Fermi LAT observations of LS I +61°303

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Variable Galactic Gamma-ray Sources
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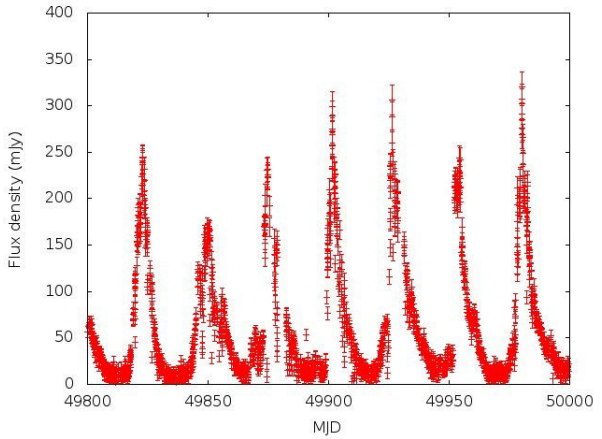
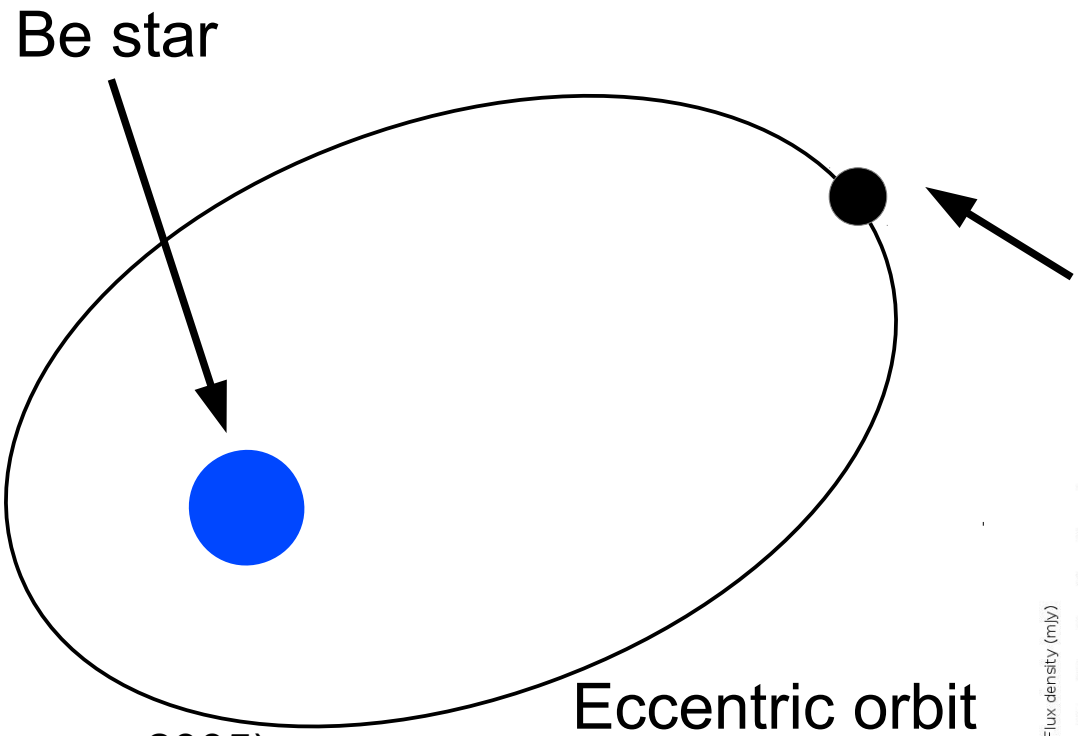
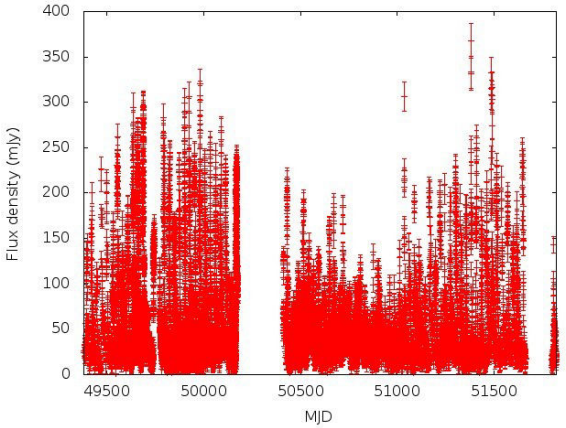
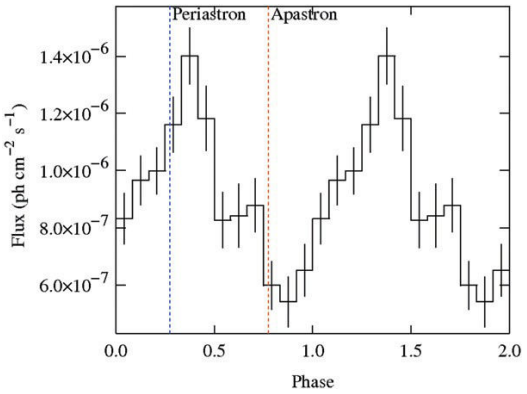
The stellar system

