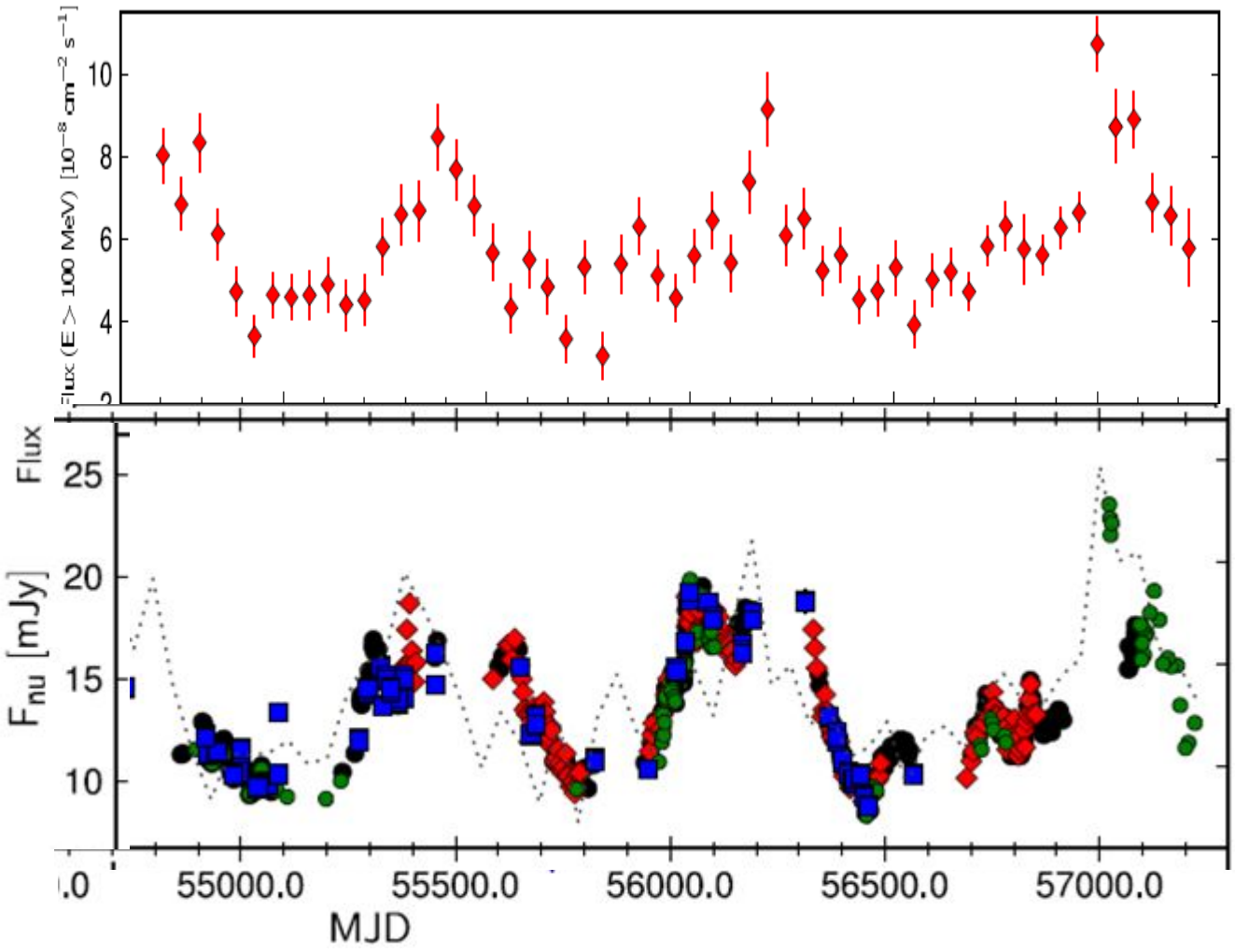
PG 1553+113

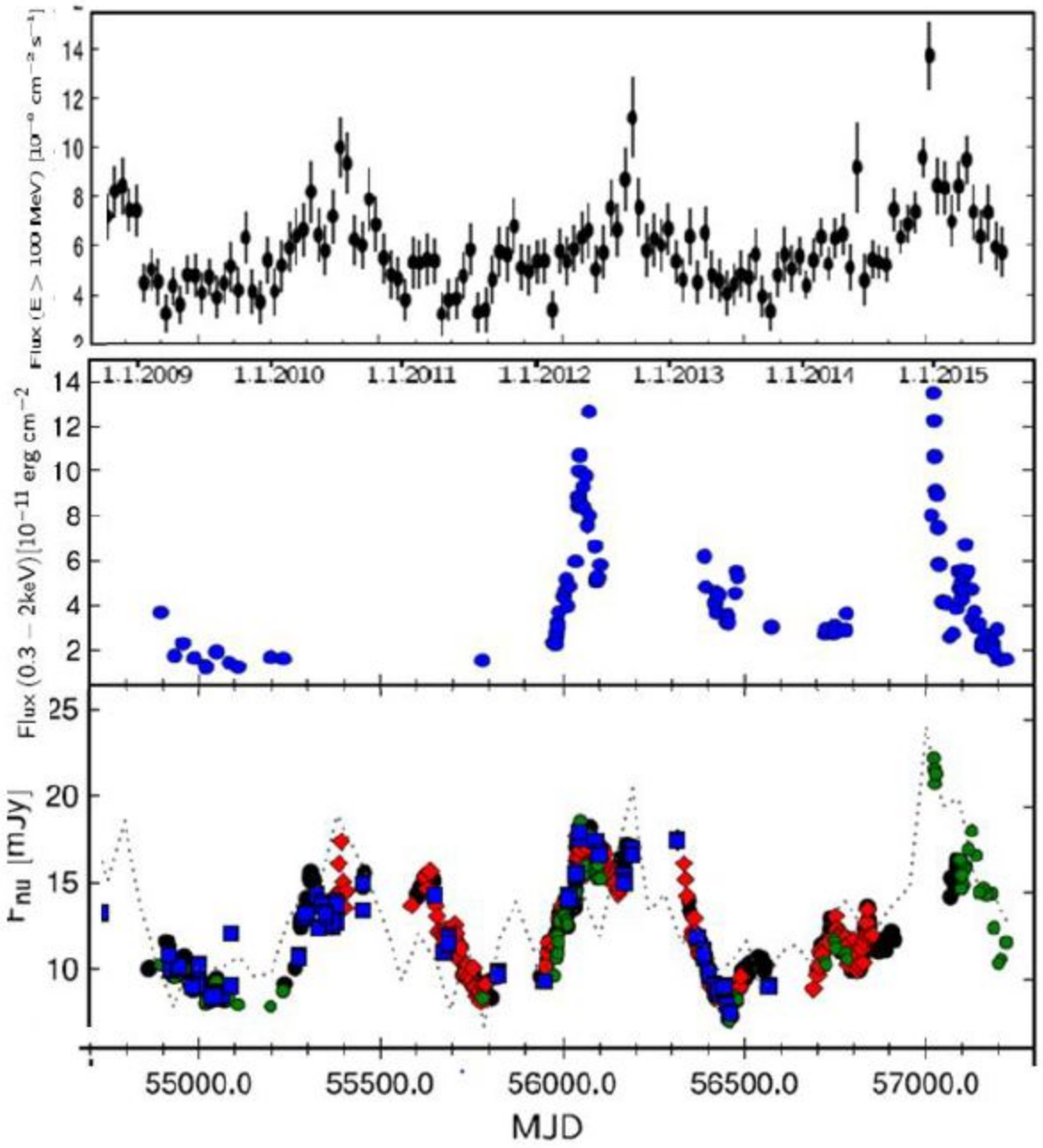
A. Cavaliere, M.T., V. Vittorini

P. Munar-Adrover

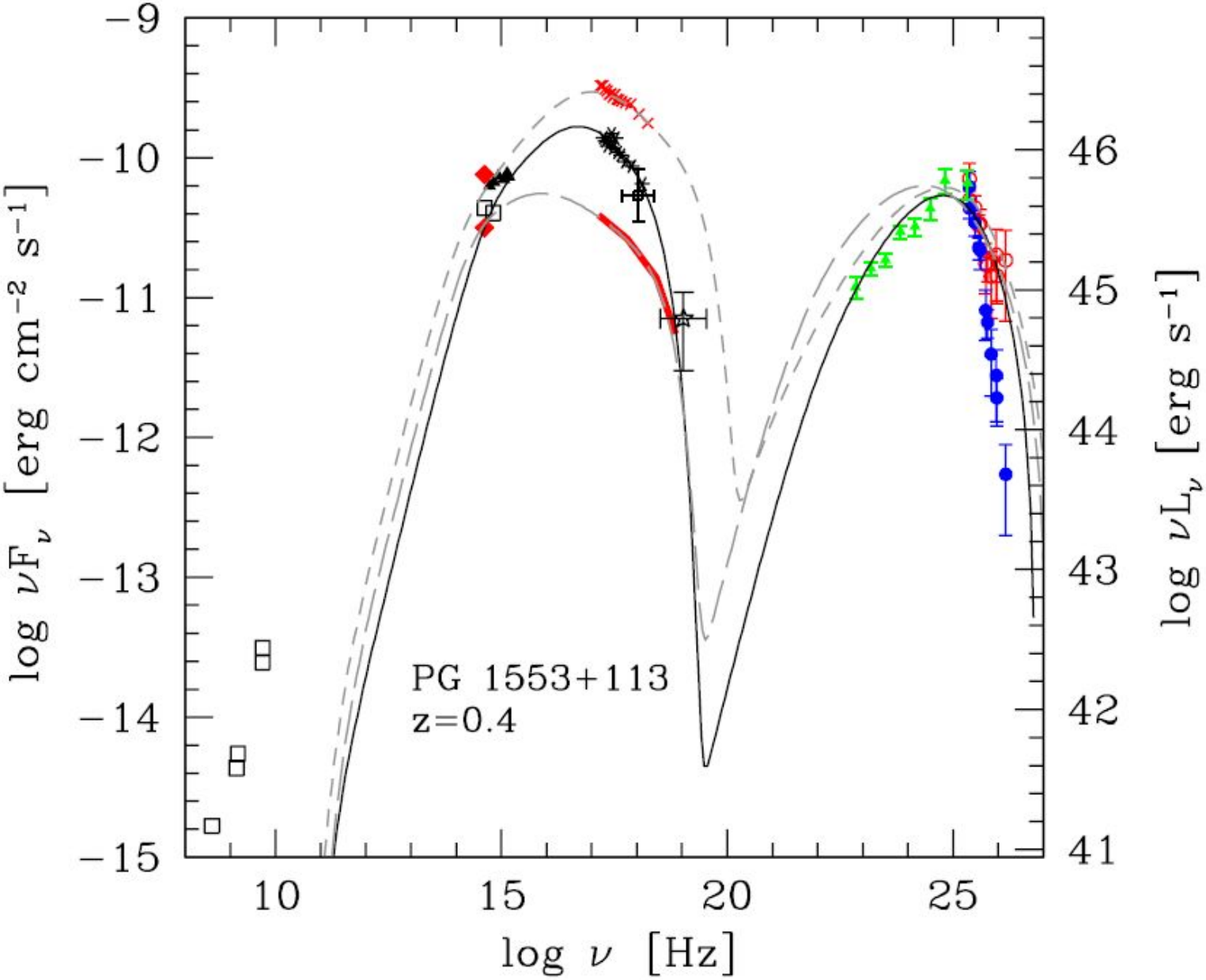
PG 1553+113, Ackermann et al. 2015



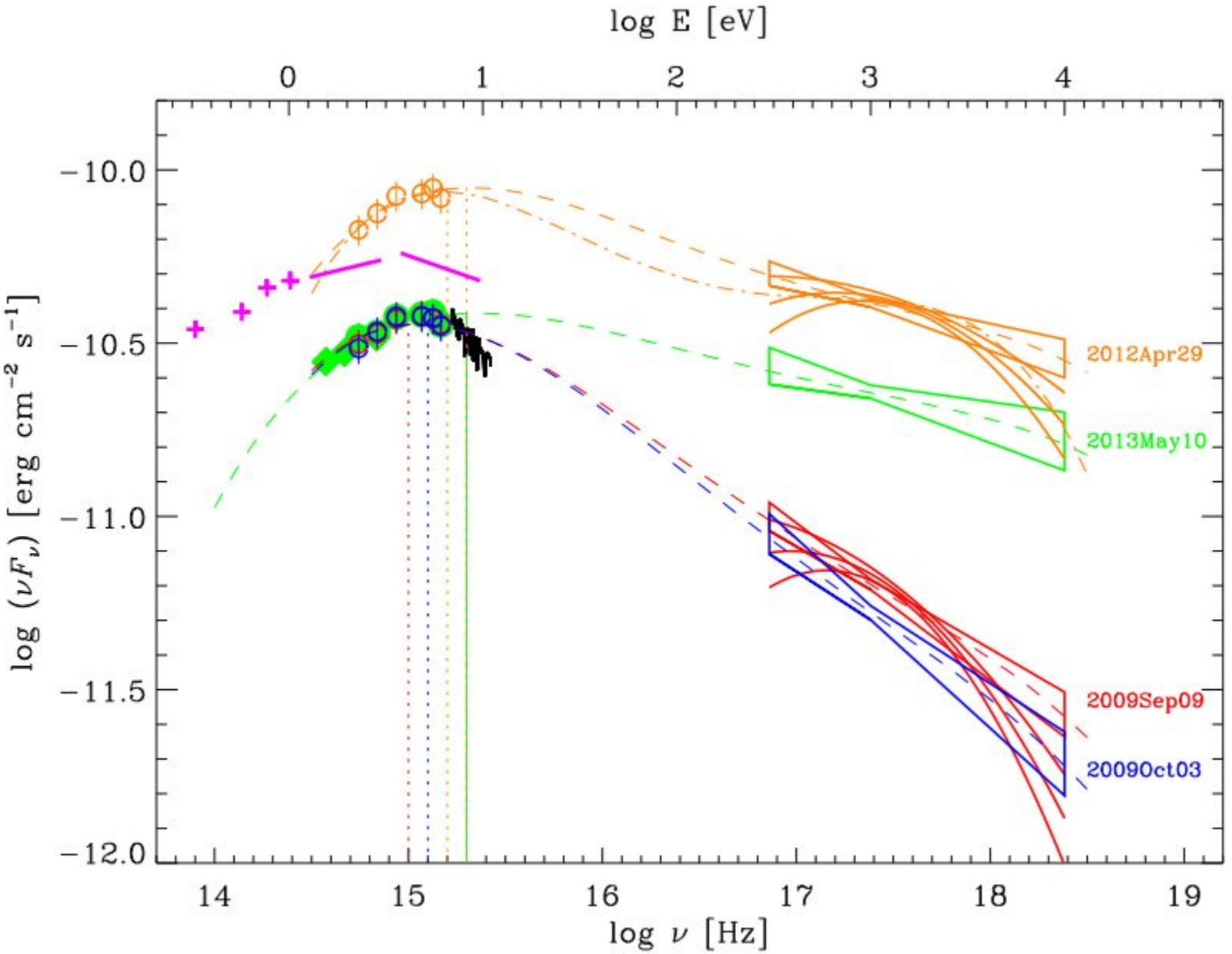
