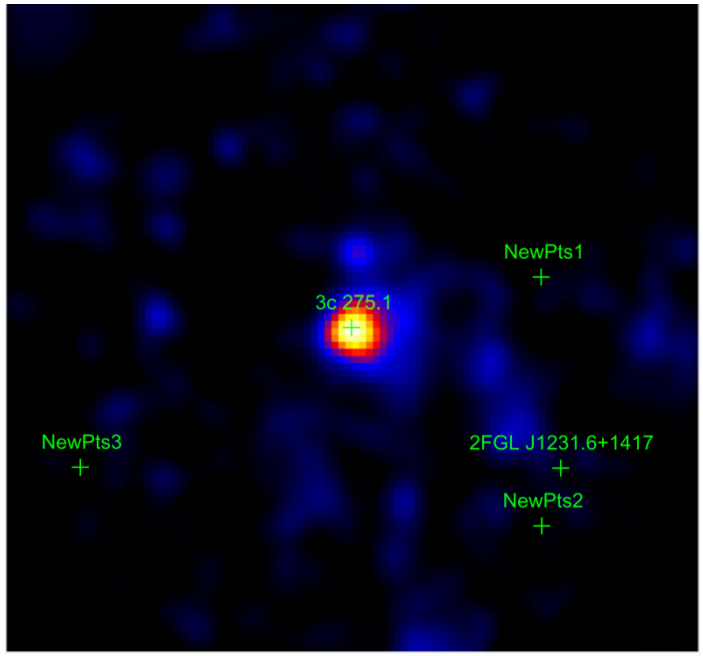


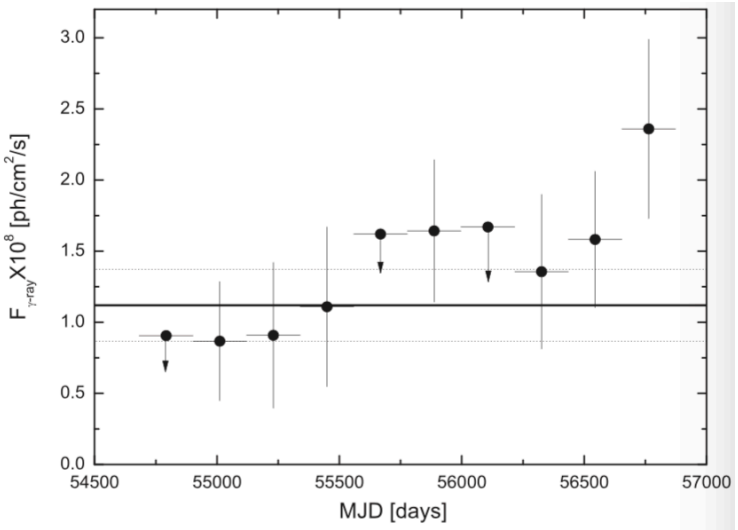


It is interesting to find gamma-ray sources with large viewing angles at relatively far distancesI

Abdo et al. 2010

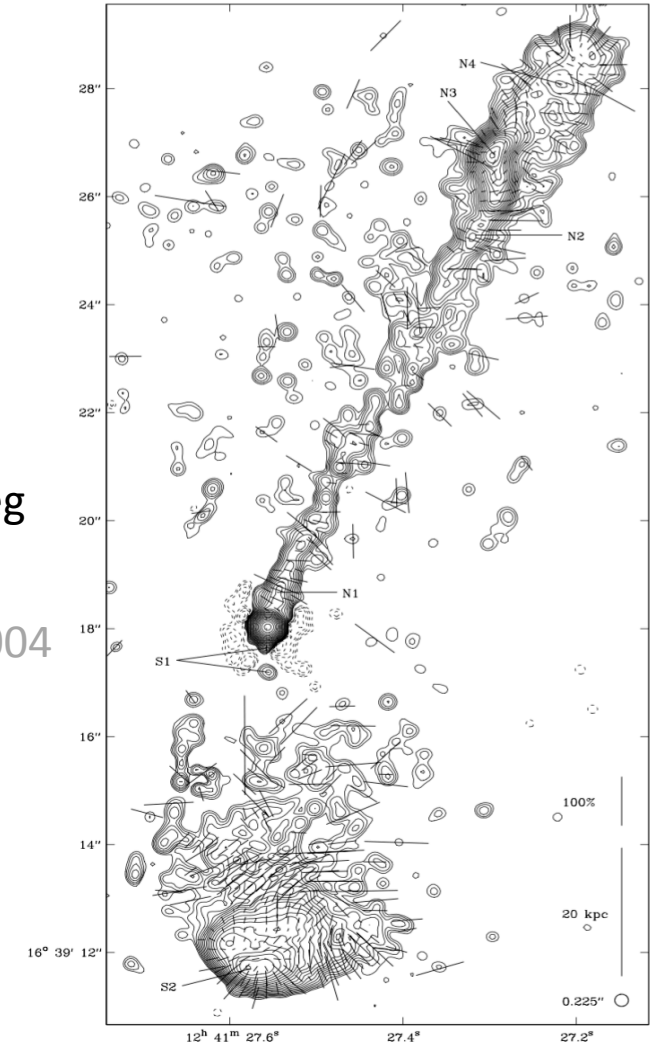
Gamma-ray from Extremely Lobe-dominated quasars