Orbital periodicity $P_1 = 26.4960 \pm 0.0028$ d
(Gregory, 2002)







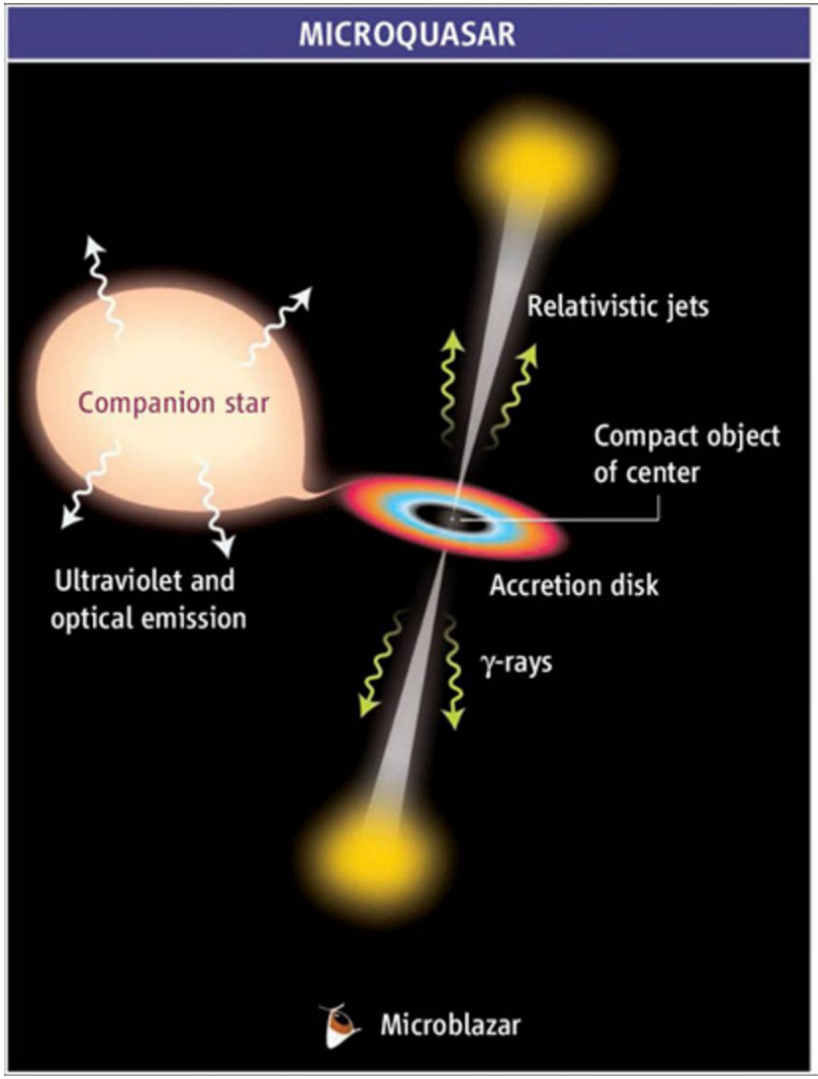


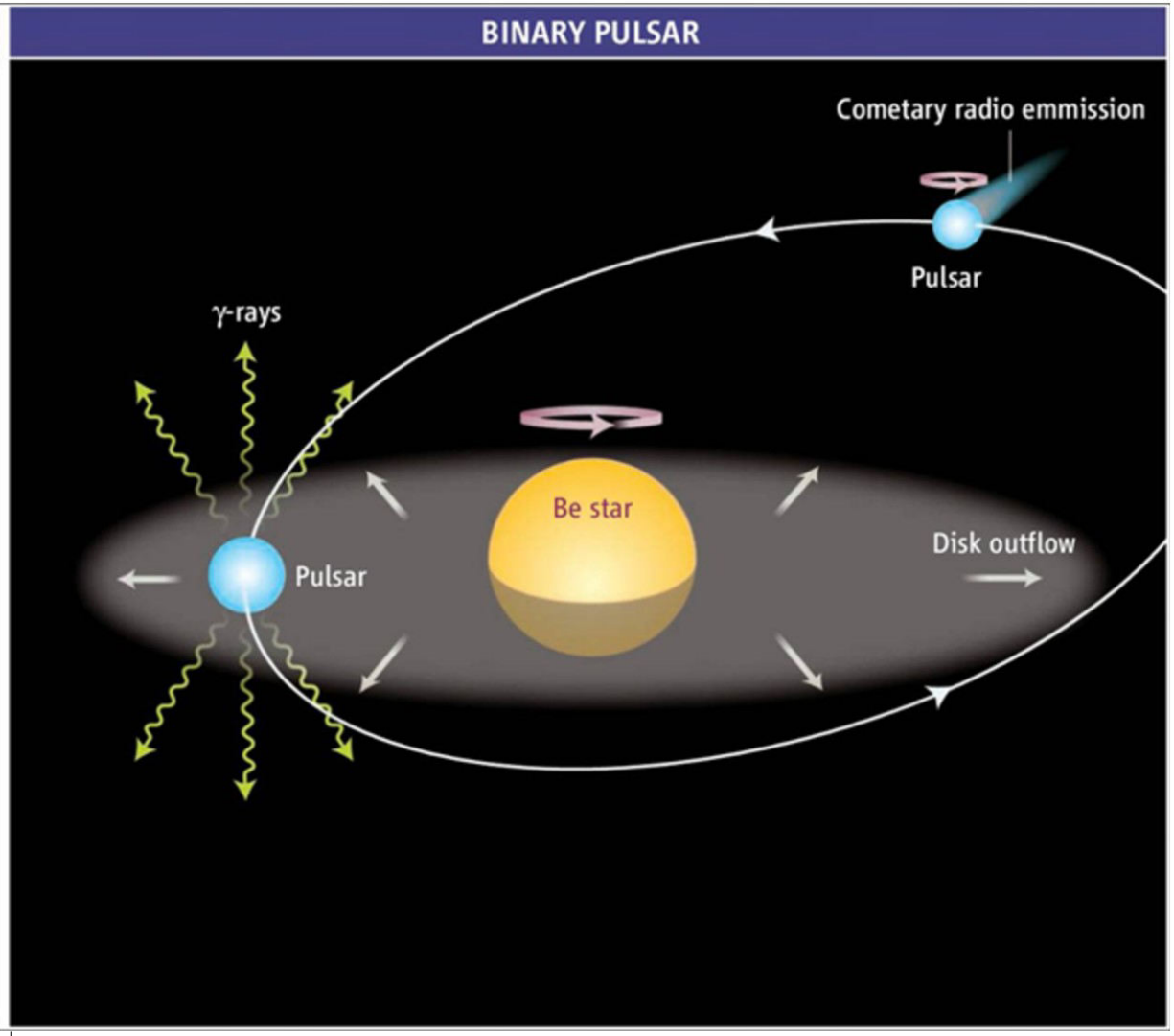
Abdo et al. (2009)