PG 1553+113, Ackermann et al. 2015



Aleksic, 2012



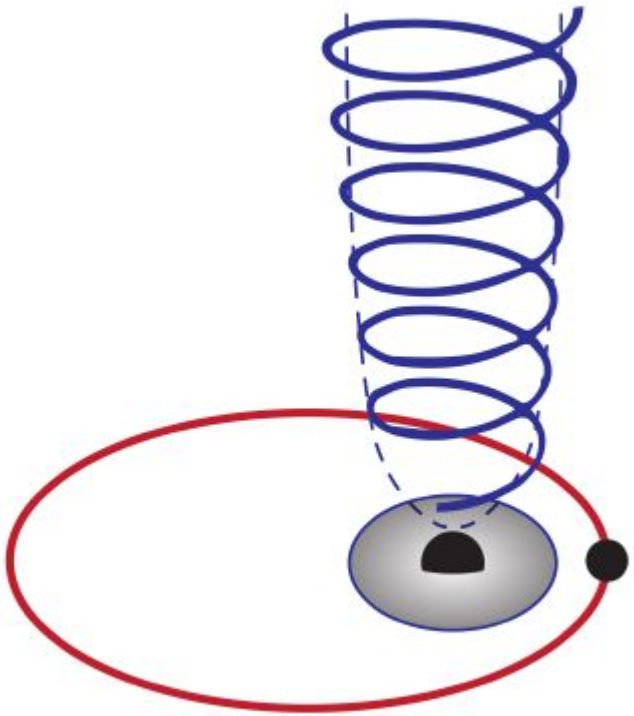
PG 1553, Raiteri et al. 2015



Modelling ‘’periodic’’ gamma-ray emissions from PG 1553+113

- consider the effect of a companion BH in a binary system
- perturb the primary BH jet by magneto-gravitational stresses
- induce enhanced B^2 (synchrotron) + local particle acceleration (reconnection ?)
- explain the erratic behavior of X-ray outbursts vs. optical and gamma-ray trends

