

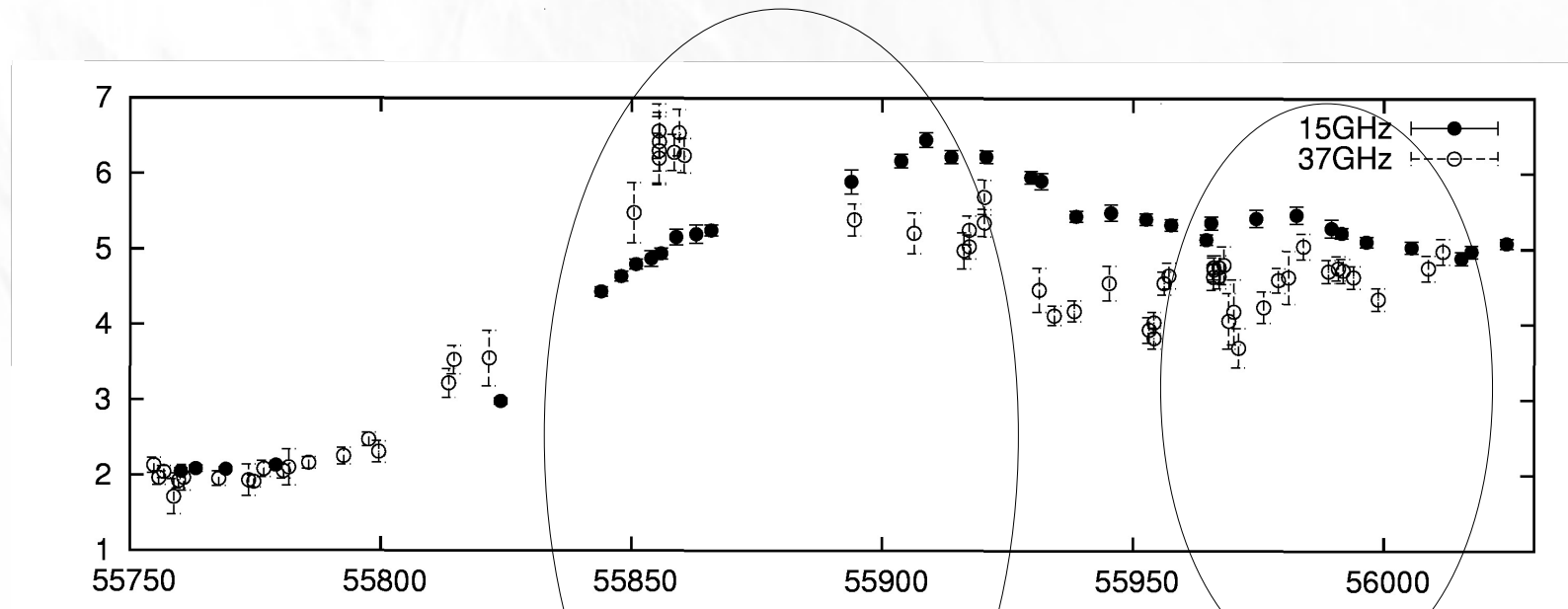
Multiwavelength behavior of PKS 1510-089 in spring 2012

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F.D'Ammando, S.Buson (Fermi-LAT, Swift),
S.Vercellone, C.Pittori et al. (AGILE), C.Raiteri, M.Villata
(GASP-WEBT, UVOT), K.Nilsson et al. (LT),
A.Lähteenmäki et al. (Metsähovi), T.Hovatta et al.
(OVRO), L.Fuhrman et al. (F-Gamma), S.Jorstad and
A.Marscher (VLBA)

PKS 1510-089 in 2009

- Major outburst in optical, radio, gamma-rays, but not much in X-rays (e.g. D'Ammando et al. 2010, Abdo et al. 2010)
- Rotation of the optical polarization angle simultaneous to radio core EVPA for >360 degrees (Marscher et al. 2010)
- HESS detected VHE gamma-rays (S.Wagner private communication: paper has been submitted (already in Oct12, the variability not statistically significant))

Radio - longterm



Autumn 2011: Very large outburst

- The peak flux reached the historical maximum value
- clear delay from high to low frequencies