Long-term periodicity

$P_{\mathrm{long}} = 1667 \pm 8$ d
(Gregory, 2002)

The two models





Two peak accretion model
Taylor et al (1992)
Martí & Paredes (1995)
Bosch-Ramón et al. (2006)
Romero et al. (2007)

Mirabel (2006)

All emission peaks at periastron
like in PSR B1259-63 (Connors et al. 2002).

1. Introduction

Two peak accretion model

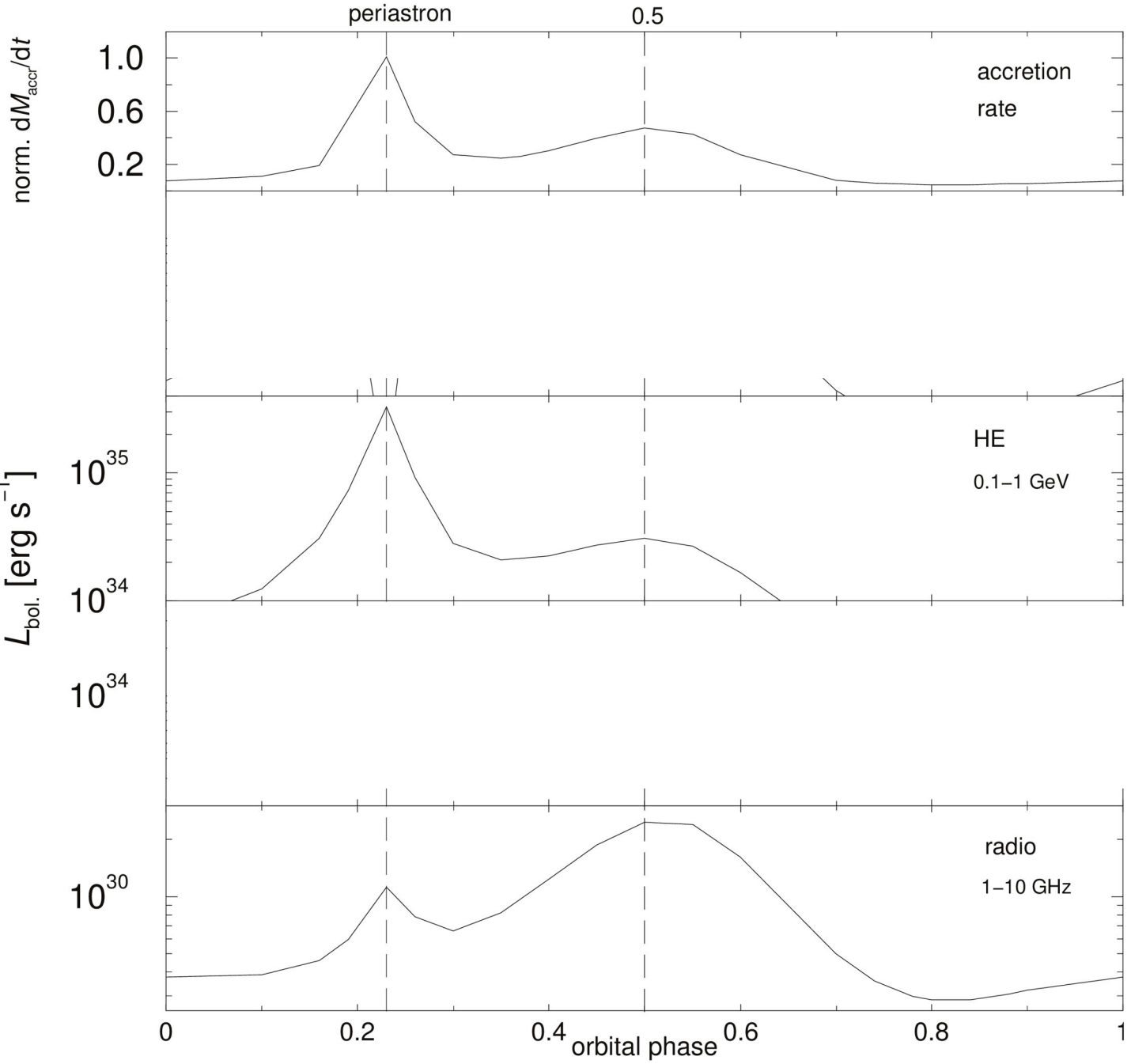
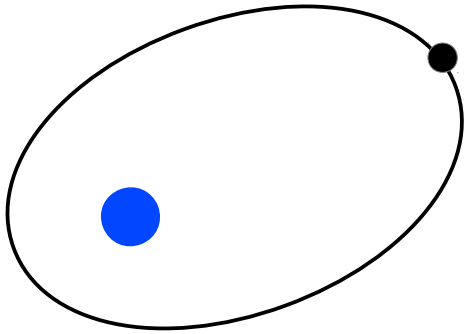


