Connection between optical polarization plane rotations and γ-ray flares in blazars

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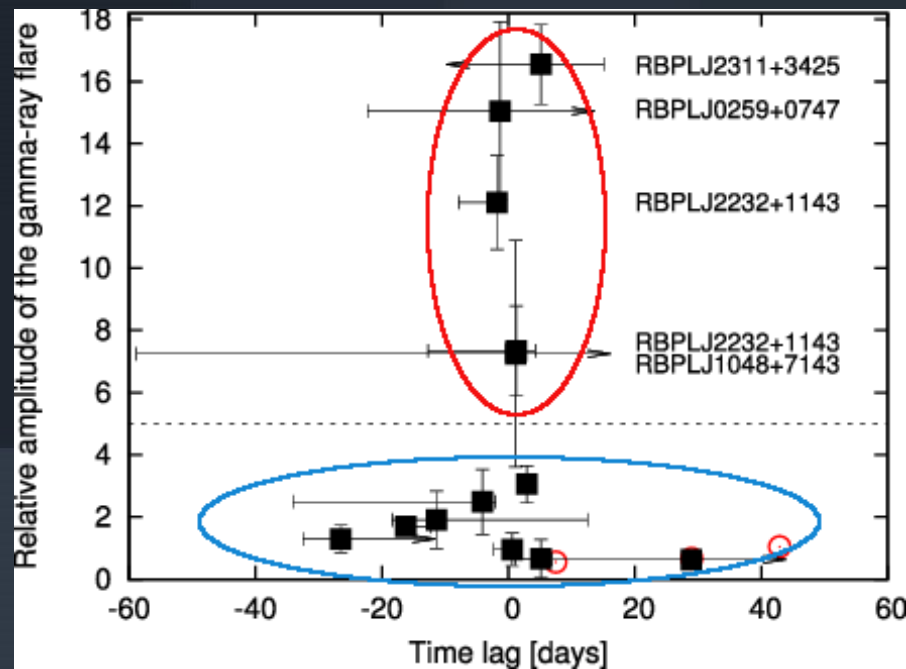
Previous results on rotations vs γ-ray flares