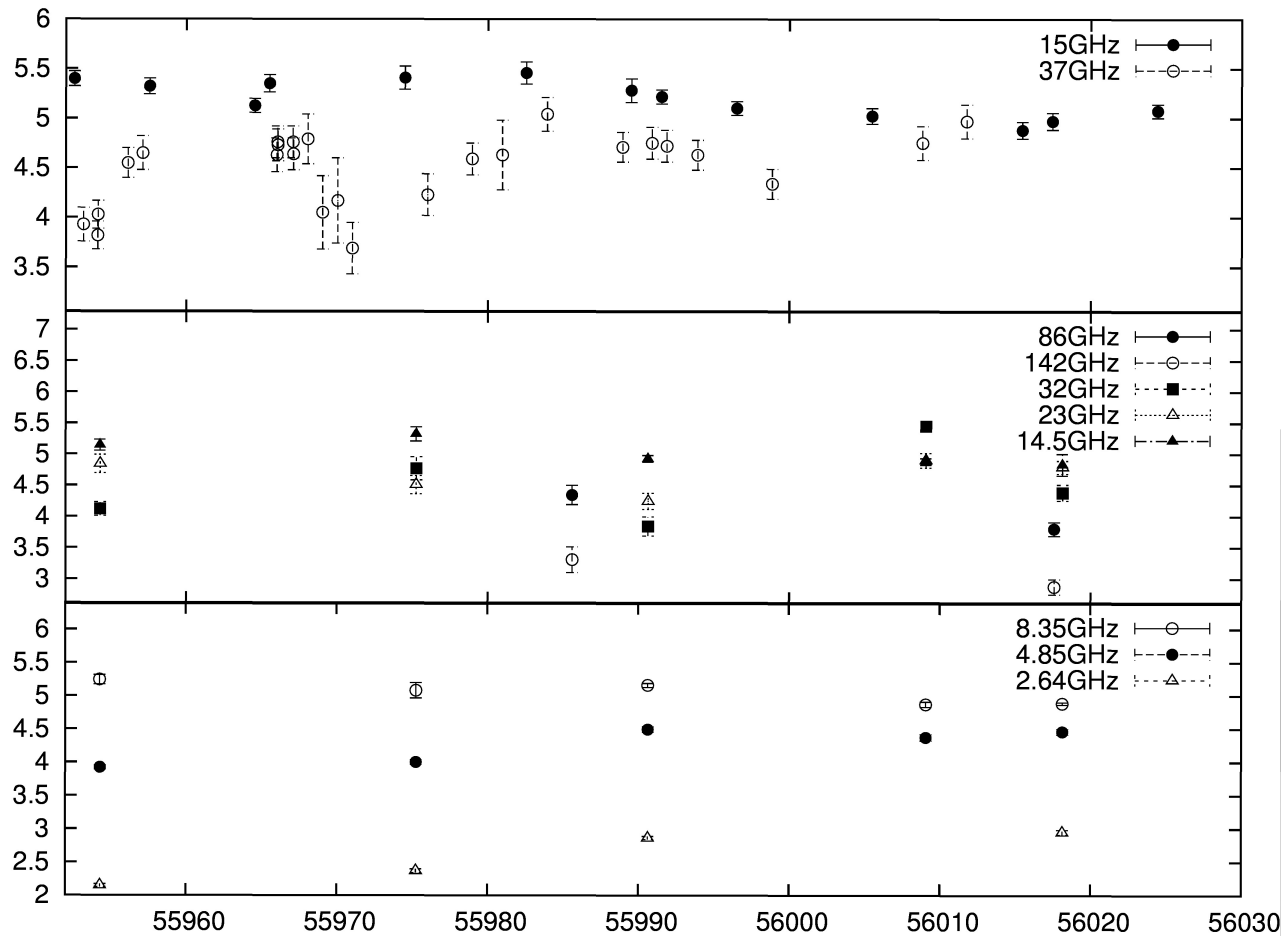
- in lowest frequencies this outburst continued until spring 2012

- Recent publication by Orienti et al. 2012

Second, but much smaller outburst, in February 2012

- In 37GHz looks like two peaks?