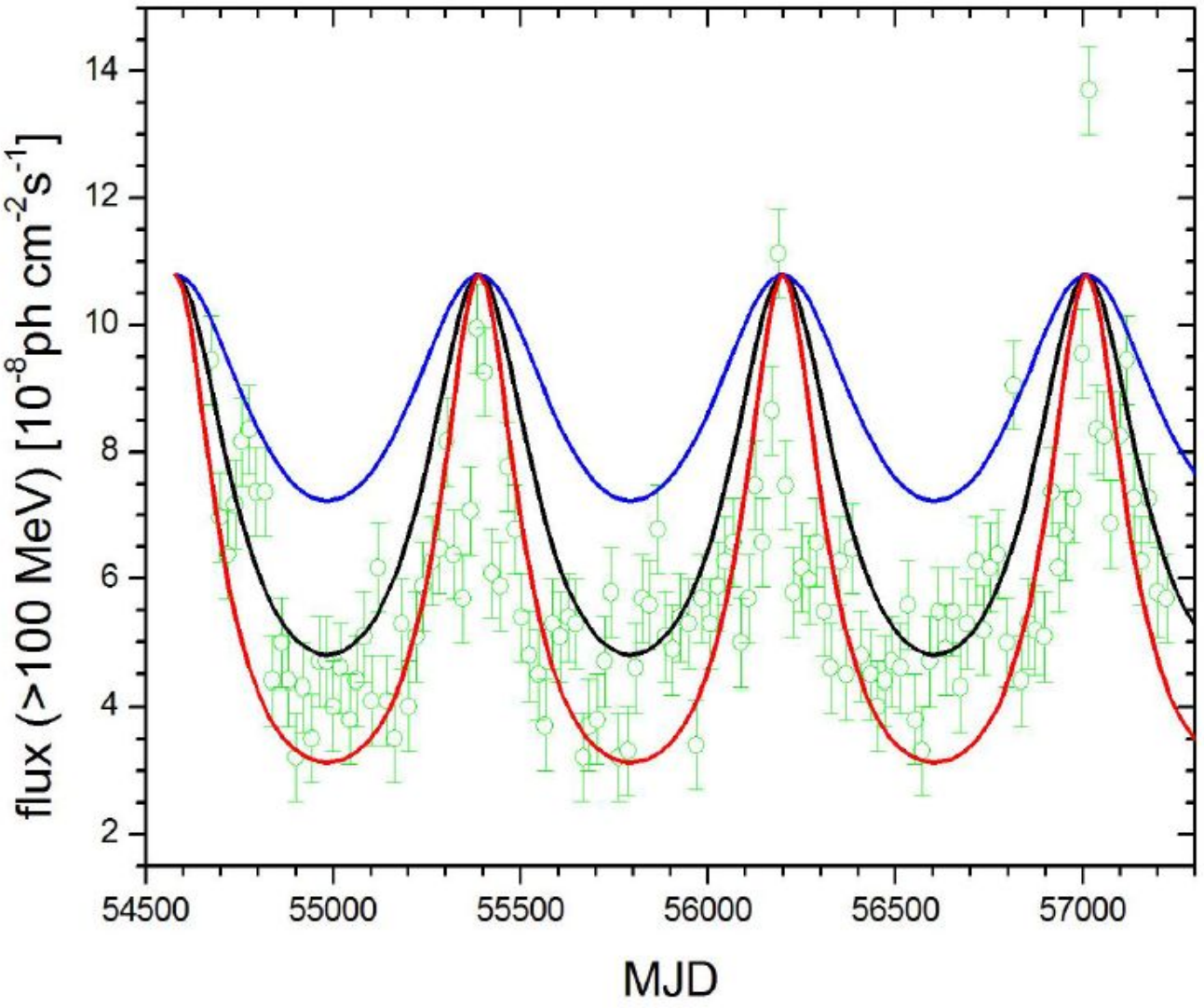
Modelling PG 1553+113, Cavaliere etal. 2017