Blinov et al. 2015
16 rotations in 14 blazars

- Time lags are too small to be random
- Possible sign of two types of rotations

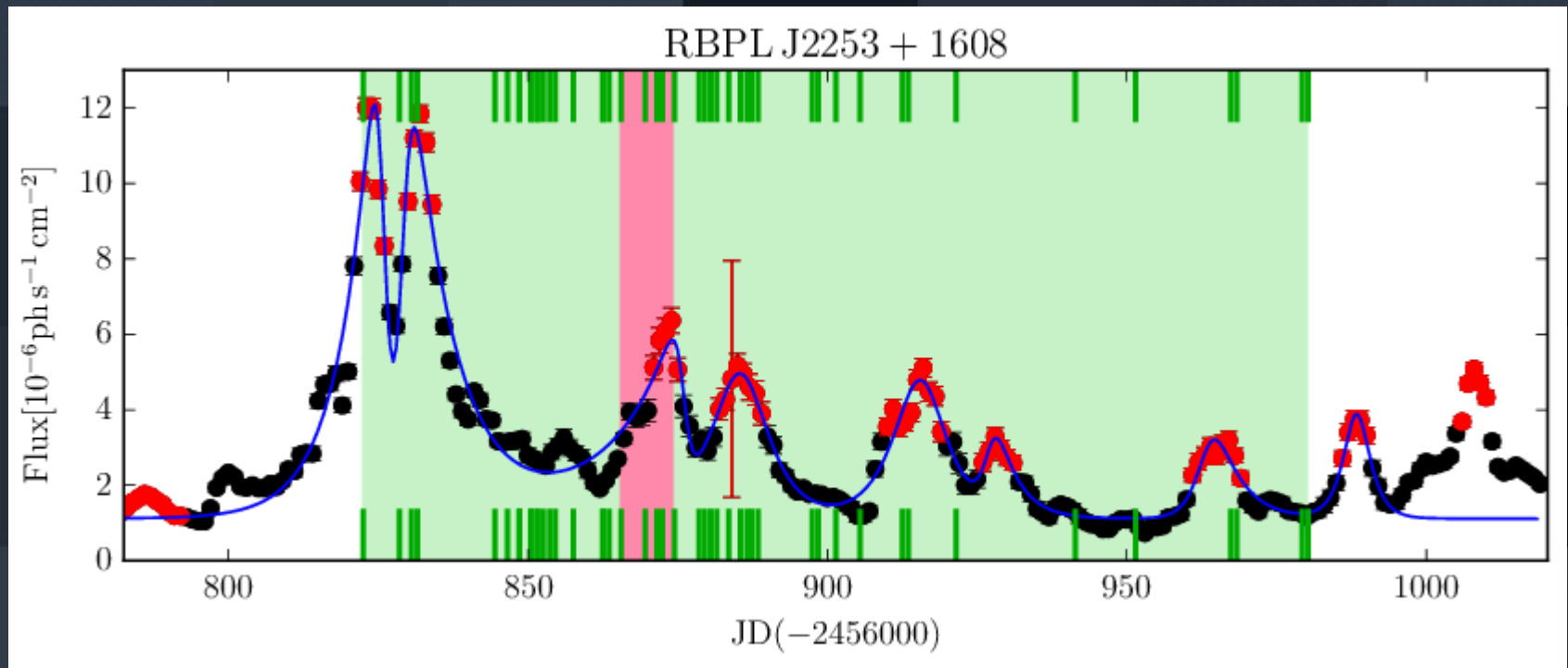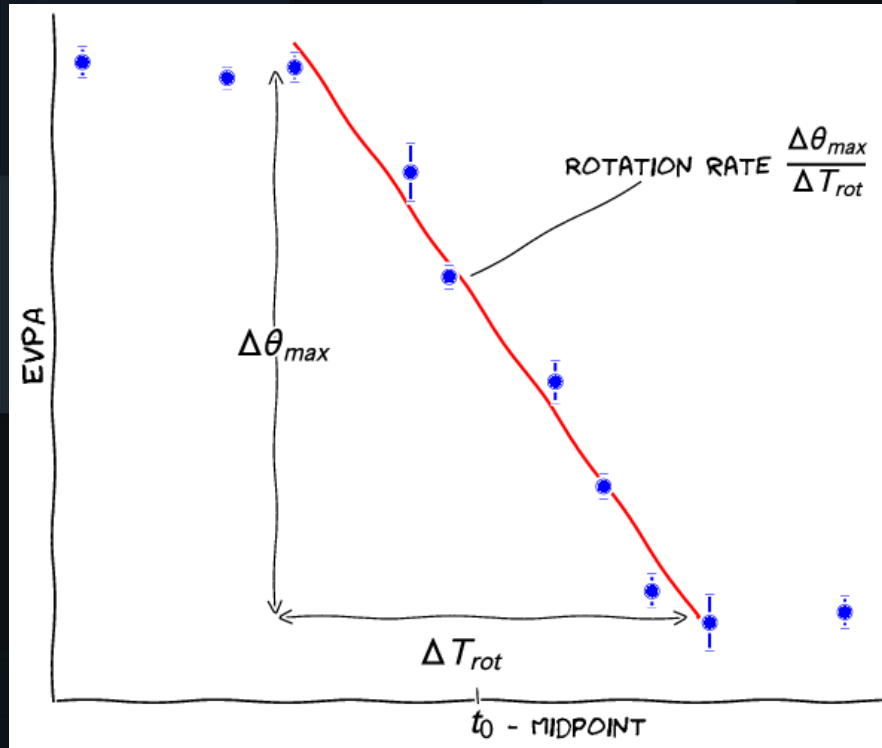3 seasons data
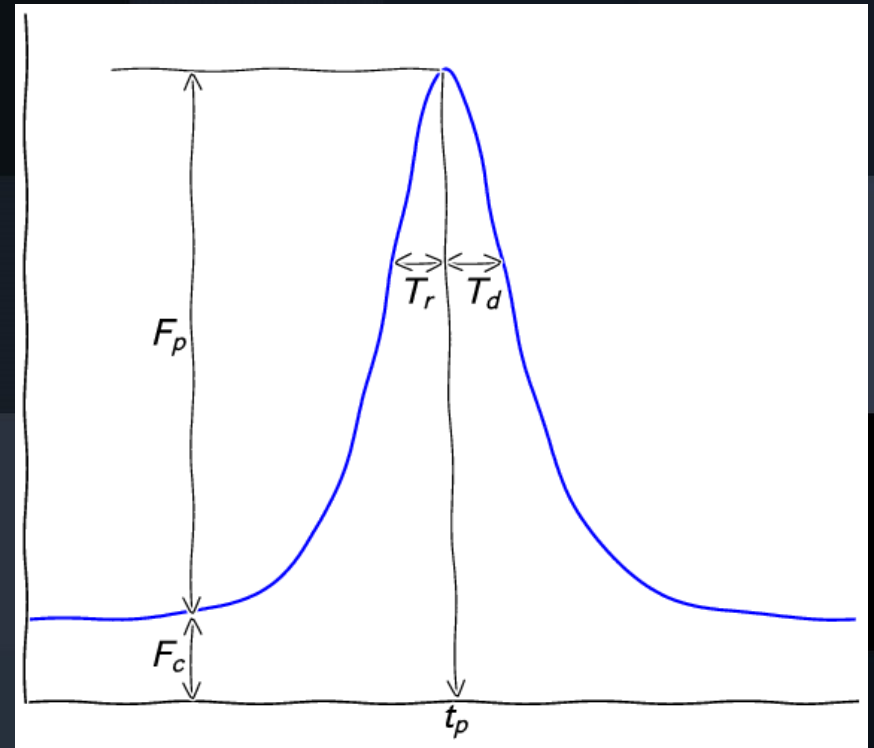
40 EVPA rotations in 24 blazars
- identified flares
- fitted flares => F_0, t_p, F_p, T_r, T_d