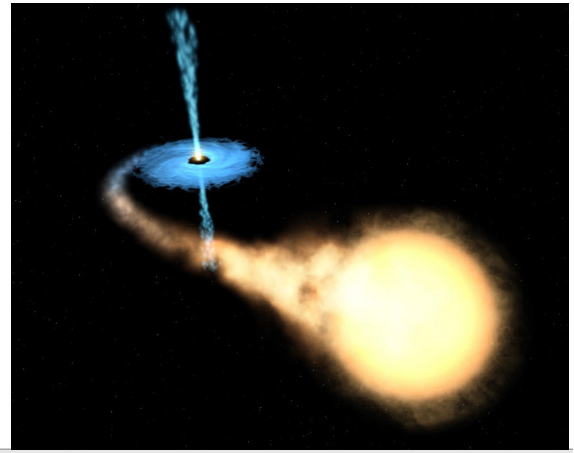
Fig. 1 from Bosch-Ramon et al. (2006)



$$\dot{M} \propto \frac{\rho}{v^3}$$

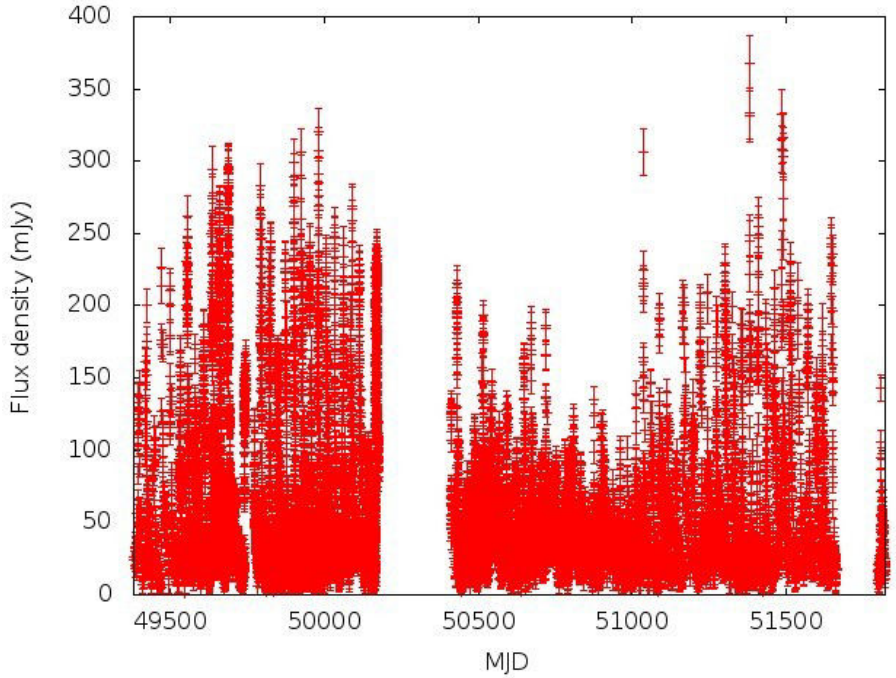
Bondi & Hoyle (1944)

Two peaks along the orbit
Taylor et al (1992)
Martí & Paredes (1995)
Bosch-Ramón et al. (2006)
Romero et al. (2007)