Radio - Spring 2012



-here the second outburst is well visible

-in lower frequencies, With poorer sampling, it is not

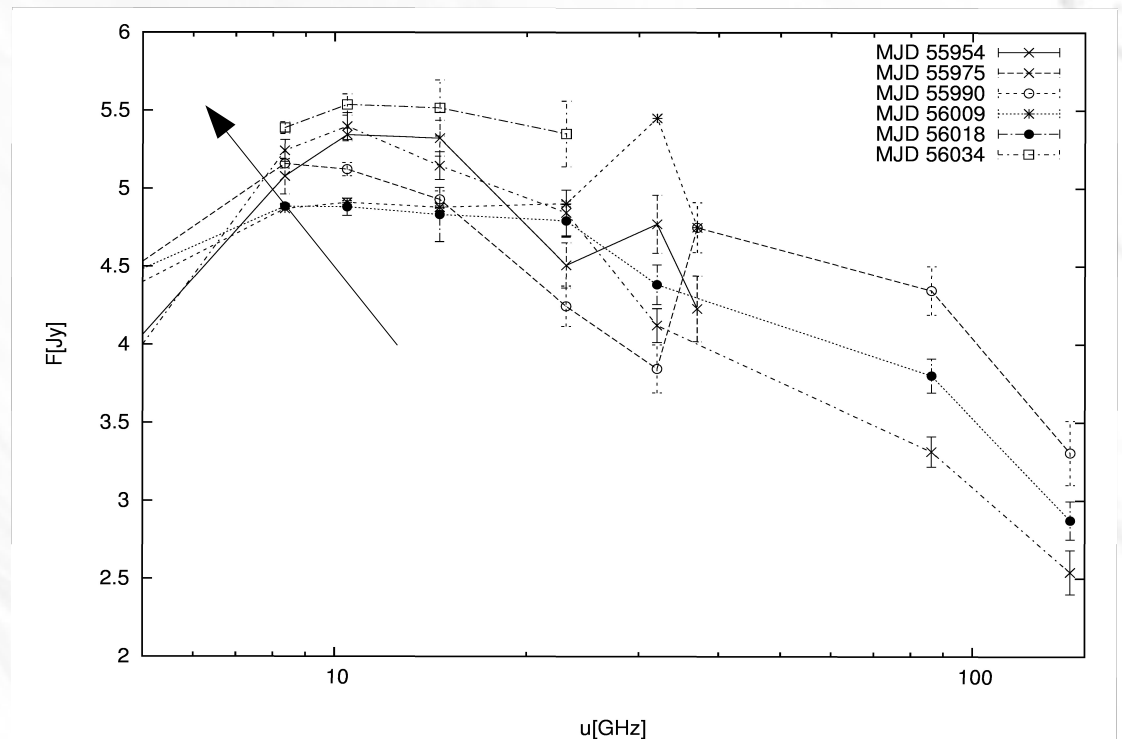
Radio-spring 2012

- Three stage evolution of the radio outbursts (Marscher & Gear 1985):

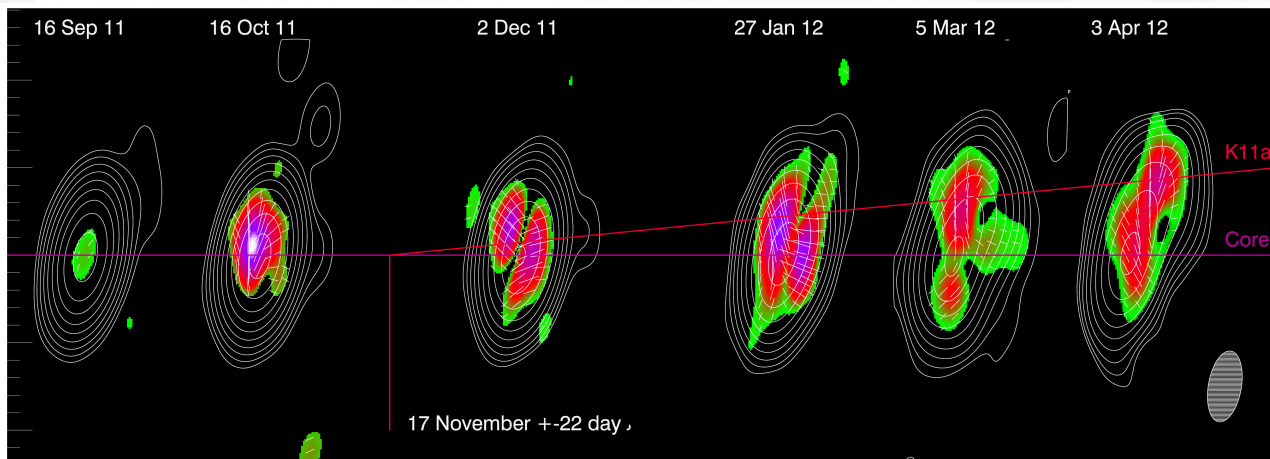
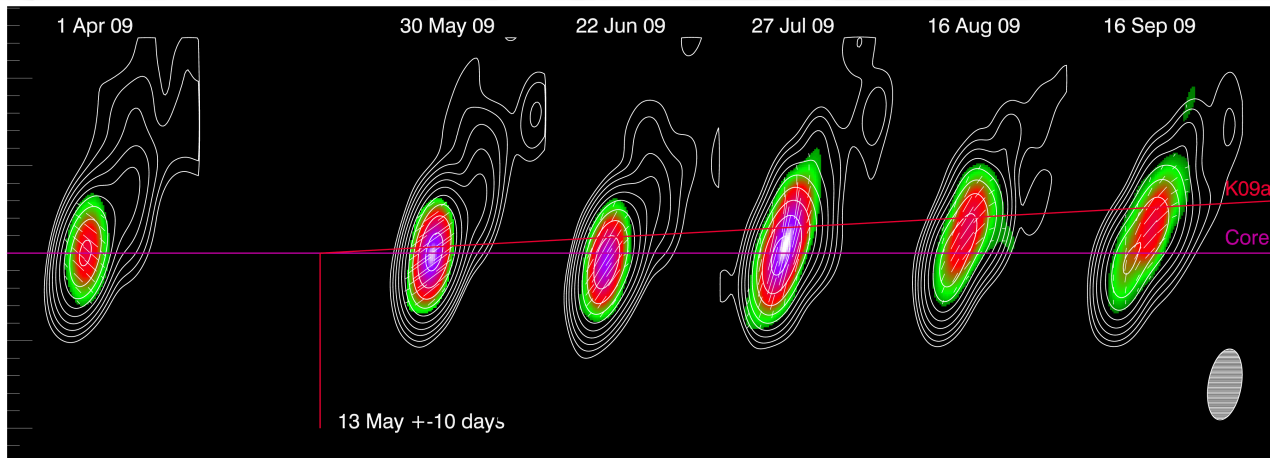
1.IC losses