EVPA rotation

γ-ray flare
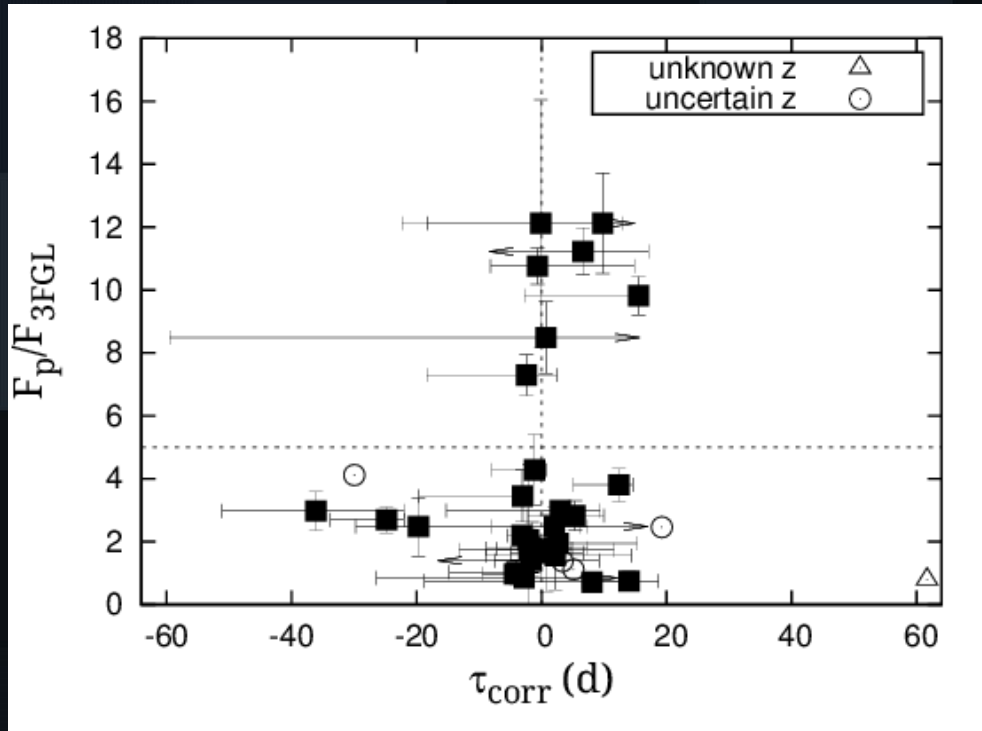
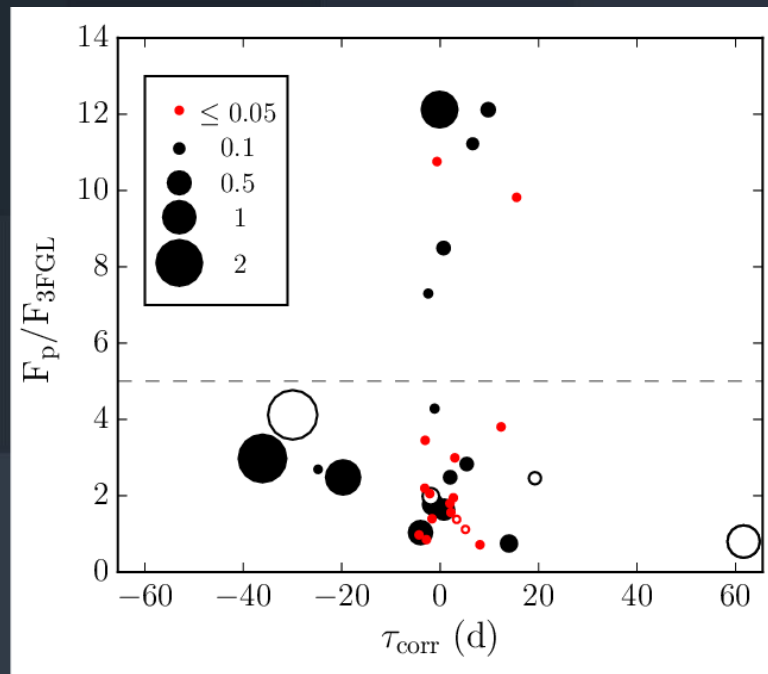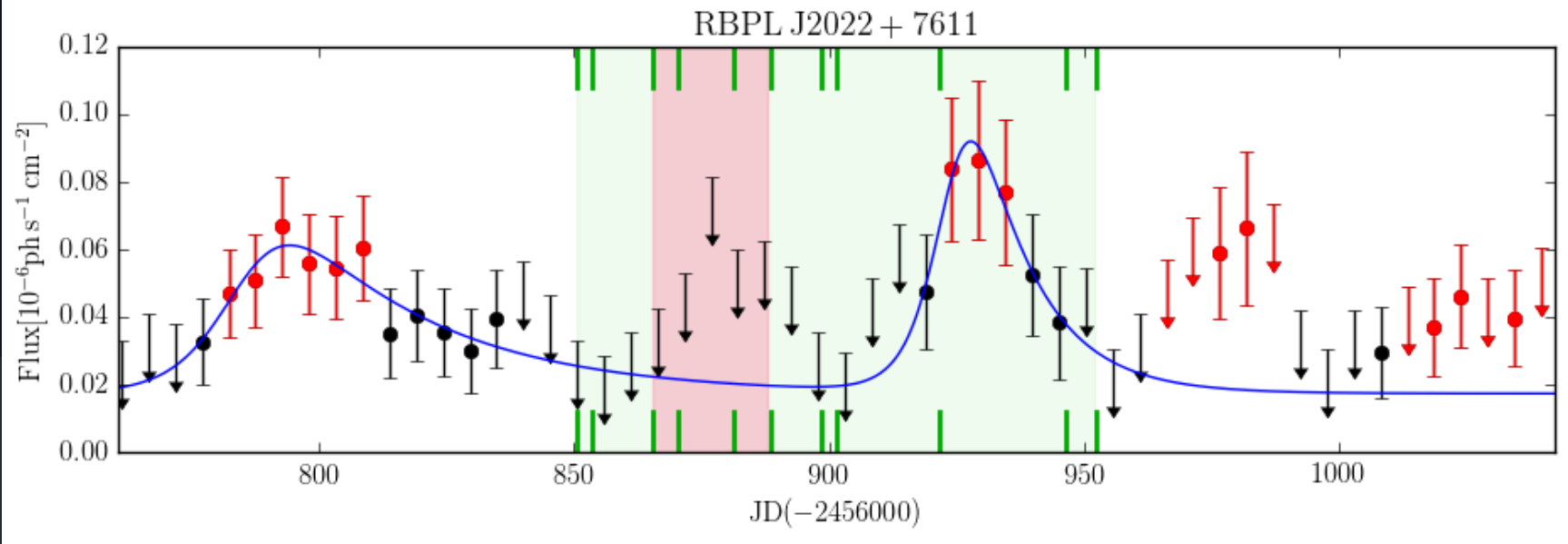$$\sigma_\tau = 18\,d$$
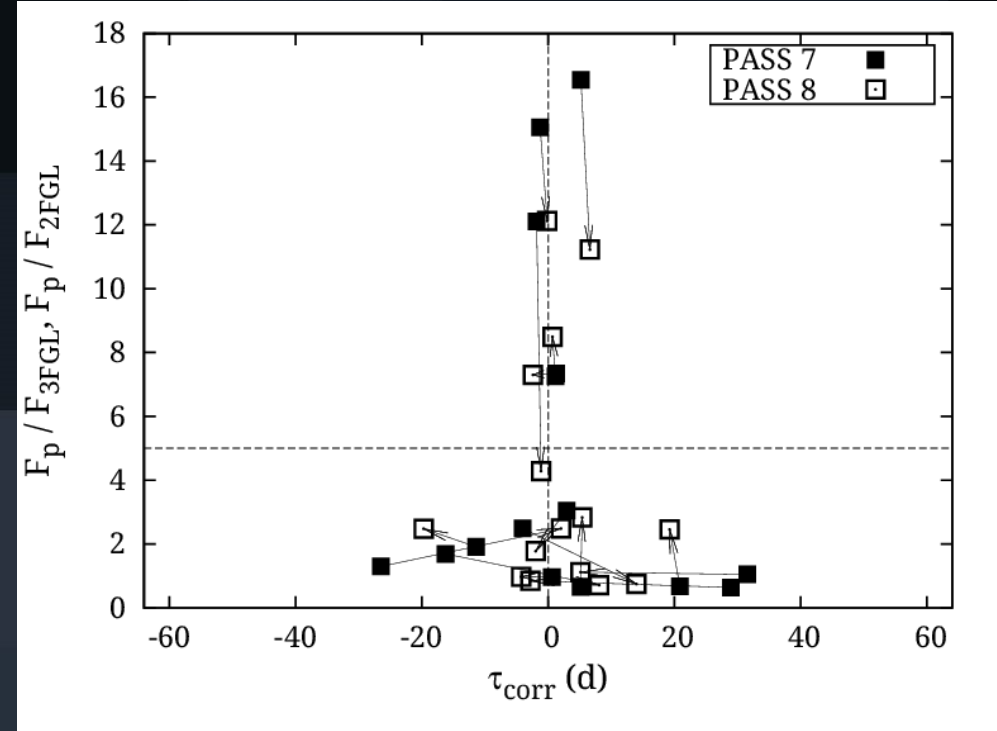
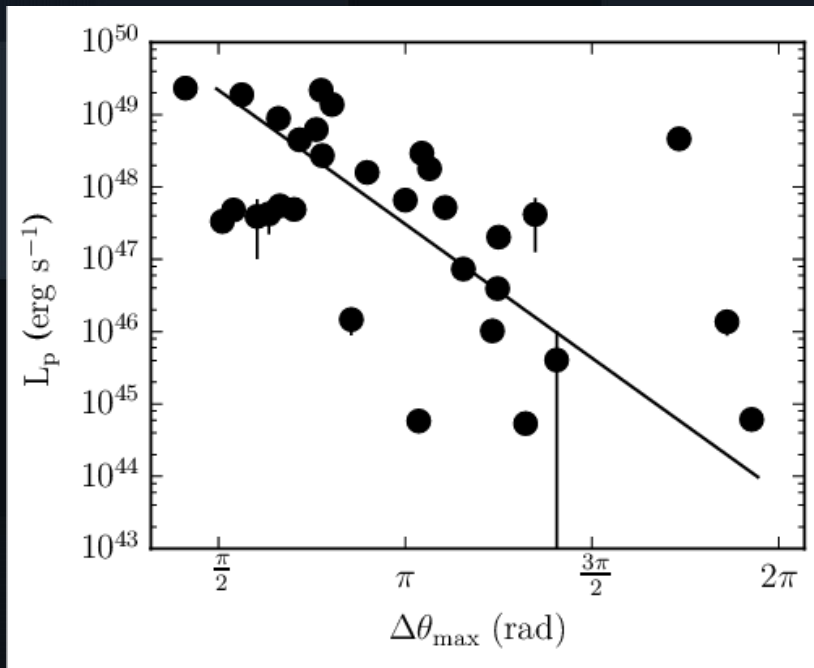$$\langle \Delta\tau \rangle = 16\,d$$