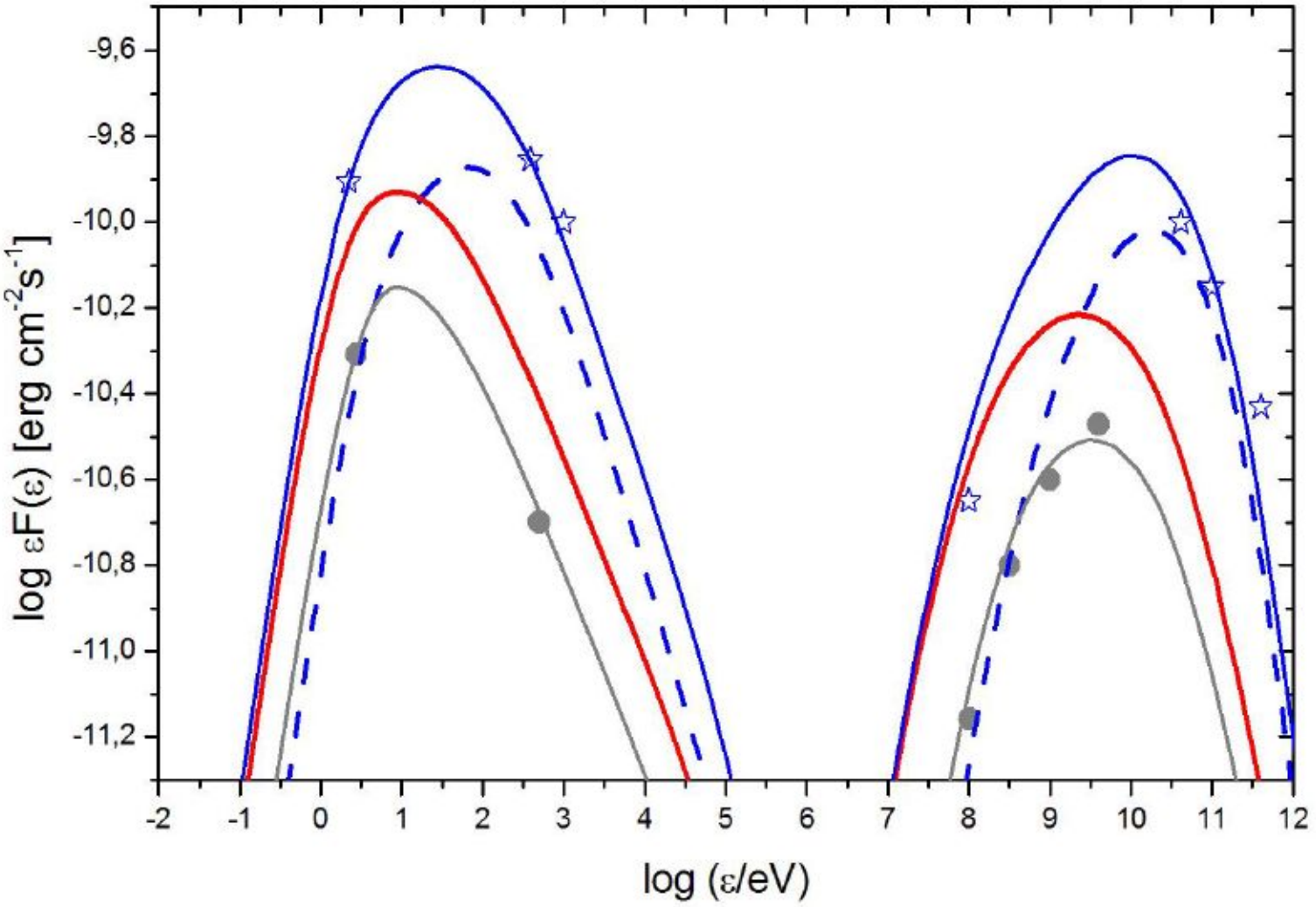
$$\sigma_j = \frac{\bar{B}^2}{4\,\pi\,n_p\,m_p\,c^2\,\Gamma^2}\,.$$