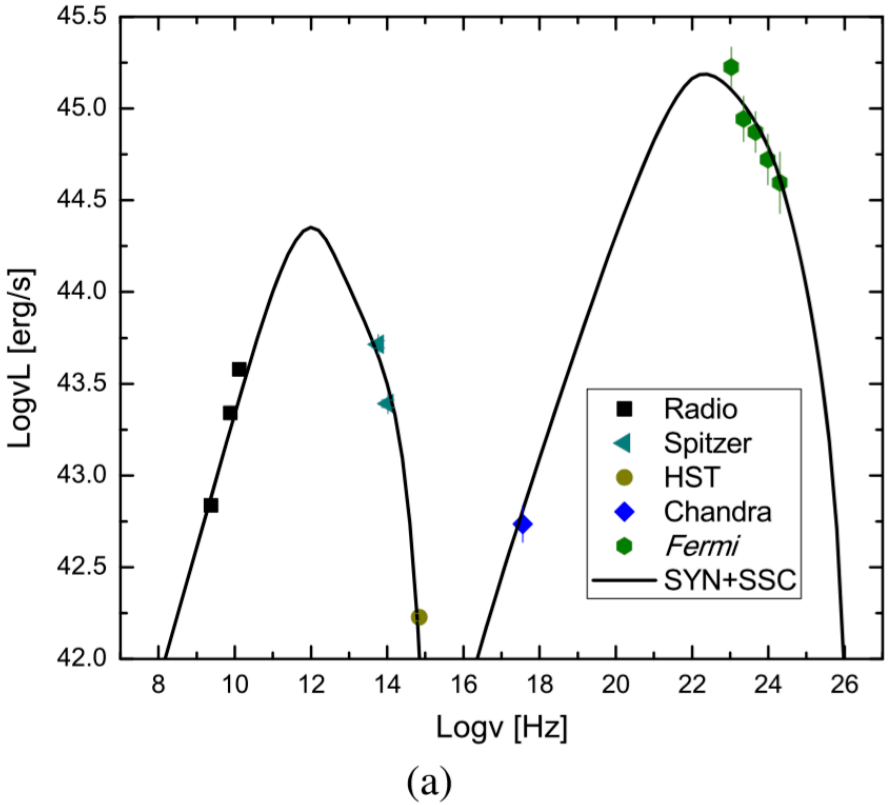


CD=0.11
Theta = 20 deg
Z=0.56

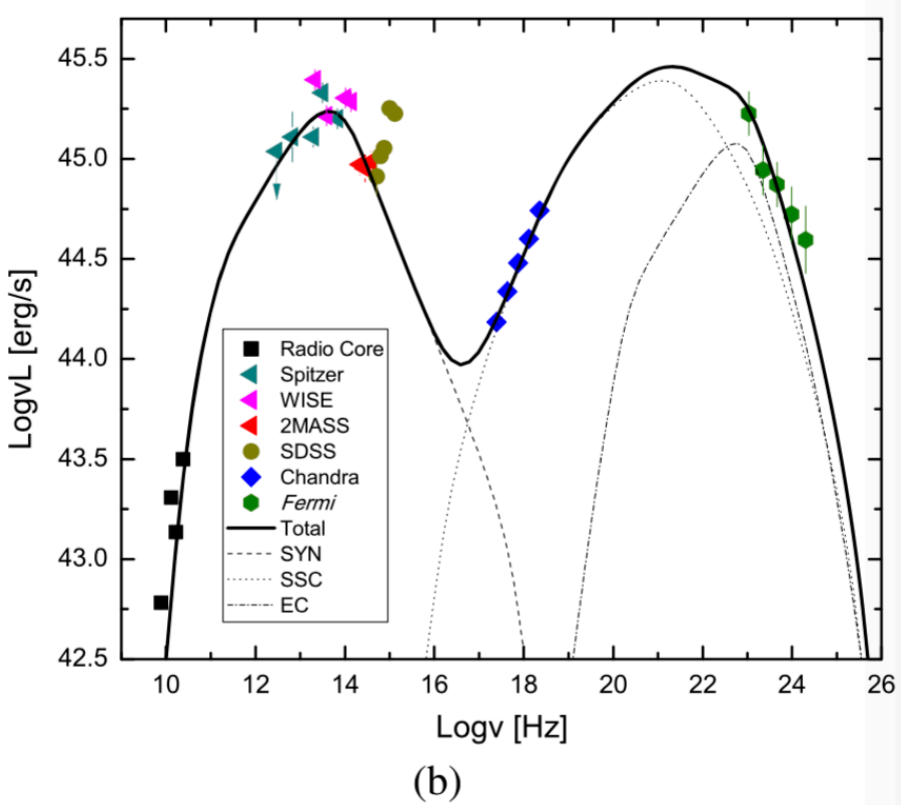
Gilbert et al.2004



Liao et al. 2015, ApJ, 808, 74



(a)



(b)

For hotspot model, the potential gamma-ray variability should be dealing with.