Blinov et al. 2015

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Point size = N_{upp}/N_{det}
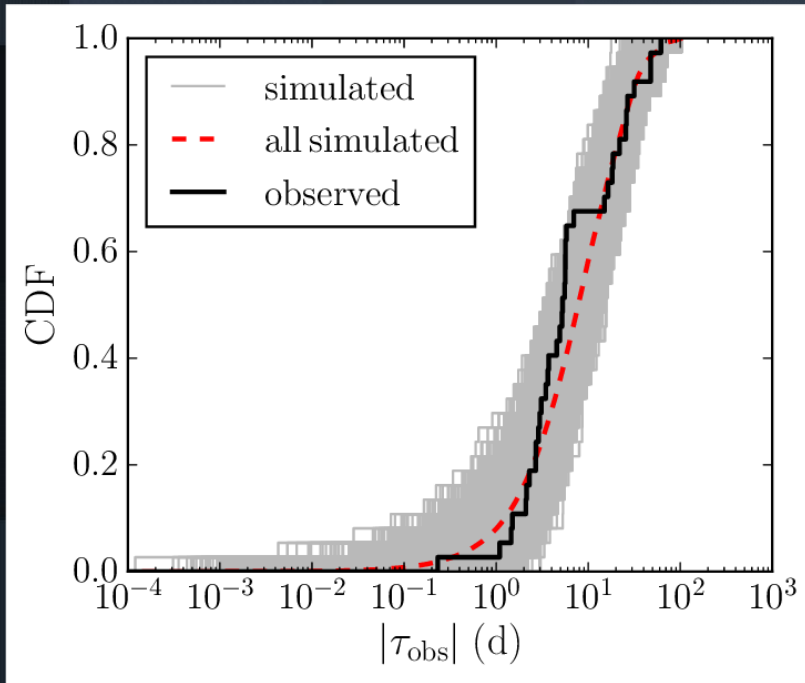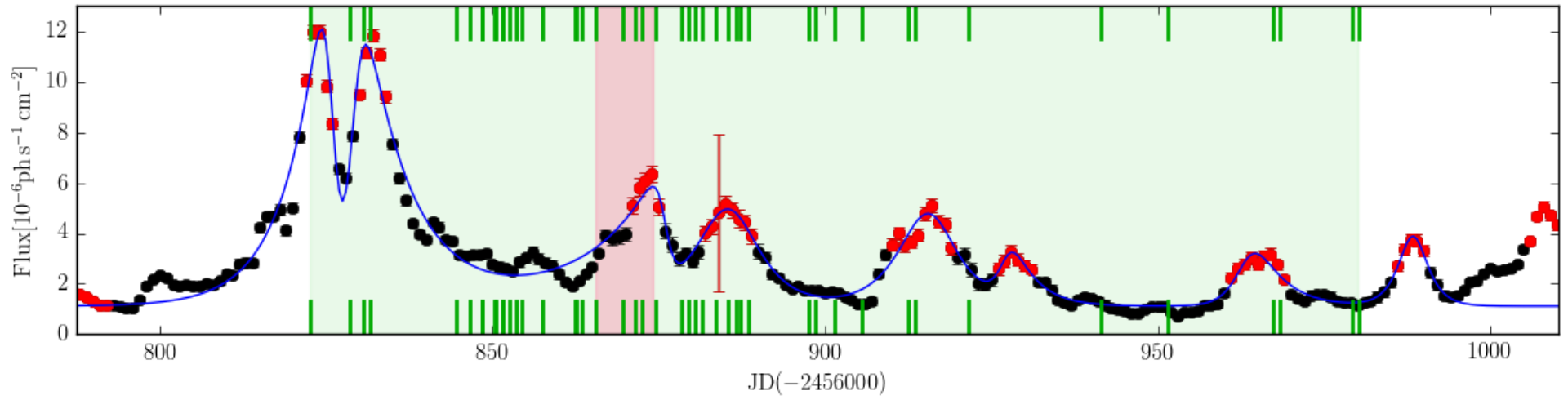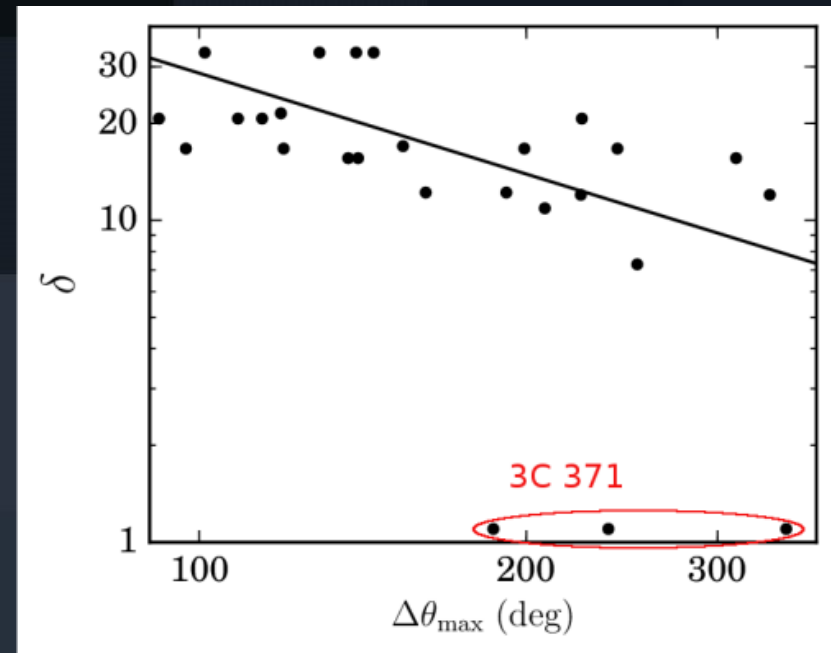
Such small time lags can be
produced accidentally
with p = 7×10^{-5}