$$\sigma_e = \frac{B^2}{4\,\pi\,n_e\,m_e\,c^2},$$

Cavaliere et. al. 2017

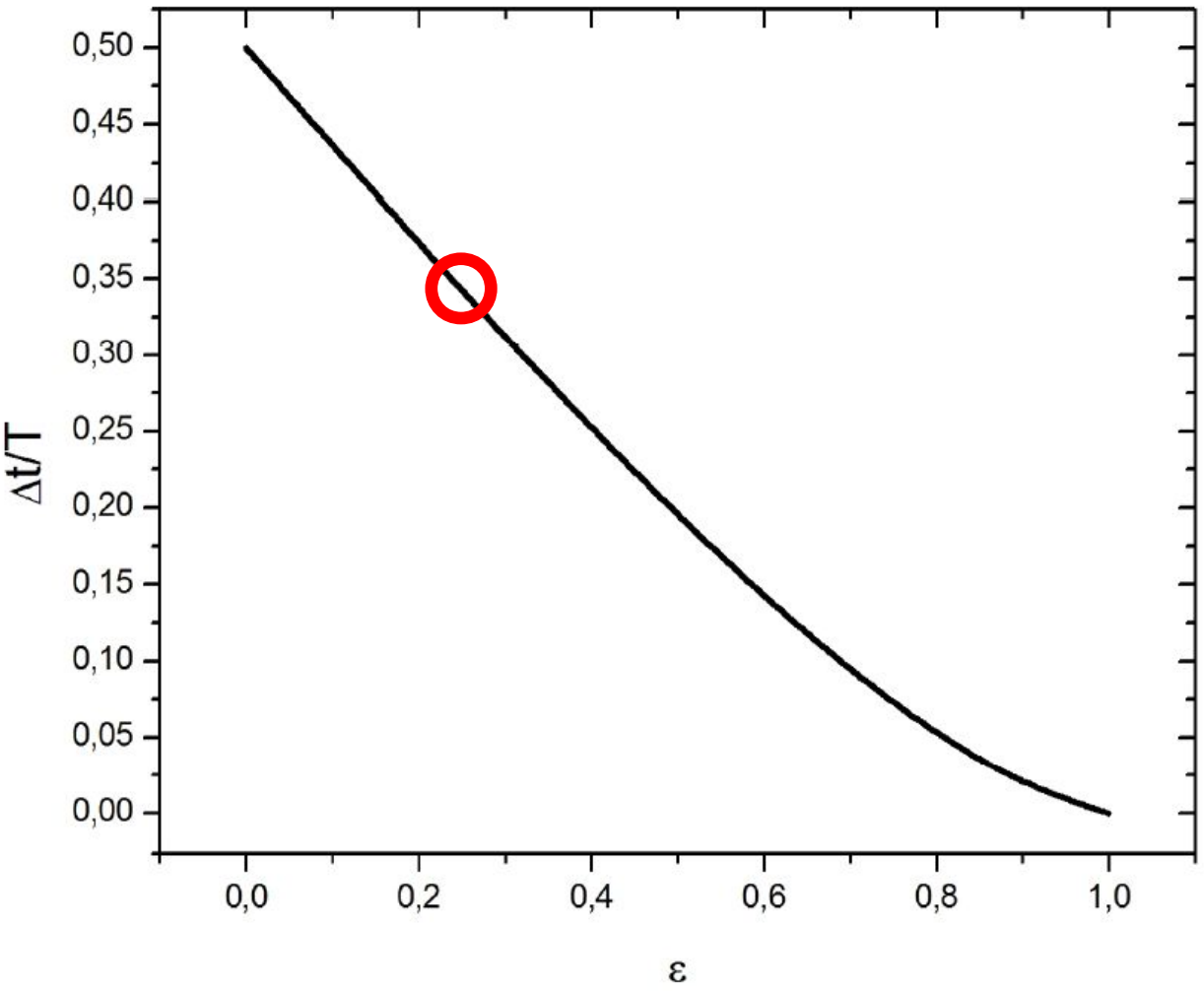


Cavaliere et. al. 2017



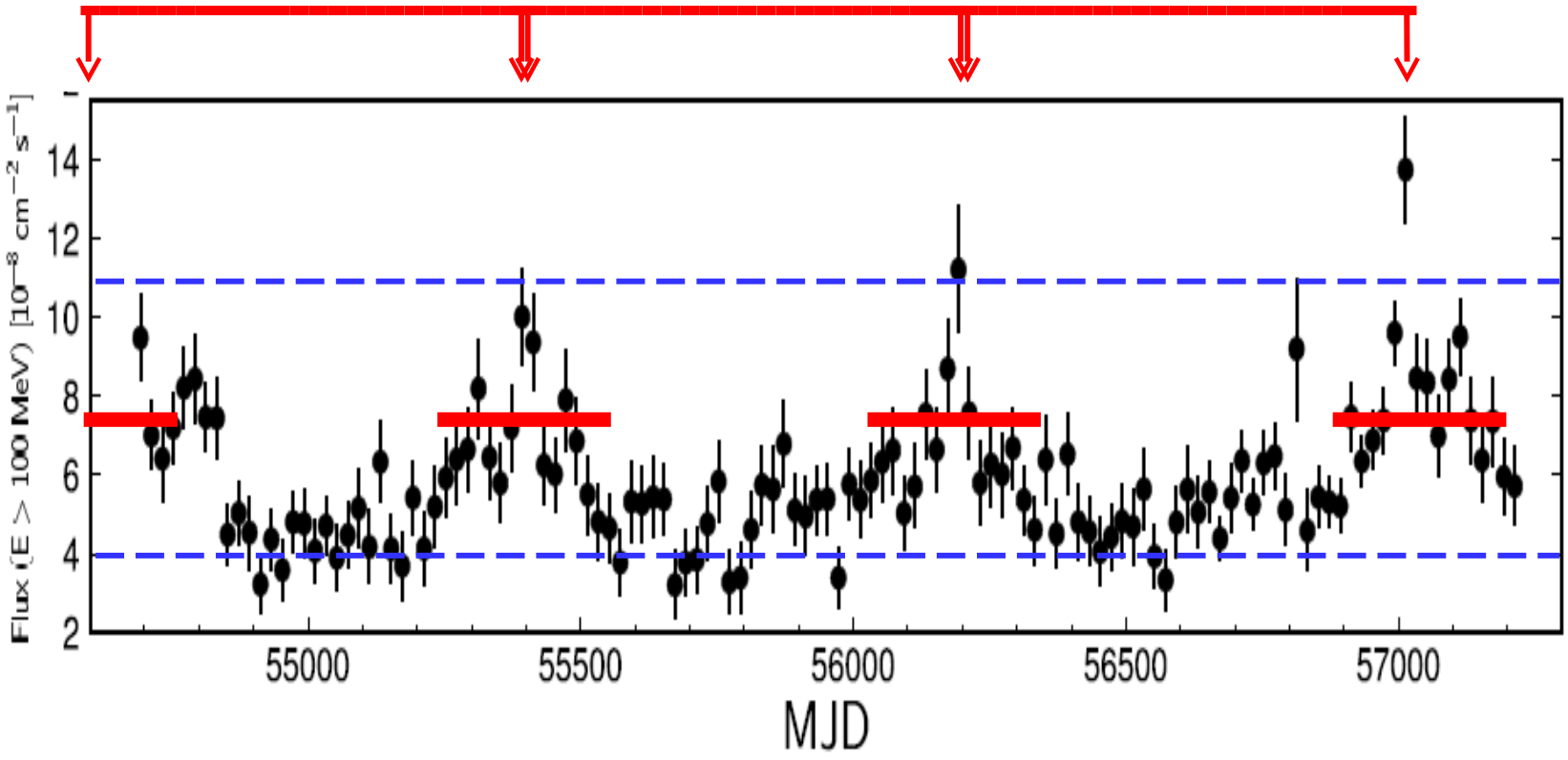
Cavaliere et. al. 2017

$$\frac{\Delta t}{P} = \frac{\arccos(\varepsilon) - \varepsilon\sqrt{1-\varepsilon^2}}{\pi}.$$