2.Synchrotron losses

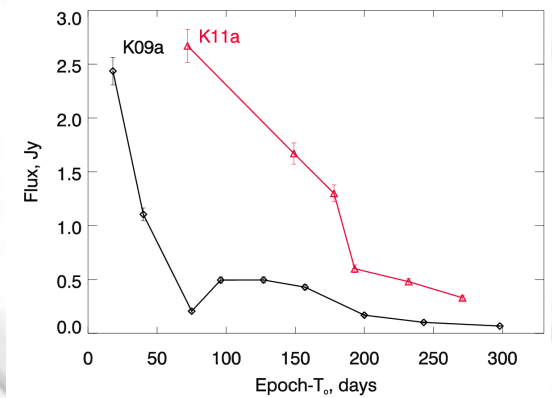
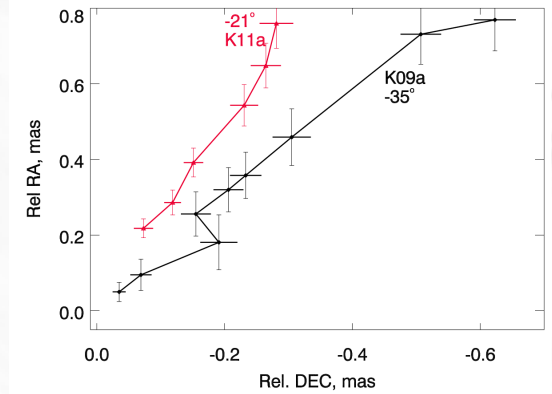
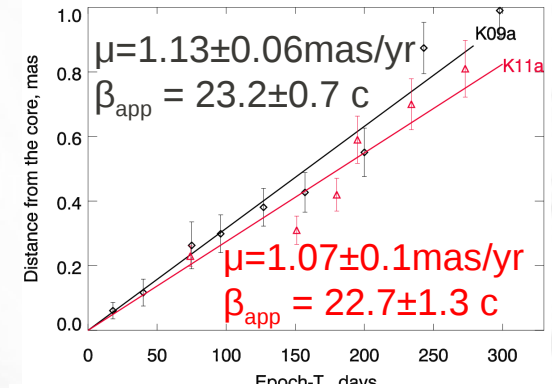
3.Adiabatic losses