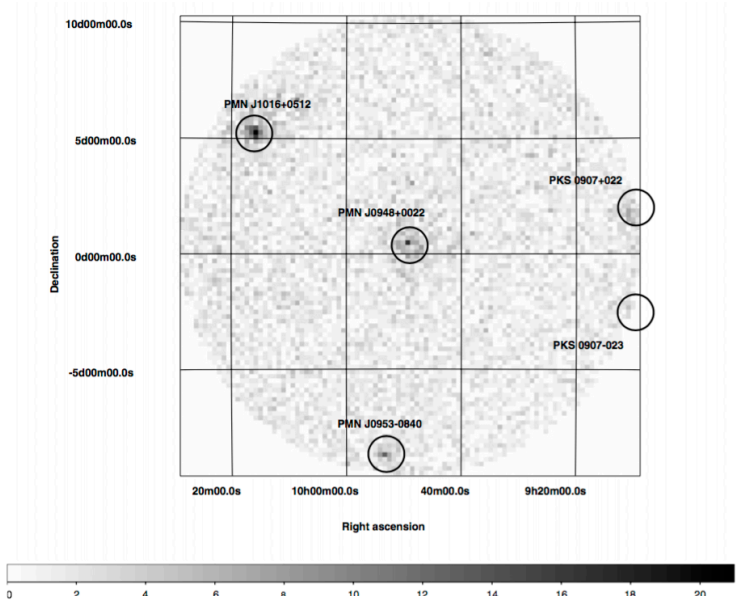
For core model, 20 deg seems to be too large, a jet bending might be assumed.

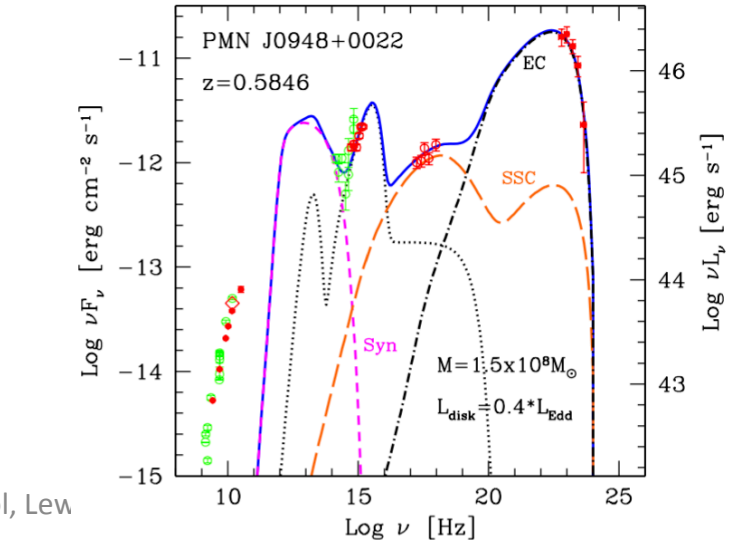
Liao et al. 2015, ApJ, 808, 74

New subtype of Gamma-ray AGNs:RLNLS1

Abdo et al. 2009

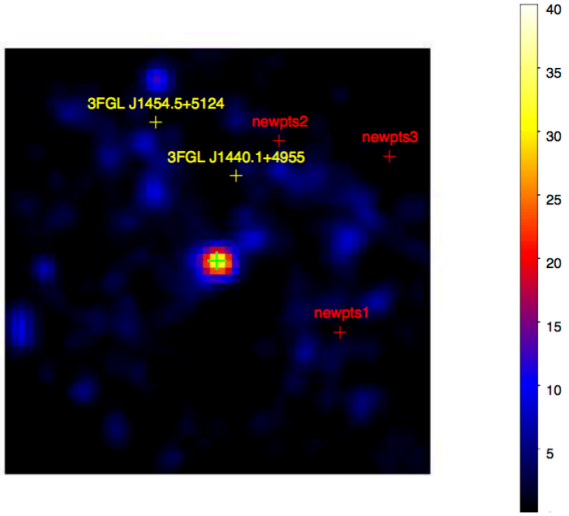
- NLS1s are a peculiar subclass of AGNs
- RLNLS1s provide an valuable chance to study the AGN jet in a different environment.
- But all the LAT detected RLNLS1s exhibit flat radio spectra, how about **the mis-aligned version?**