Rotation amplitude vs flare luminosity

r=-0.58 (p-value=7x10^{-4})
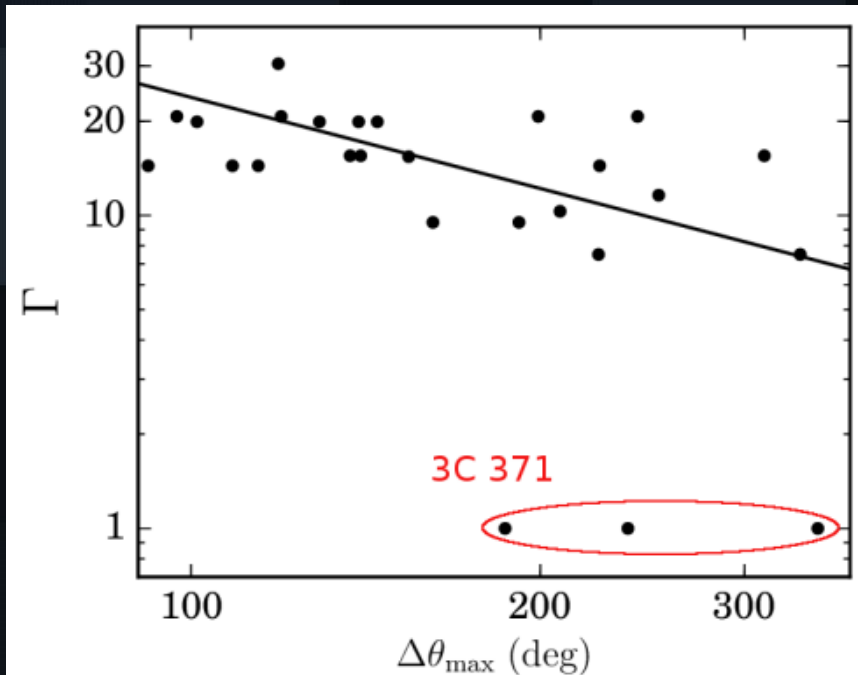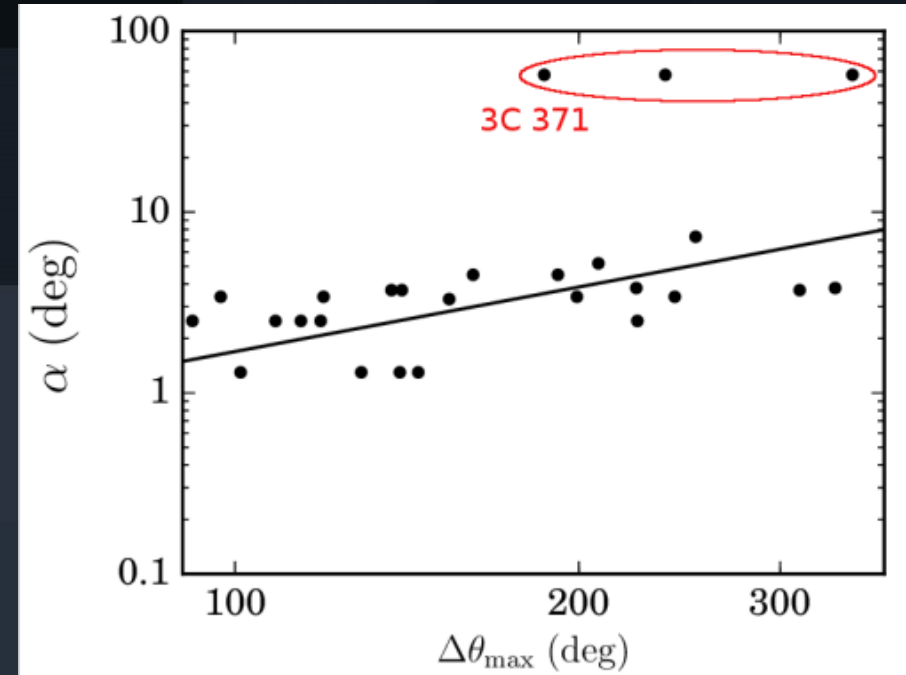slope=-1.18±0.08