1. Introduction

The long-term period in radio



8 GHz GBI data, amplitude modulation

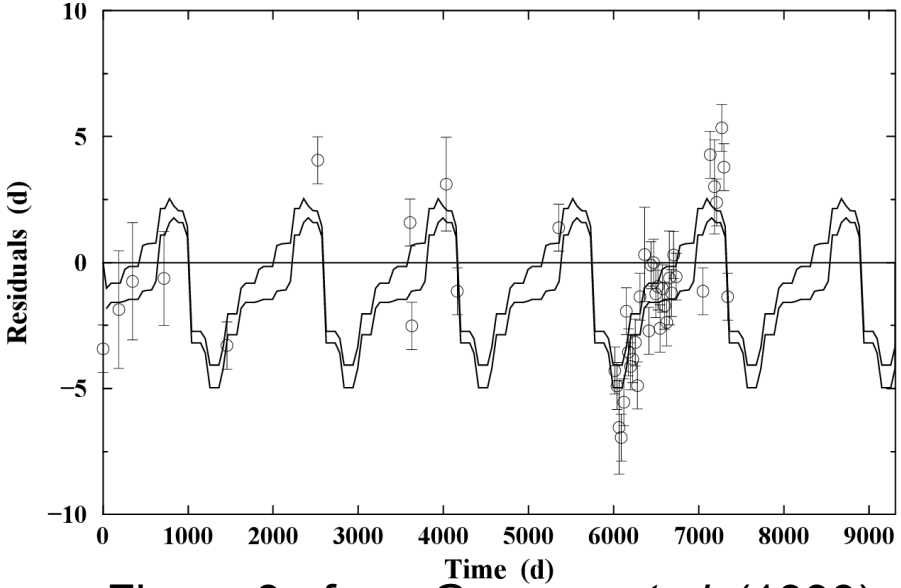
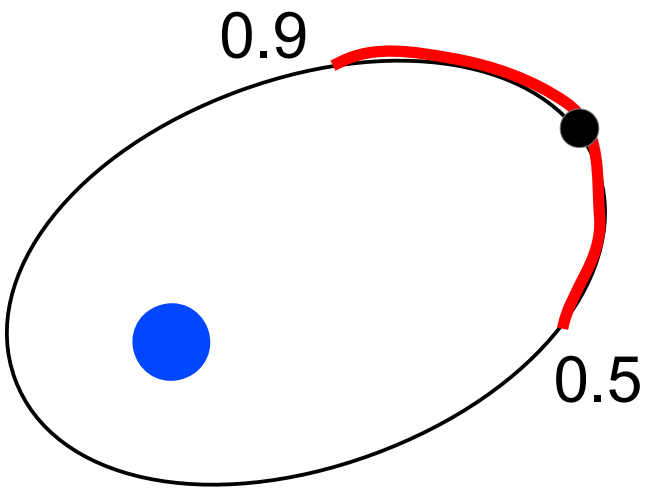
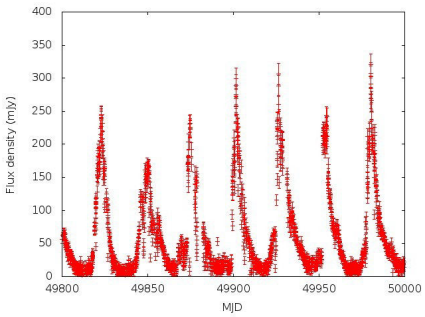


Figure 8a from Gregory *et al.* (1999)