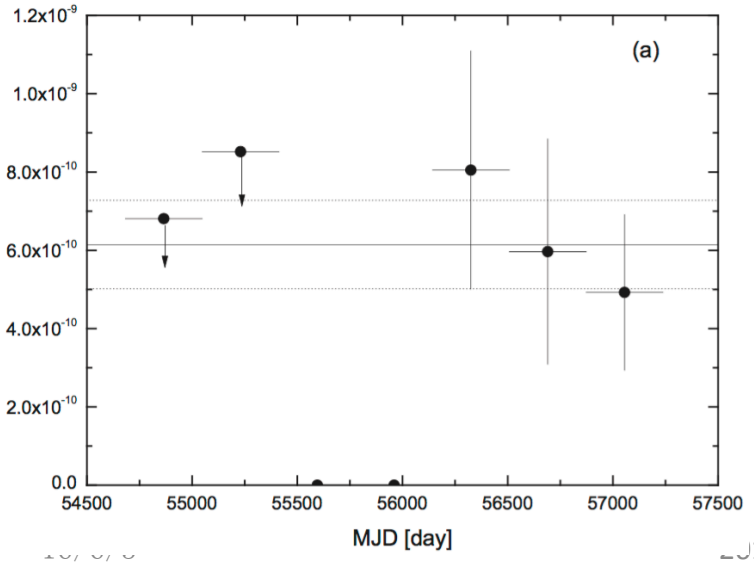




Gamma-ray from Steep radio spectrum NLS1—B3 1441+476

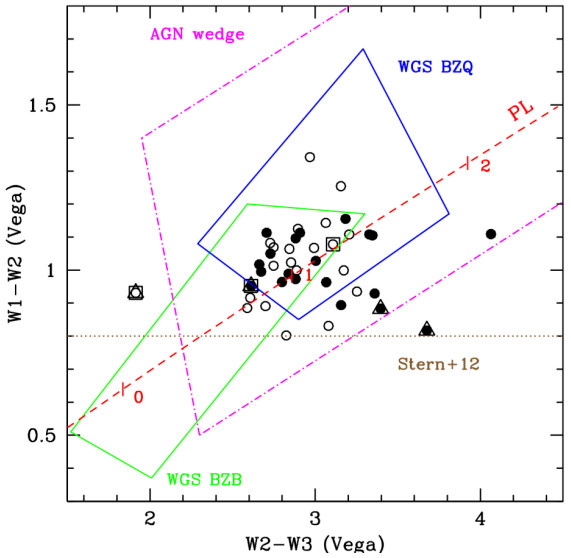
- It is one of the two steep radio spectrum RL NLS1 with R>1000.
- It show typical NLS1 behaviors
- It falls in the WISE Blazar Stripe.

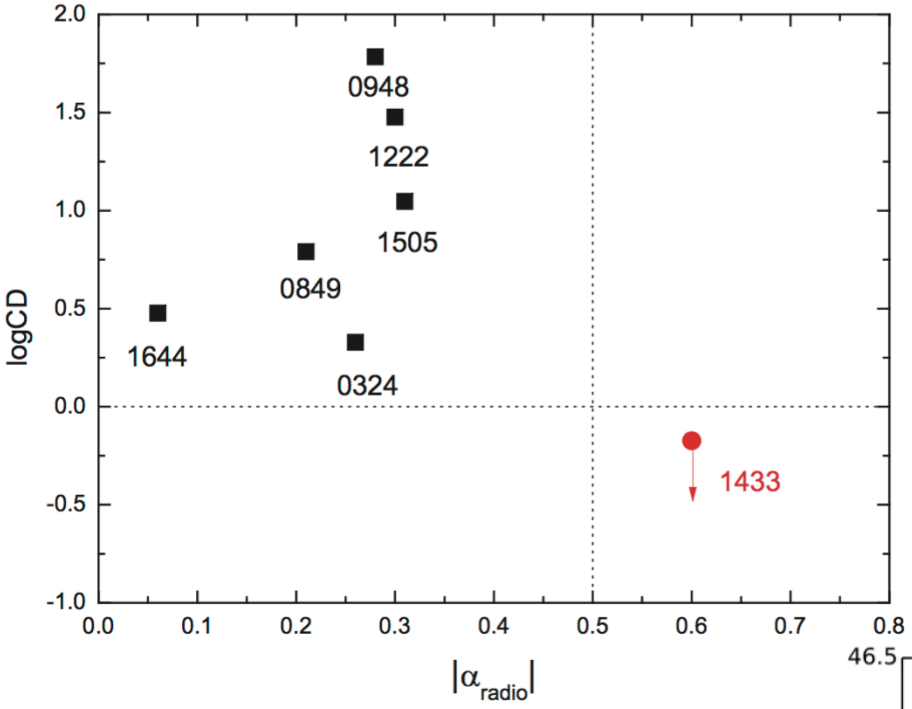




Massaro et al. 2012

Liao et al. 2015
arXiv:1510.05584



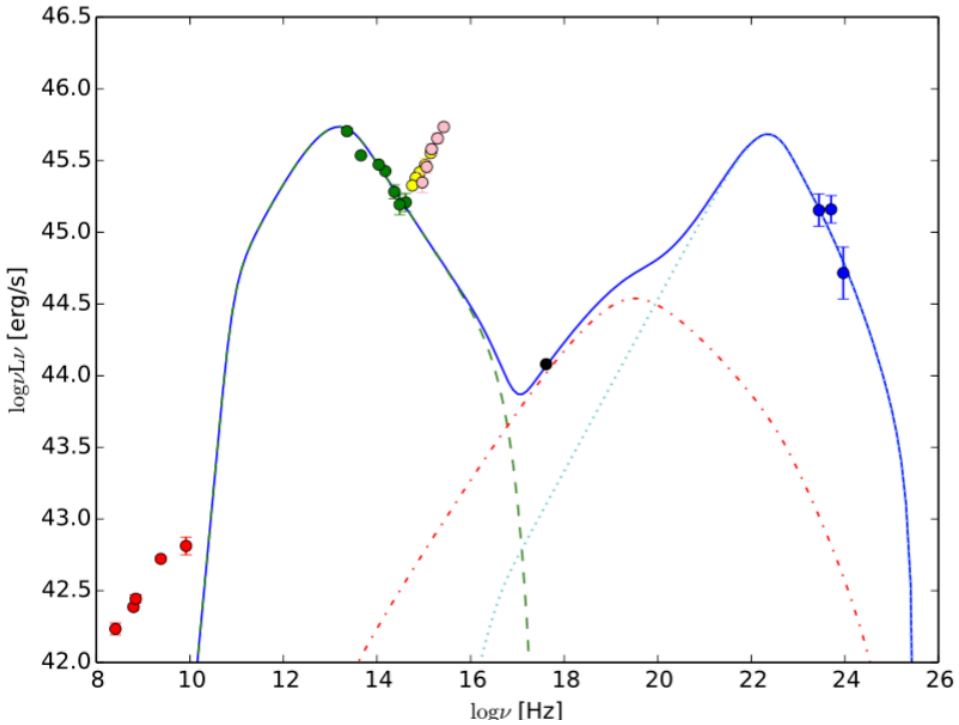


1433 is clearly separated from other LAT detected NLS1s.