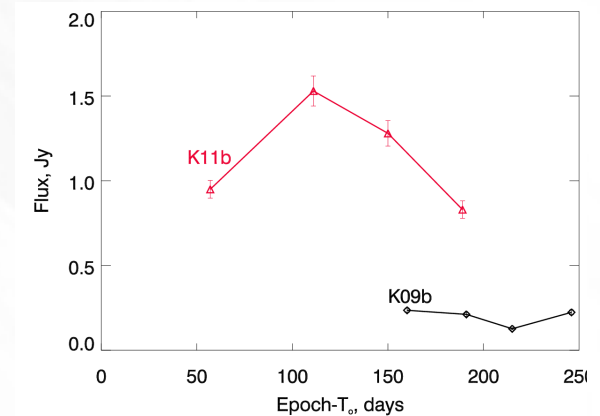
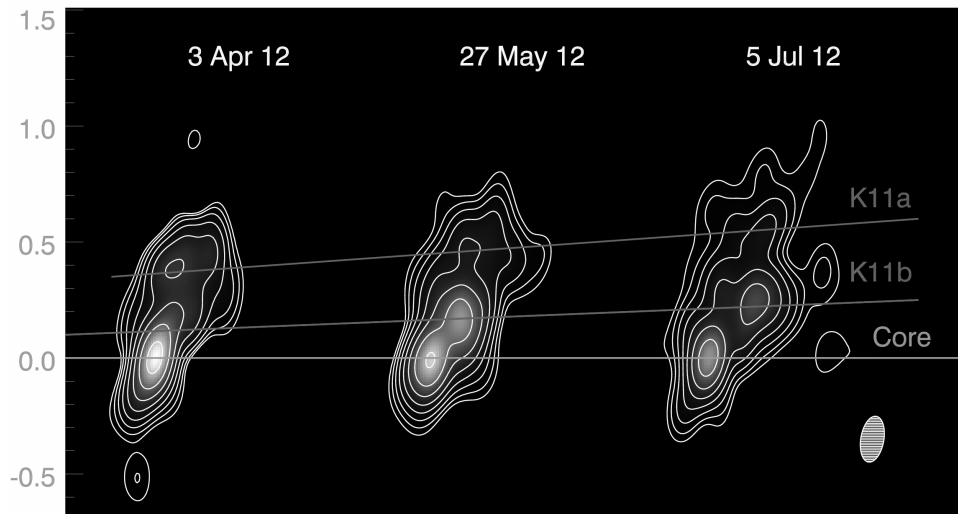
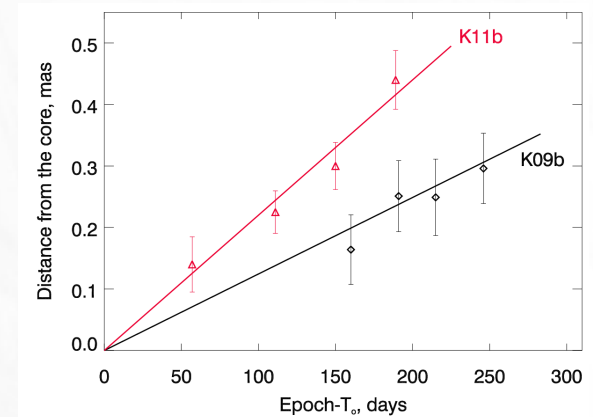
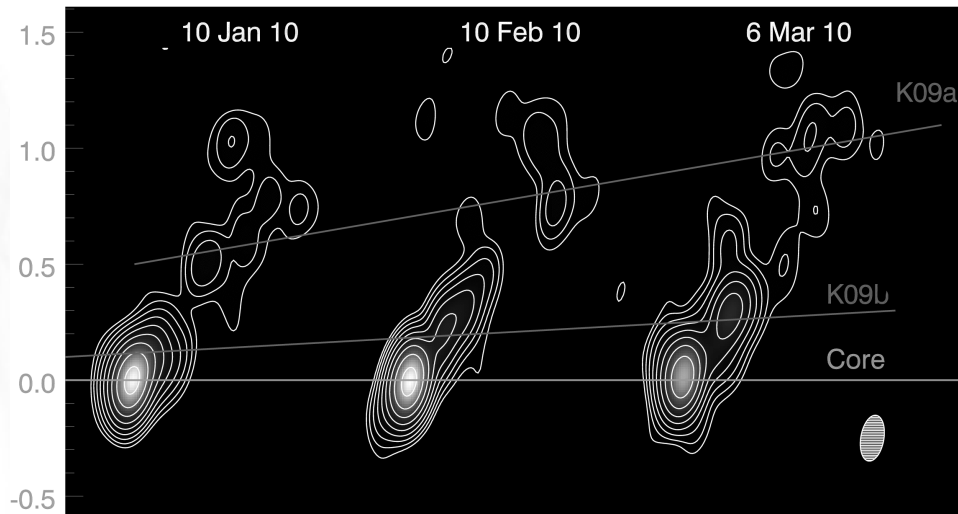
Radio - VLBA