Modulation in orbital phase occurrence

Θ

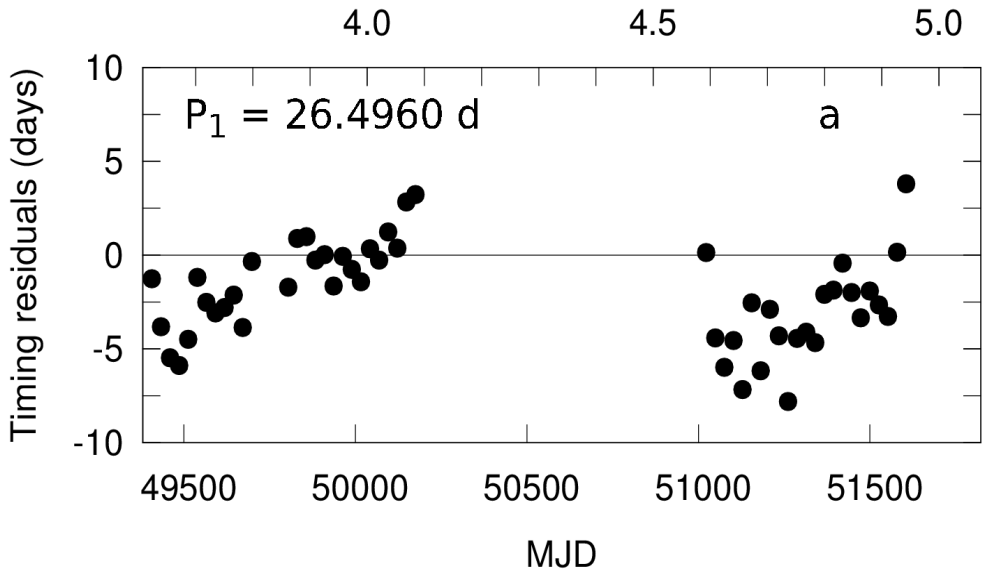
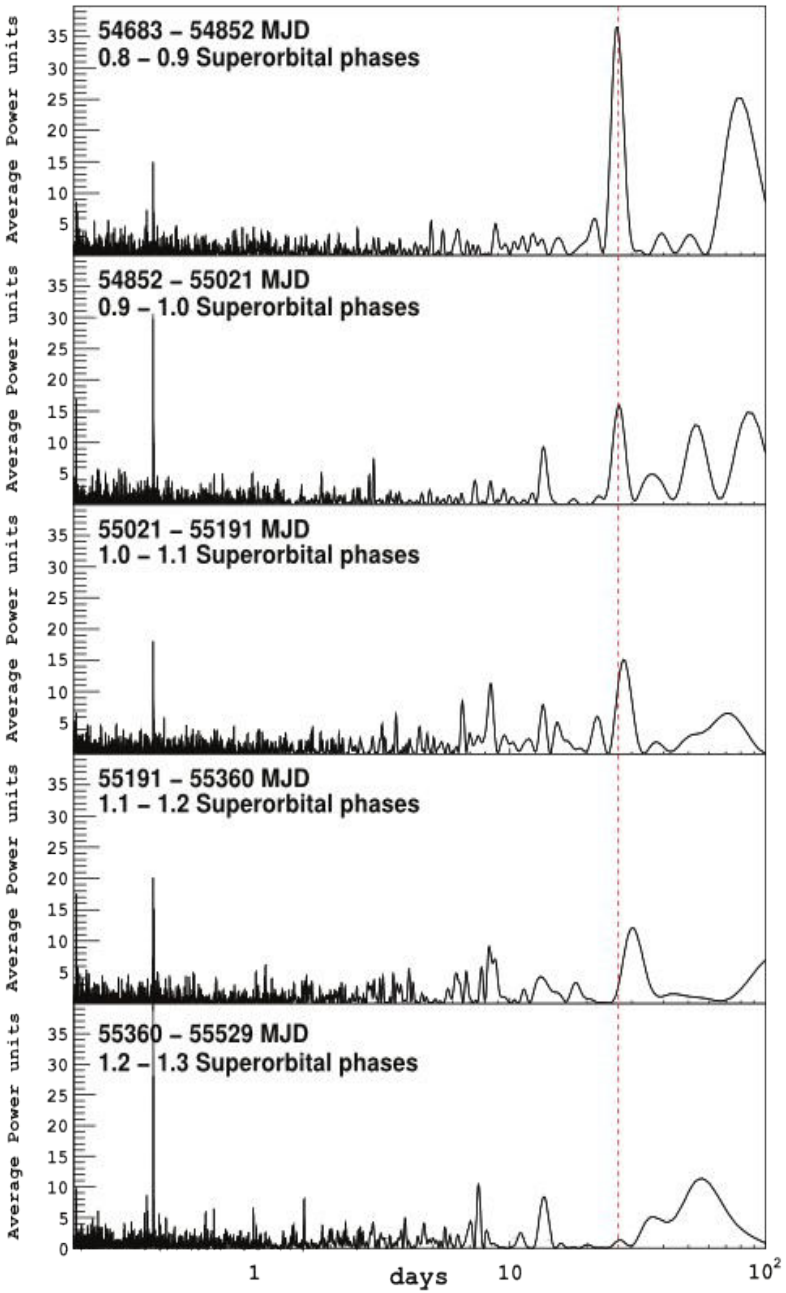
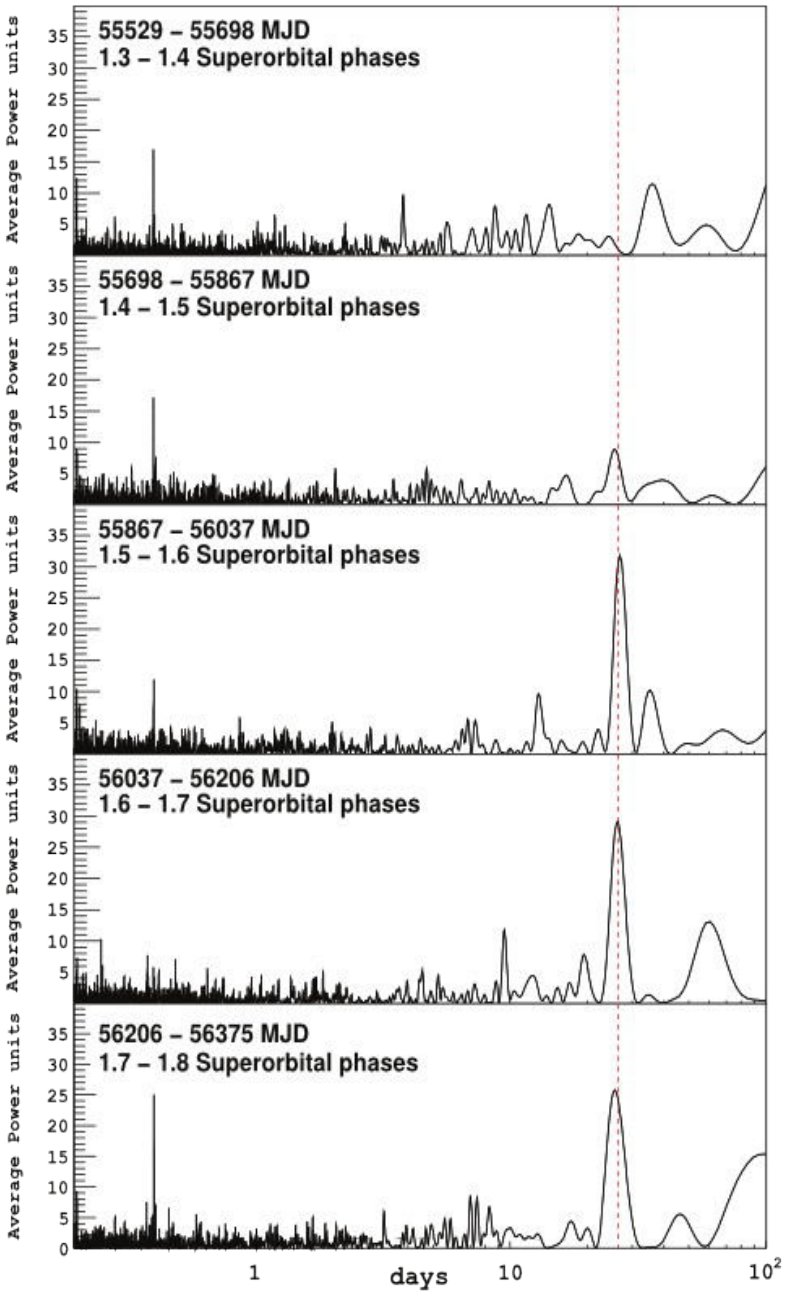
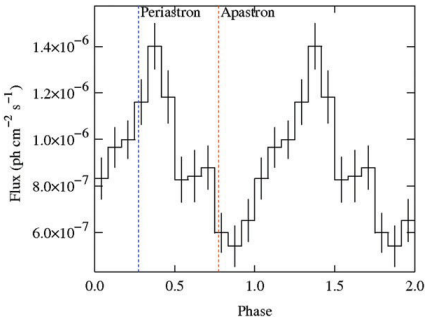