- **No variability is detected from radio to X rays.**
- **Constrain from the Compton Dominance, delta < 5**
- **Radiation model successfully applied in SSRQs can work for 1443.**

Liao et al. 2015 arXiv:1510.05584

- **Happy to see the United Model holds**
- **However, looking the number ratio…**
- **Connecting to CSS?**
- **Ideal target for disk/outflow – jet connection**

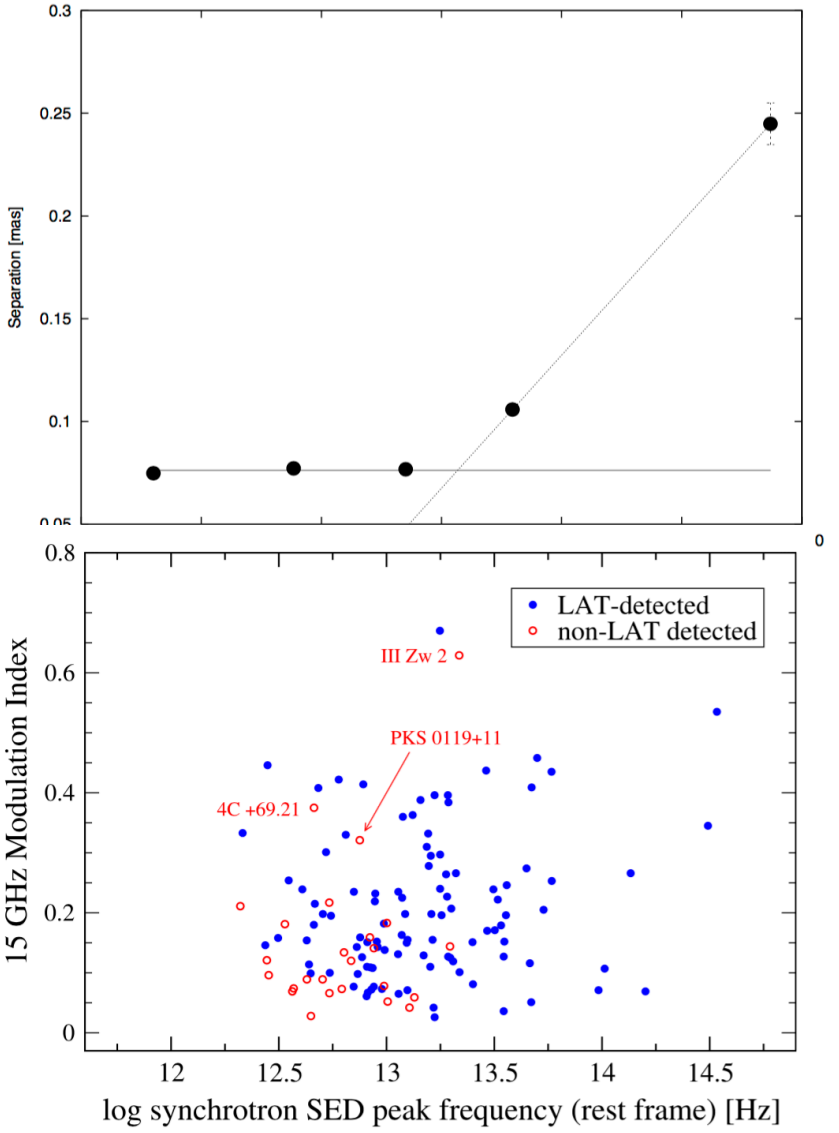


Gamma-ray from radio inter-mediate quasar (RIQ)

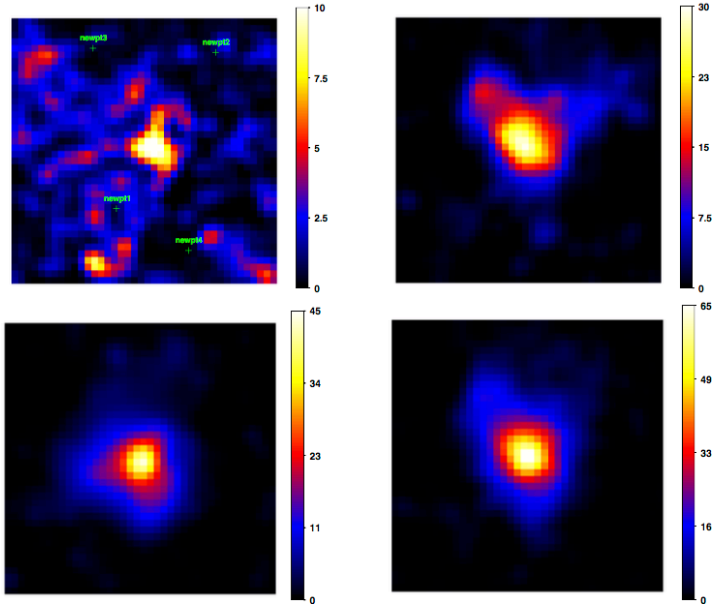
- Evidences of strong jets in RIQs are presented.