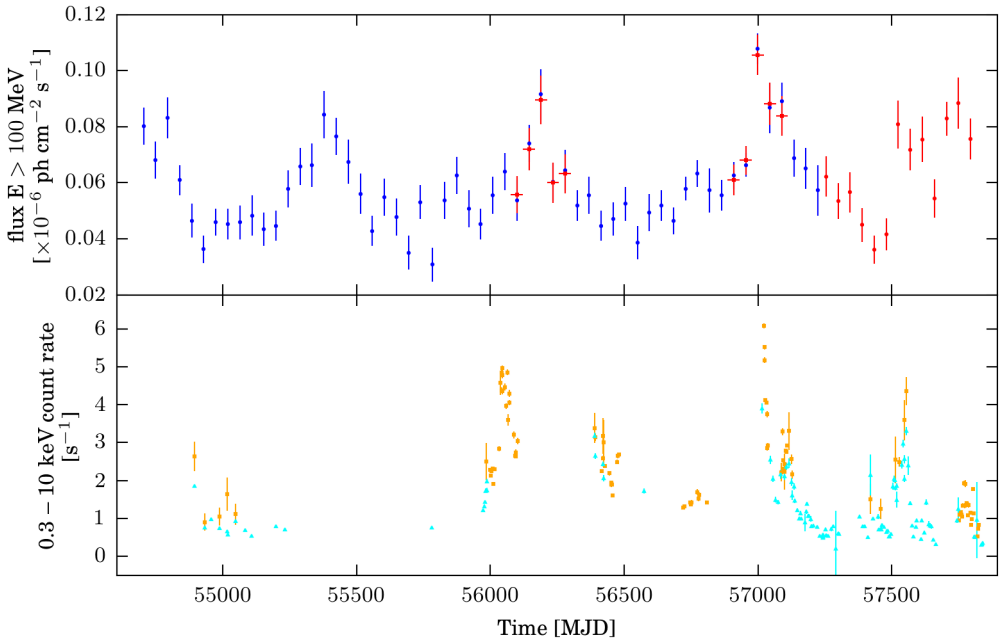


PG 1553+113

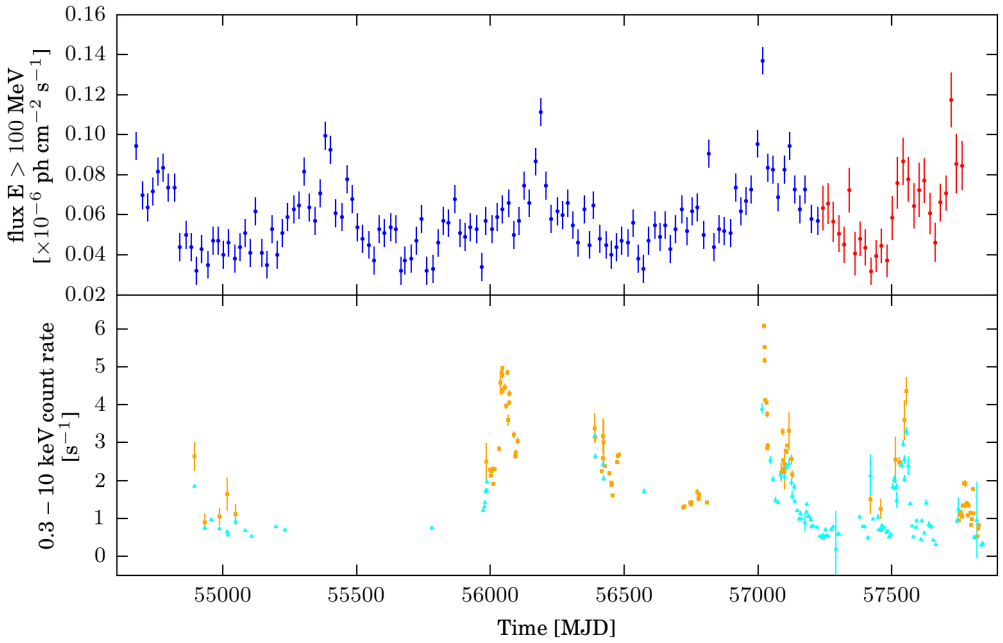
- Possibly the first example of periodic blazar
- Modelling by
  - 1 magneto-gravitational stresses induced by a binary BH companion
  - 2 precession effects in the primary or secondary BH jet
- In model 1: repetitive particle acceleration by induced reconnection induced by an ‘’external’’ driver


Flux (E > 100 MeV) [10^-8 cm^-2 s^-1]
14
12
10
8
6
4
2
55000
55500
56000
56500
57000
MJD

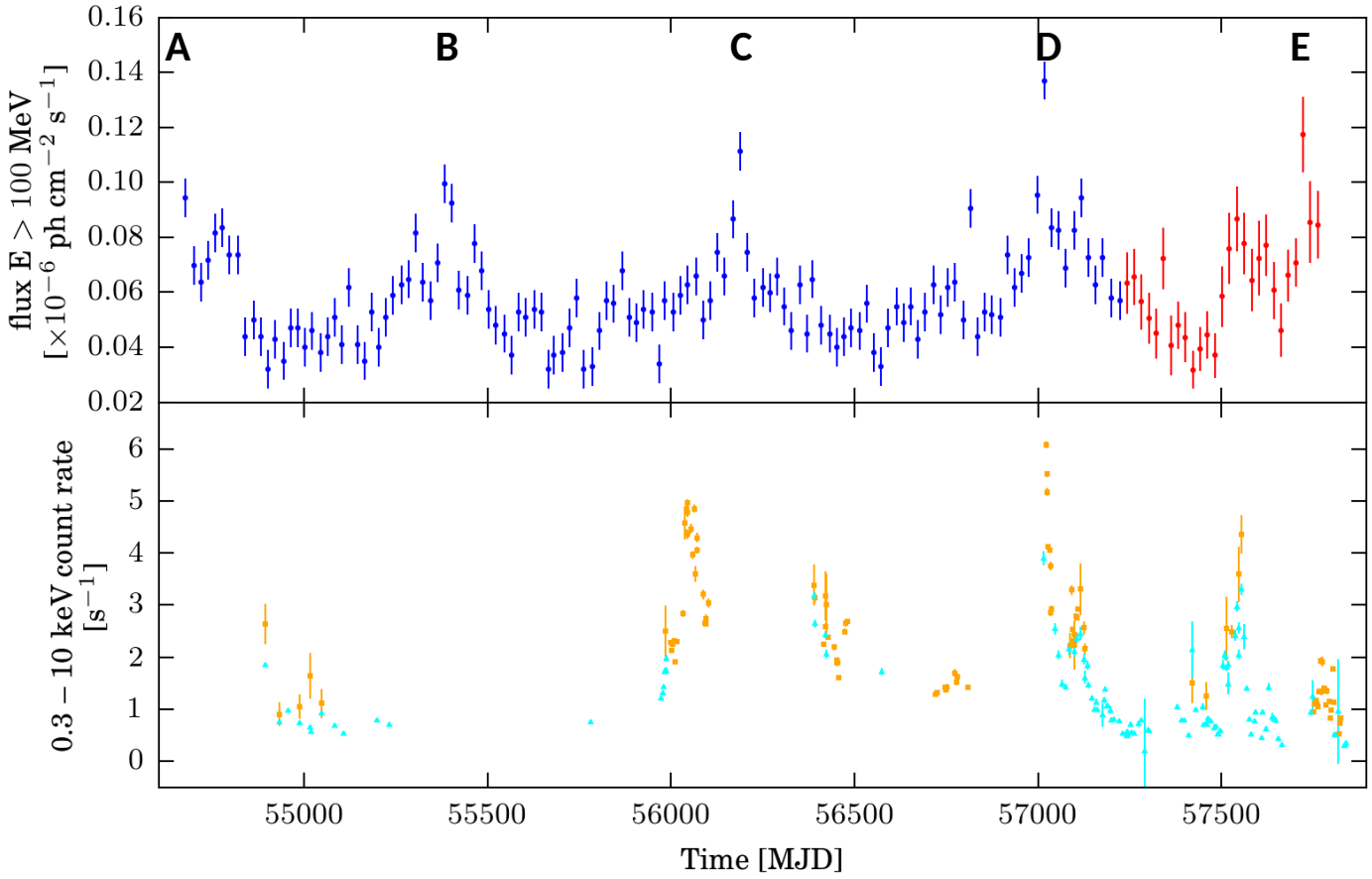
PG 1553+113, Fermi-LAT (45 day bins) & Swift-XRT