Figure 1a from Jaron & Massi (2014)

Disappearing orbtial period in GeV







Abdo et al. (2009)

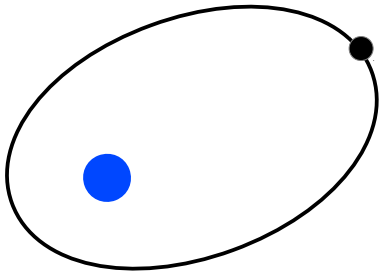
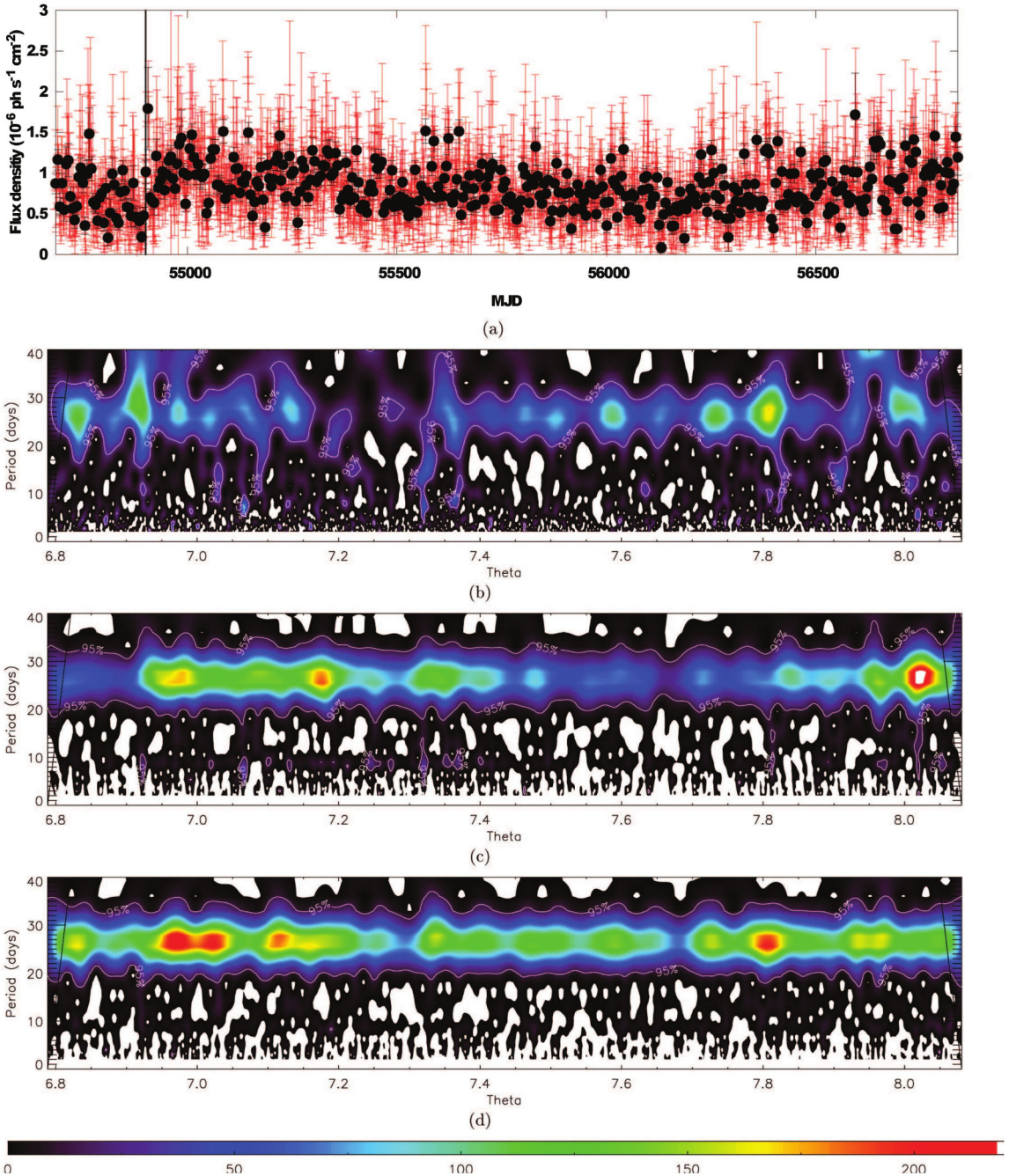