Ejection in November very similar to one seen in 2009

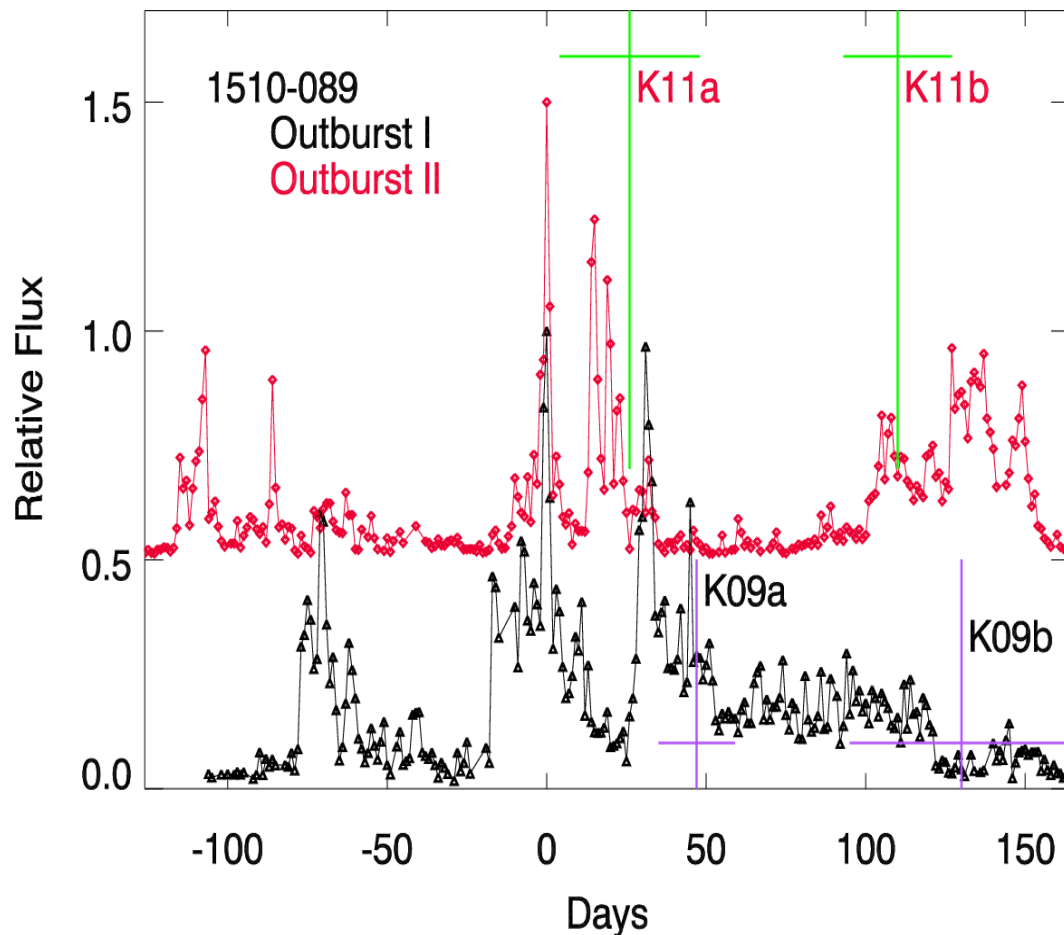


Radio - VLBA



Ejection in February is slower and fainter than the ejection in November

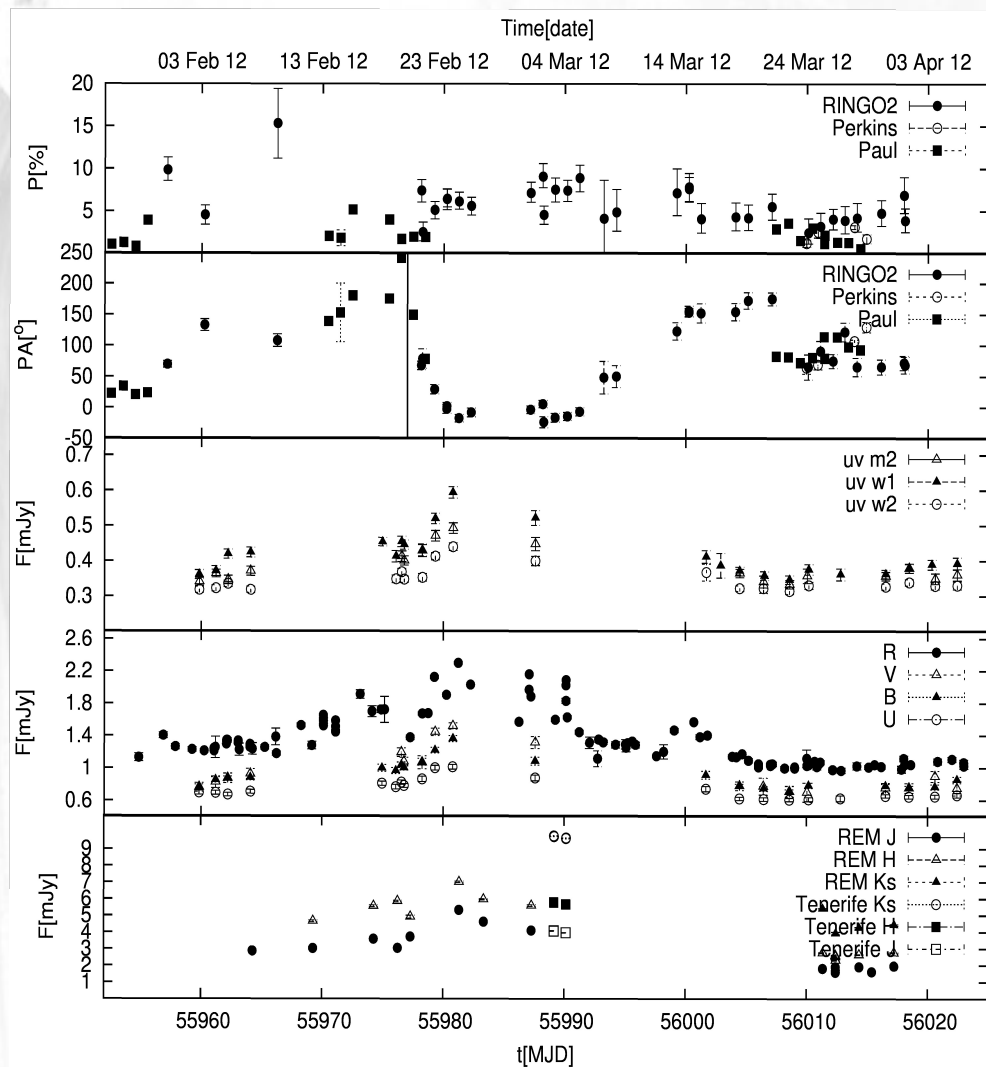
Why should we care what was happening in radio?