r=-0.57 (p-value=0.005)
slope=-1.04±0.03

Amplitude vs jet parameters
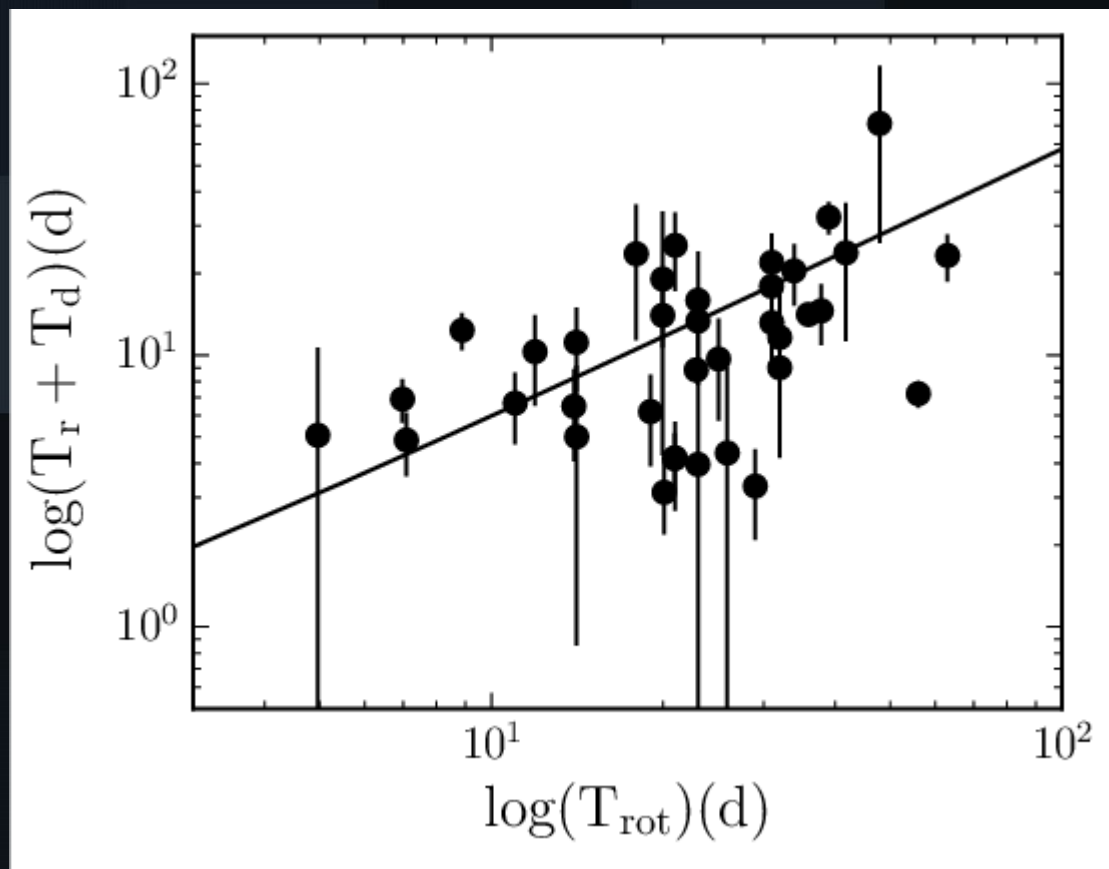

r=-0.51 (p-value=0.01)
slope=-0.97±0.01

r=0.51 (p-value=0.01)
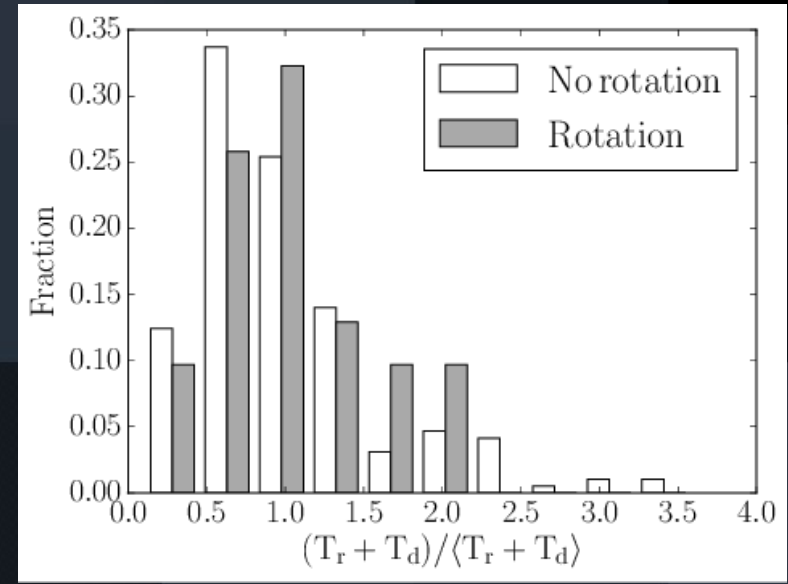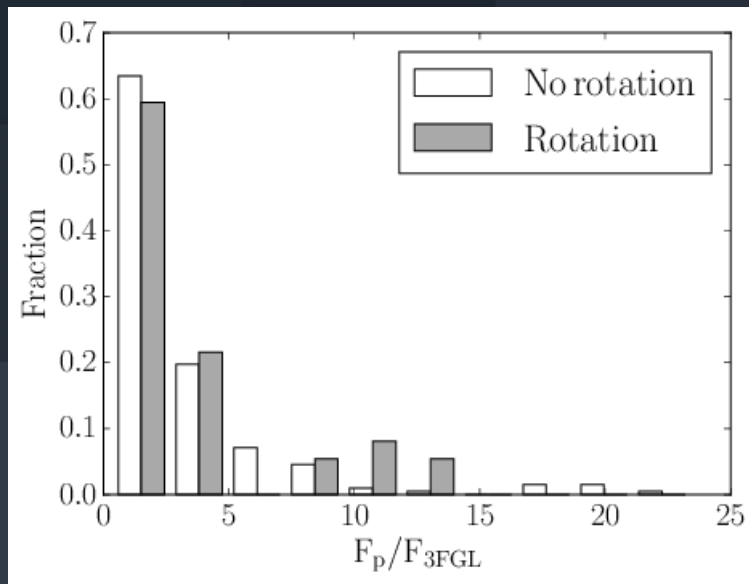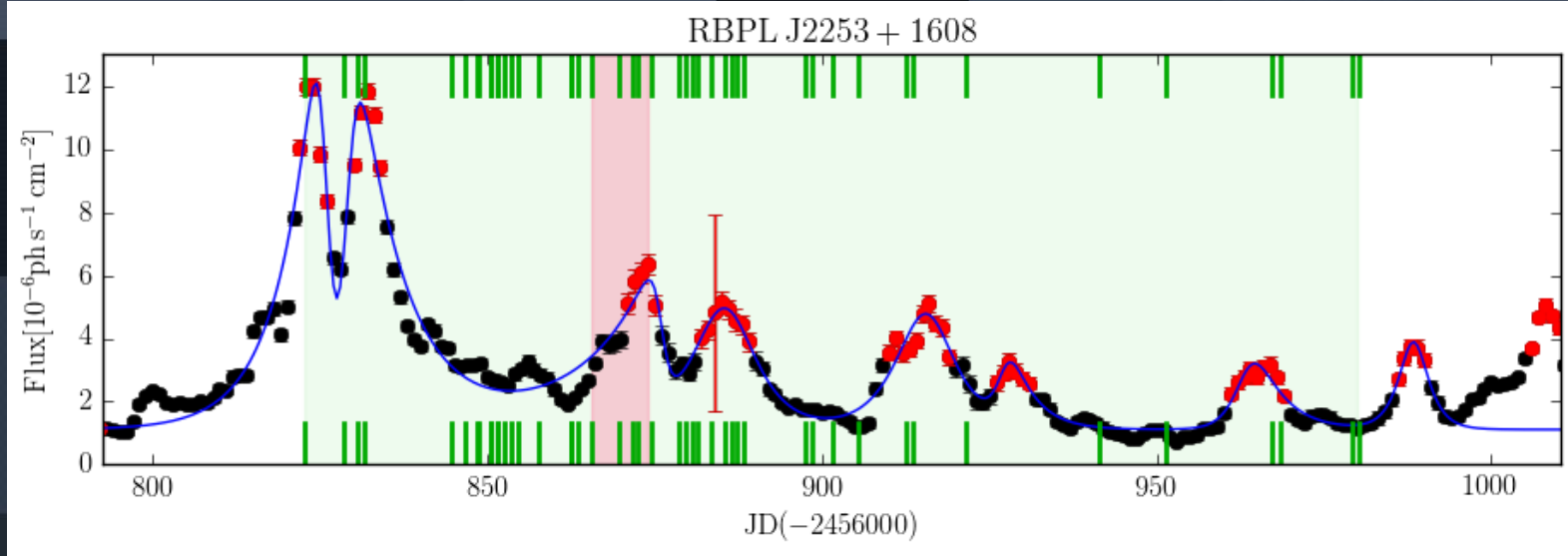slope=1.19±0.04

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Rotation duration vs flare duration

r=0.37 (p-value=0.02)
Slope=0.57±0.19
Slope ≠ 0 at 2.8σ level

Are these flares special?

Conclusions

- There is no evidence for non-zero time lags
- Time lags are so small that they cannot **all** be accidental
- Amplitudes of the rotations are anticorrelated with luminosities of the flares
- Amplitudes of the rotations are correlated with the jet properties (Γ and the viewing angle)
- Durations of the flares and rotations are marginally correlated
- Majority of EVPA rotations must be deterministic, however, some of them can be produced by random walks – see the next talk