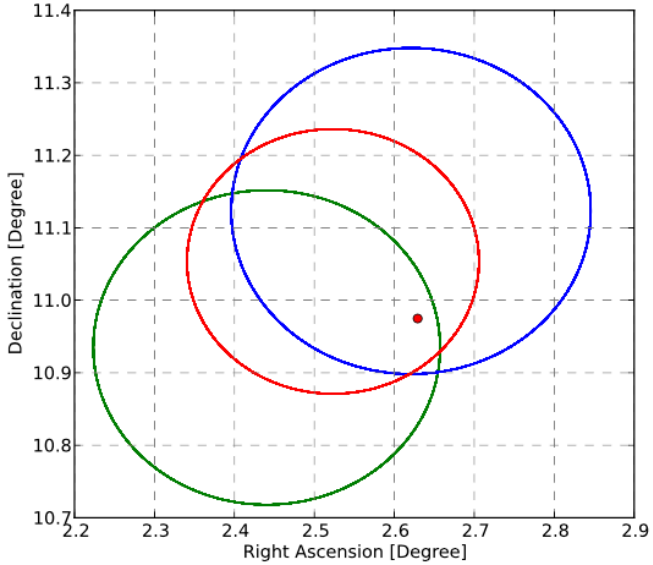
- III Zw 2 is the prototype of RIQs, and the only one with superluminal motion.

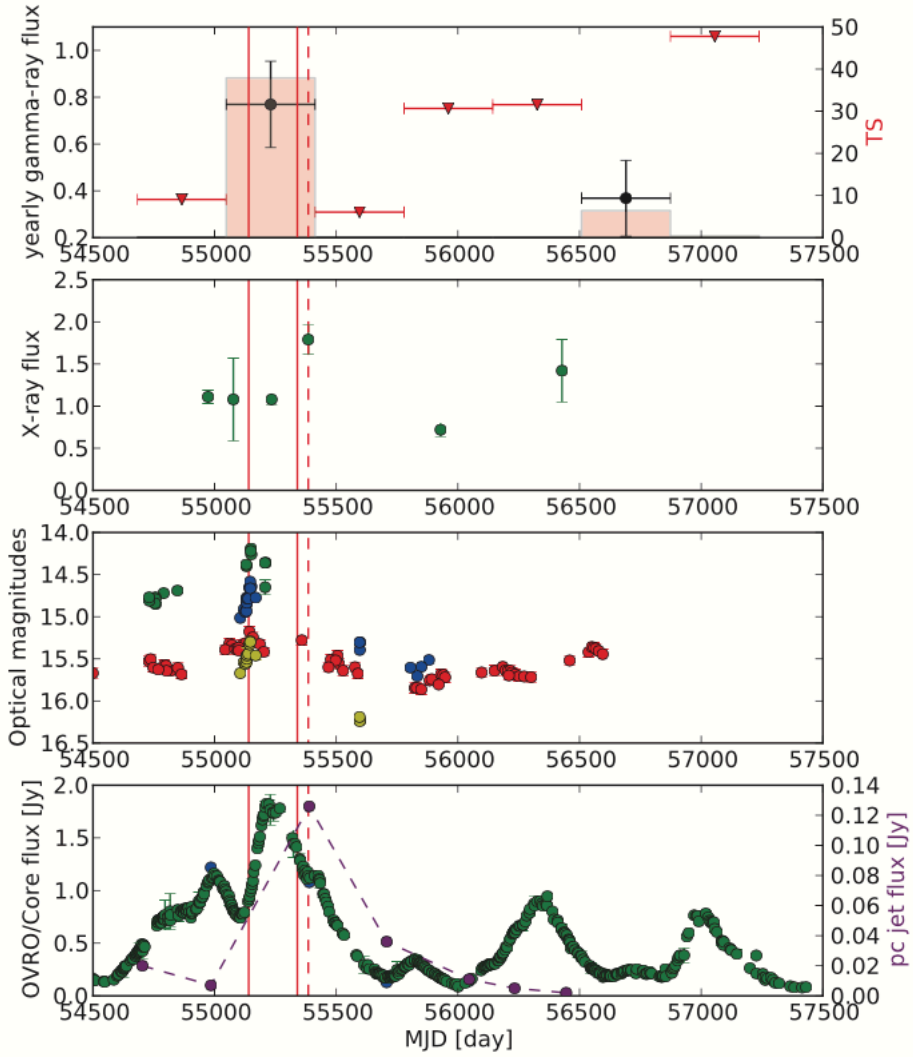
- Predictions of its gamma-ray Emission have been performed