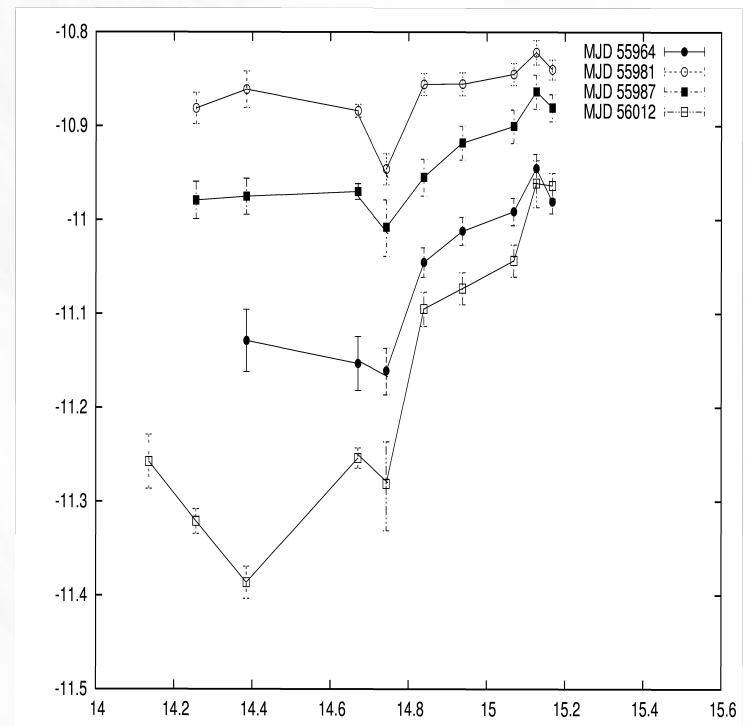
Statistics for quasars

Source	Type	γ +jet	γ -jet	jet- γ
1622-29	Q	1	0	0
1633+38	Q	3	1	0
3C345	Q	3	0	1
1730-13	Q	1	0	0
CTA102	Q	0	1	1
3C446	Q	0	0	1
3C454.3	Q	2	1	0
Total	Q	28	6	8