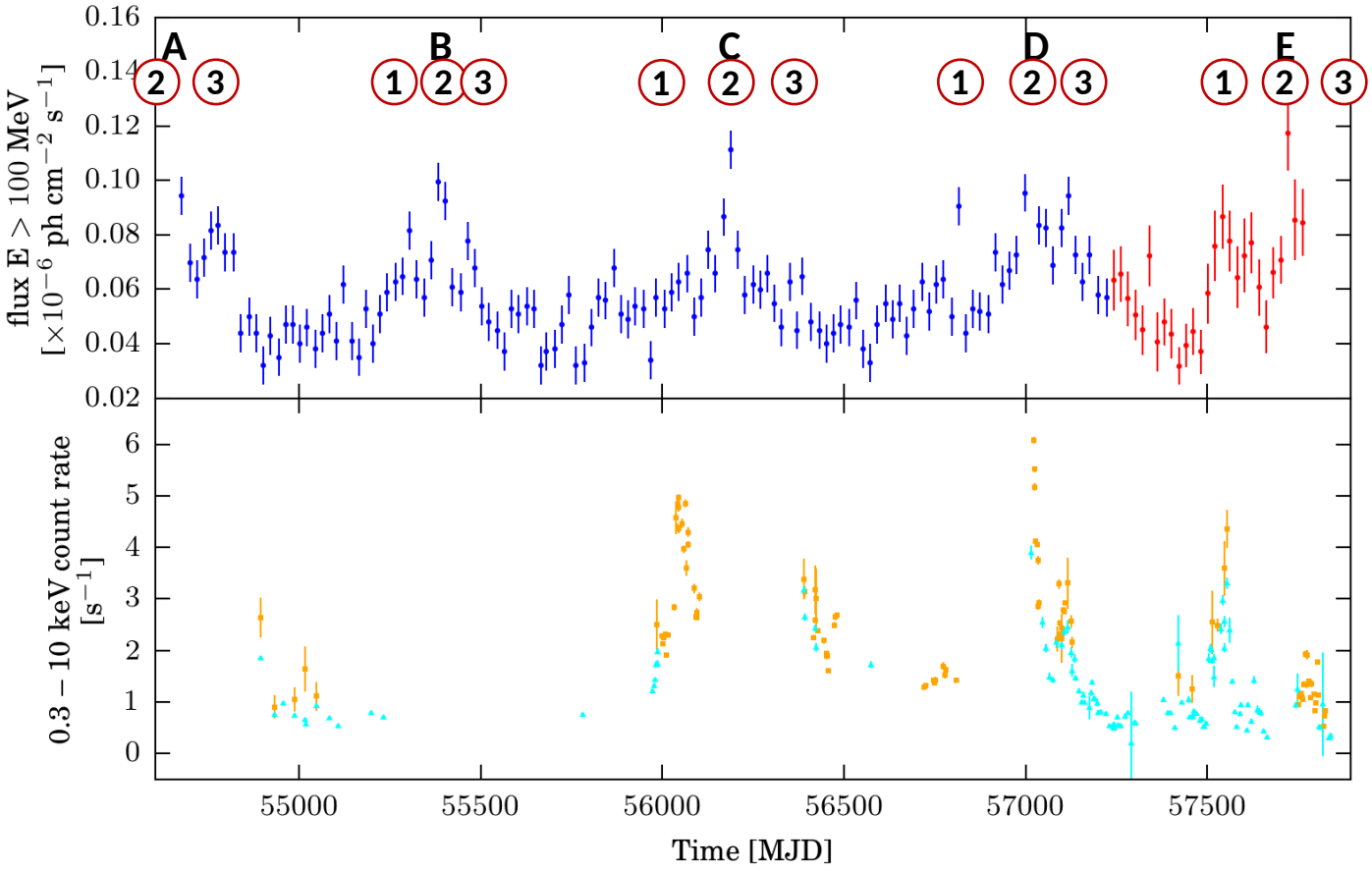


PG 1553+113, Fermi-LAT (20 day bins) & Swift-XRT



PG 1553+113, Fermi-LAT (20 day bins) & Swift-XRT




A
B
C
D
E
1
2
3
flux E > 100 MeV
[×10^−6 ph cm^−2 s^−1]
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.3 – 10 keV count rate
[s^−1]
6
5
4
3
2
1
0
55000
55500
56000
56500
57000
57500
Time [MJD]