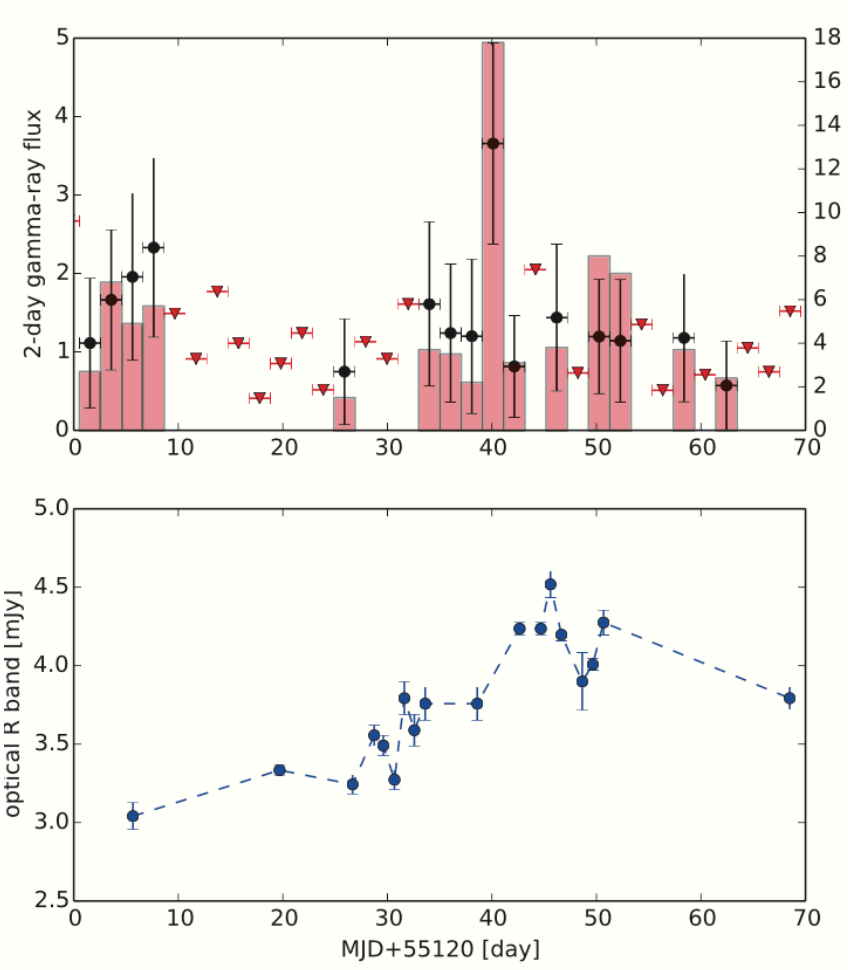
Lister et al. 2015; Brunthaler et al. 2000

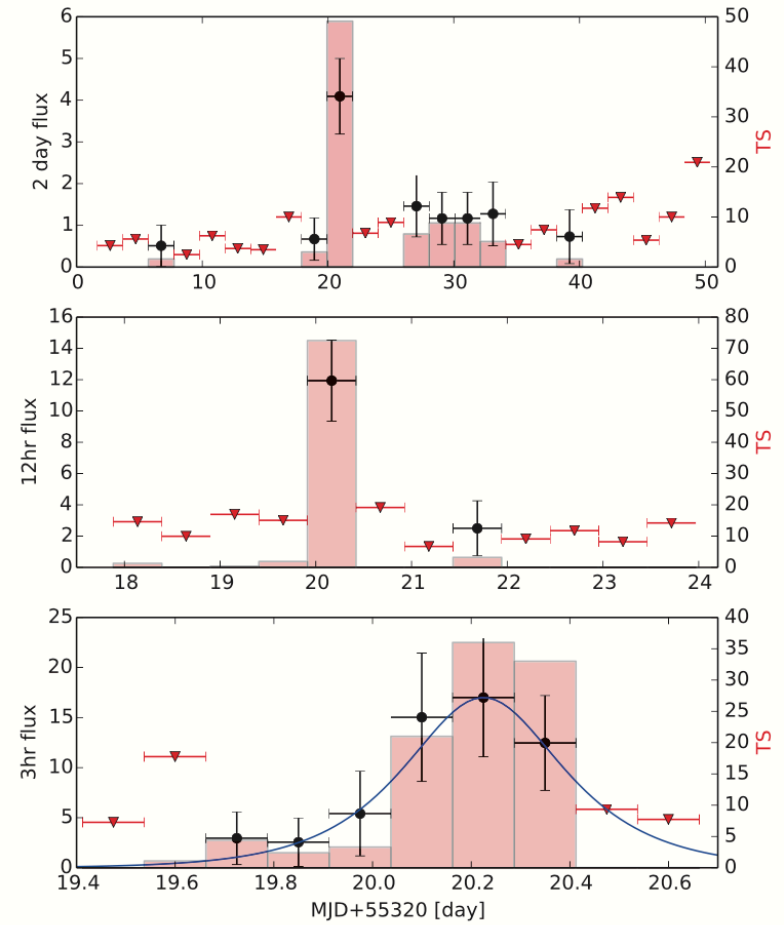






Liao et al. 2016 arXiv:1605.00276





Liao et al. 2016 arXiv:1605.00276

Intraday Gamma-ray variability strongly suggests III Zw 2 shares the same engine with Blazars.

We may watch the radio-loud AGN forming at real-time.

Summary and outlook

- 3C 275.1, a radio source having large jet angle of view (~20 deg) at redshift of 0.5 can generate strong gamma rays.
- Orientation based Unified Model also holds for RLNLS1s.
- Sources which do not need to be extreme radio loud to generate strong gamma rays
- Gamma rays from high redshift (z>4) blazars? From Radio quiet sources? Etc…

DAMPE

Successfully launched at 17th Dec 2015

Thanks for your attentions.

Welcome visit to CHINA !