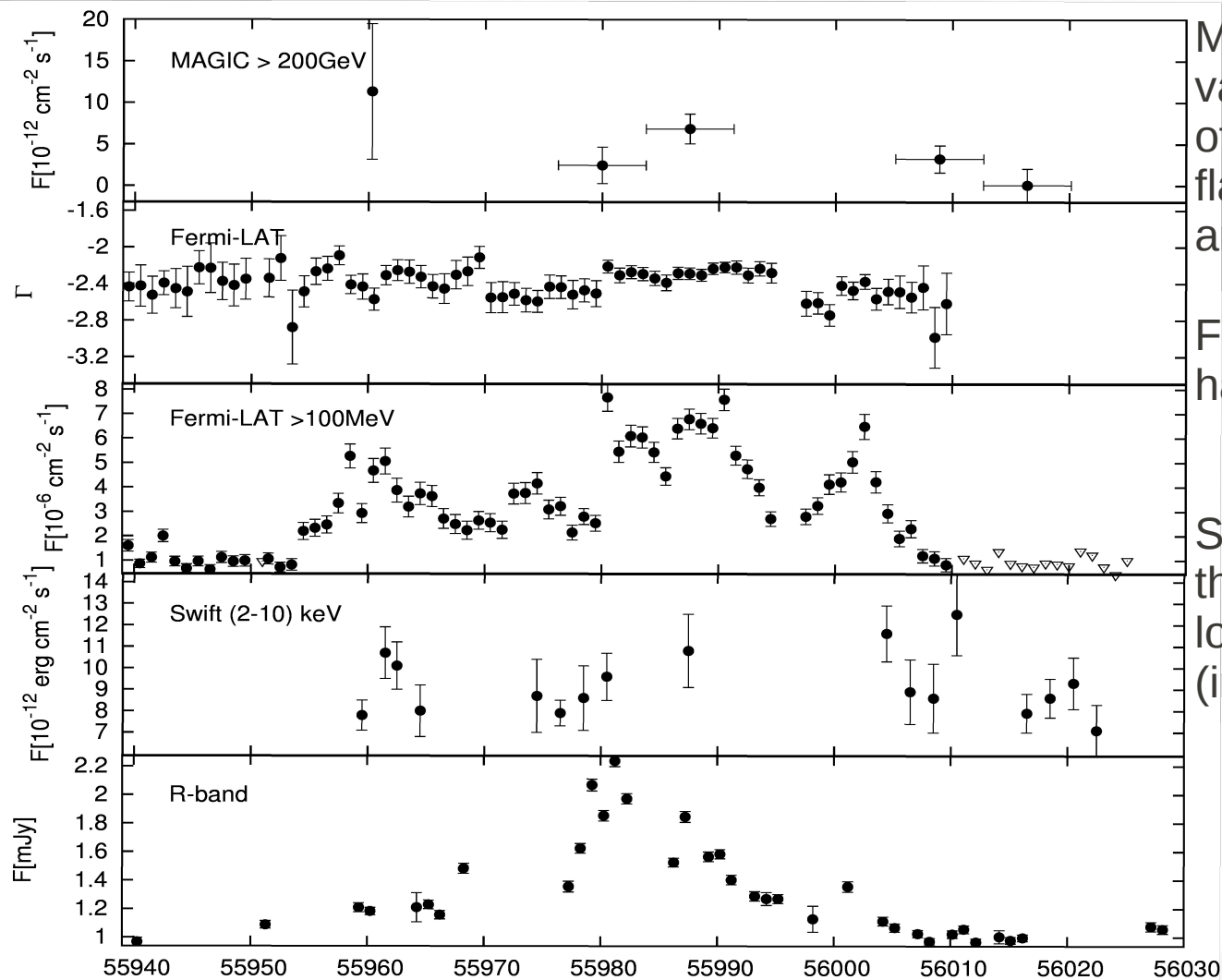
UV-optical-IR



IR-opt-UV spectra: flatter
when brighter: i.e. non-thermal
Contribution becomes more
important



X-rays, HE gamma-rays



MAGIC: no significant variability, even if the last half of the data was taken after flare was over in HE (Fermi and AGILE)

Fermi-AGILE: harder when brighter

Swift: Flux comparable with the one in March 2009, but lower compared to major flare (in X-rays) in 2006.

Fermi+MAGIC spectra

Connect “smoothly”

Flux 0.1-300.0 GeV $3.8\text{e-}06 \pm 8.0\text{e-}08 \text{ cm}^{-2} \text{ s}^{-1}$

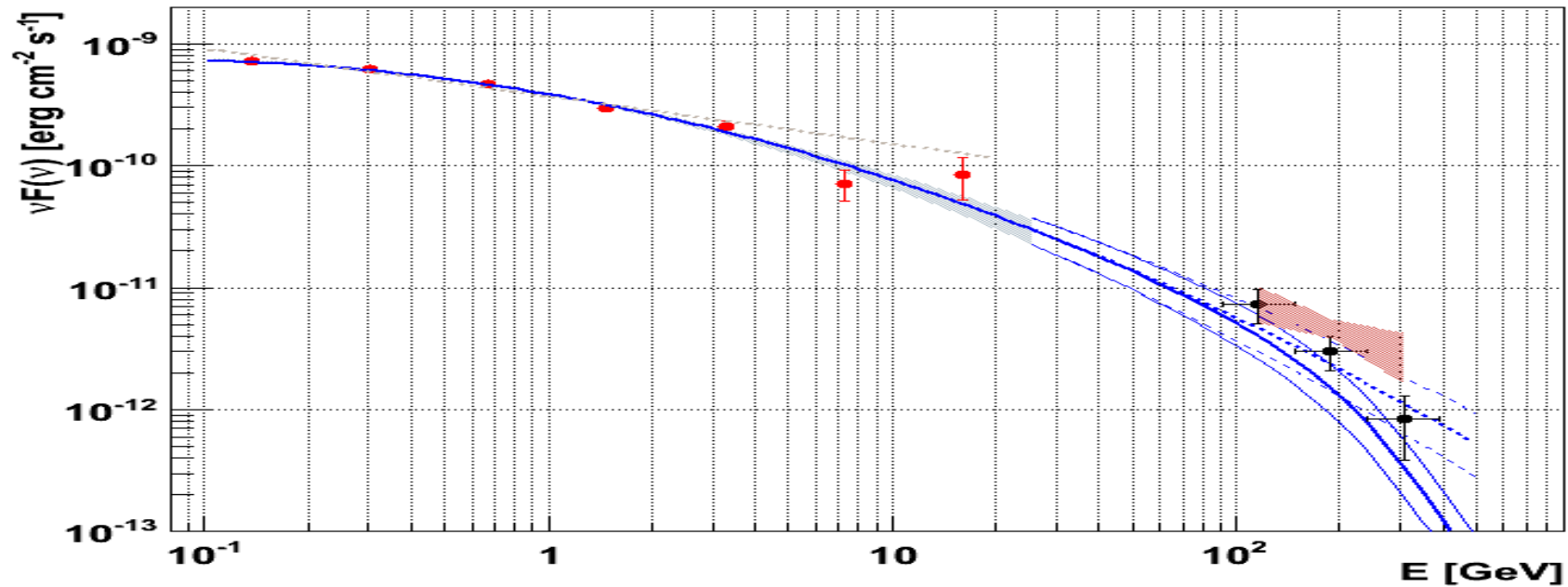
α : $2.245 \pm 2.963\text{e-}02$

β : $9.278\text{e-}02 \pm 1.559\text{e-}02$

Test Statistic 11589.32

LogLike 107056.38 (6sigma)

max energy photon is 24348.699 MeV



Conclusions

- MWL similar to 3C279 in 2007: VLBA component, optical outburst, co-rotation EVPA in radio and optical. X-rays weak.
- But VHE is not: 3C279 was detected during one night, PKS1510-089: detected but no variability
- Other bands: variability in daily scale
- MAGIC +LAT spectra connect smoothly. I think we have a case of VHE gamma-rays “far out”
- Paper status: all data there, Interpretation missing.