Gamma-ray from Steep radio spectrum NLS1—B3 1443+476

- It is one of the two very RL NLS1 with steep radio spectrum and included in the sample of Yuan et al. 2008

- It show typical NLS1 behaviors:

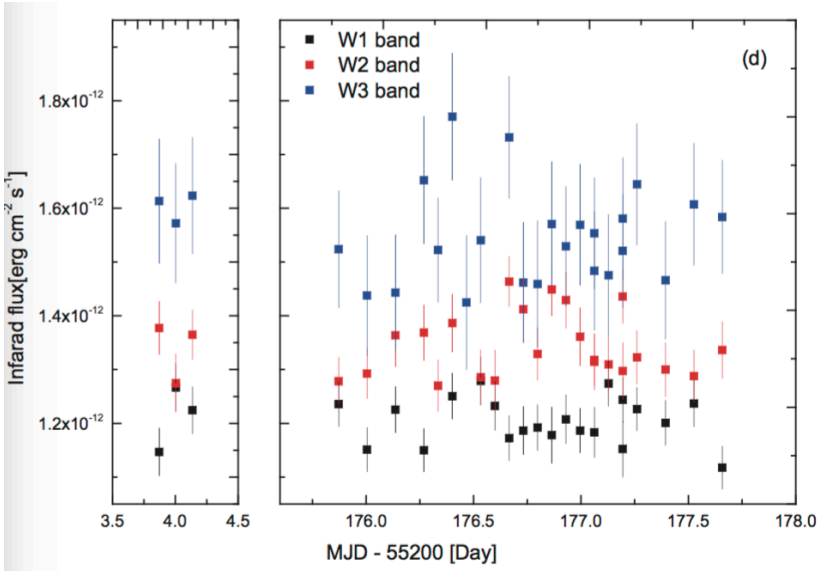
  FWHM (Hβ) =1848+-133 km s-1

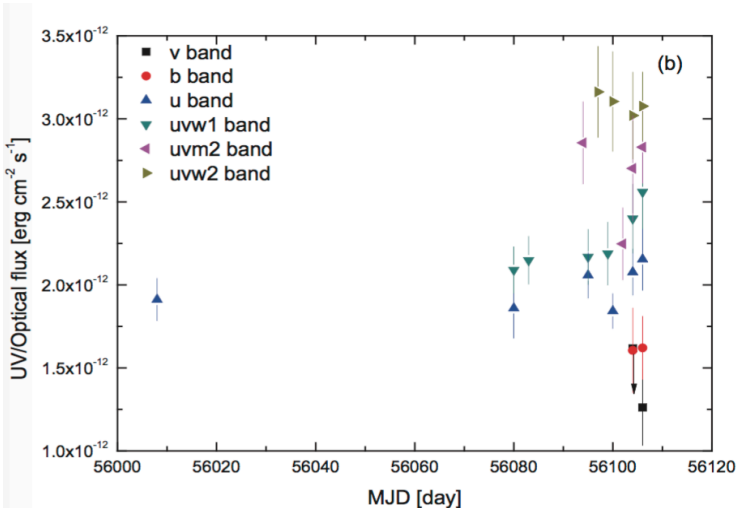
  R_4570 ~ 1.5

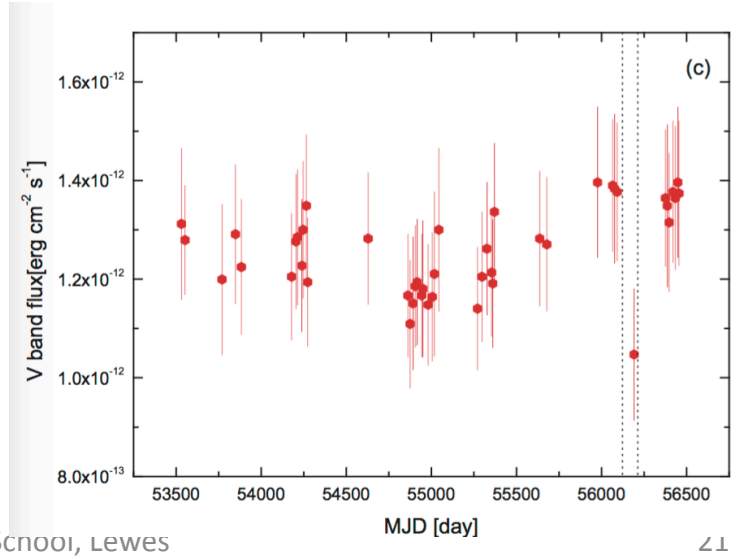
  [OIII]λ5007/Hβ ~ 0.3

  R_edd ~ 0.3

  Mass_BH ~ 10^7.4 solar_mass


W1 band
W2 band
W3 band
(d)
Infarad flux[erg cm^{-2} s^{-1}]
1.8x10^{-12}
1.6x10^{-12}
1.4x10^{-12}
1.2x10^{-12}
3.5
4.0
4.5
176.0
176.5
177.0
177.5
178.0
MJD - 55200 [Day]


v band
b band
u band
uvw1 band
uvm2 band
uvw2 band
(b)
UV/Optical flux [erg cm^{-2} s^{-1}]
3.5x10^{-12}
3.0x10^{-12}
2.5x10^{-12}
2.0x10^{-12}
1.5x10^{-12}
1.0x10^{-12}
56000
56020
56040
56060
56080
56100
56120
MJD [day]


(c)
V band flux[erg cm^{-2} s^{-1}]
1.6x10^{-12}
1.4x10^{-12}
1.2x10^{-12}
1.0x10^{-12}
8.0x10^{-13}
53500
54000
54500
55000
55500
56000
56500
MJD [day]