Figure 4 in Ackermann et al. (2013)

2. Results



Fermi LAT light curve, E = 0.1 - 300 GeV

Wavelet

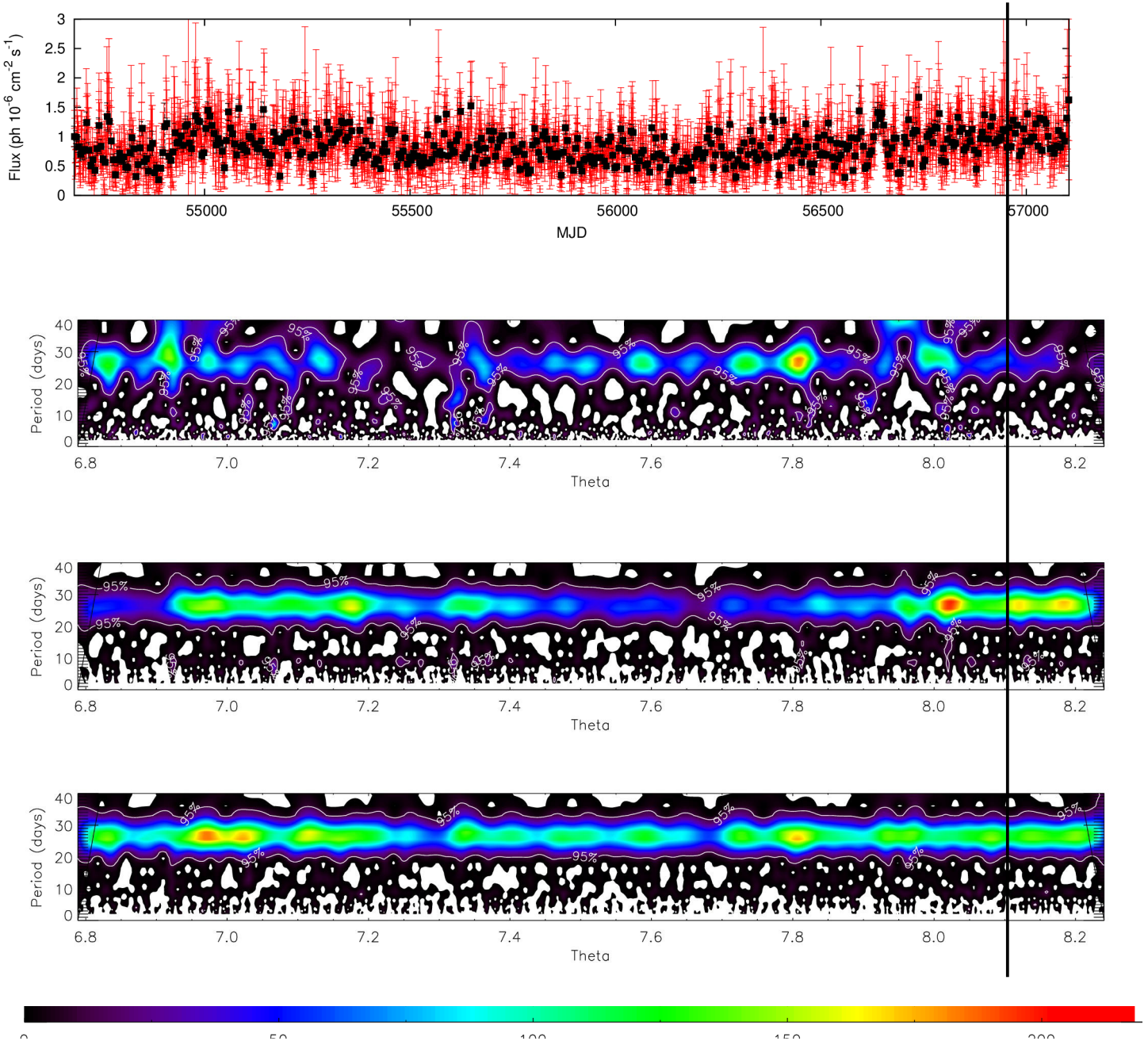
Φ = 0.0 - 1.0 (entire orbit)

Φ = 0.5 - 1.0 (apastron)

Φ = 0.0 - 0.5 (periastron)

Figure 2 from Jaron & Massi (2014)

2. Results



More recent data

Fermi LAT light curve,
E = 0.1 - 300 GeV

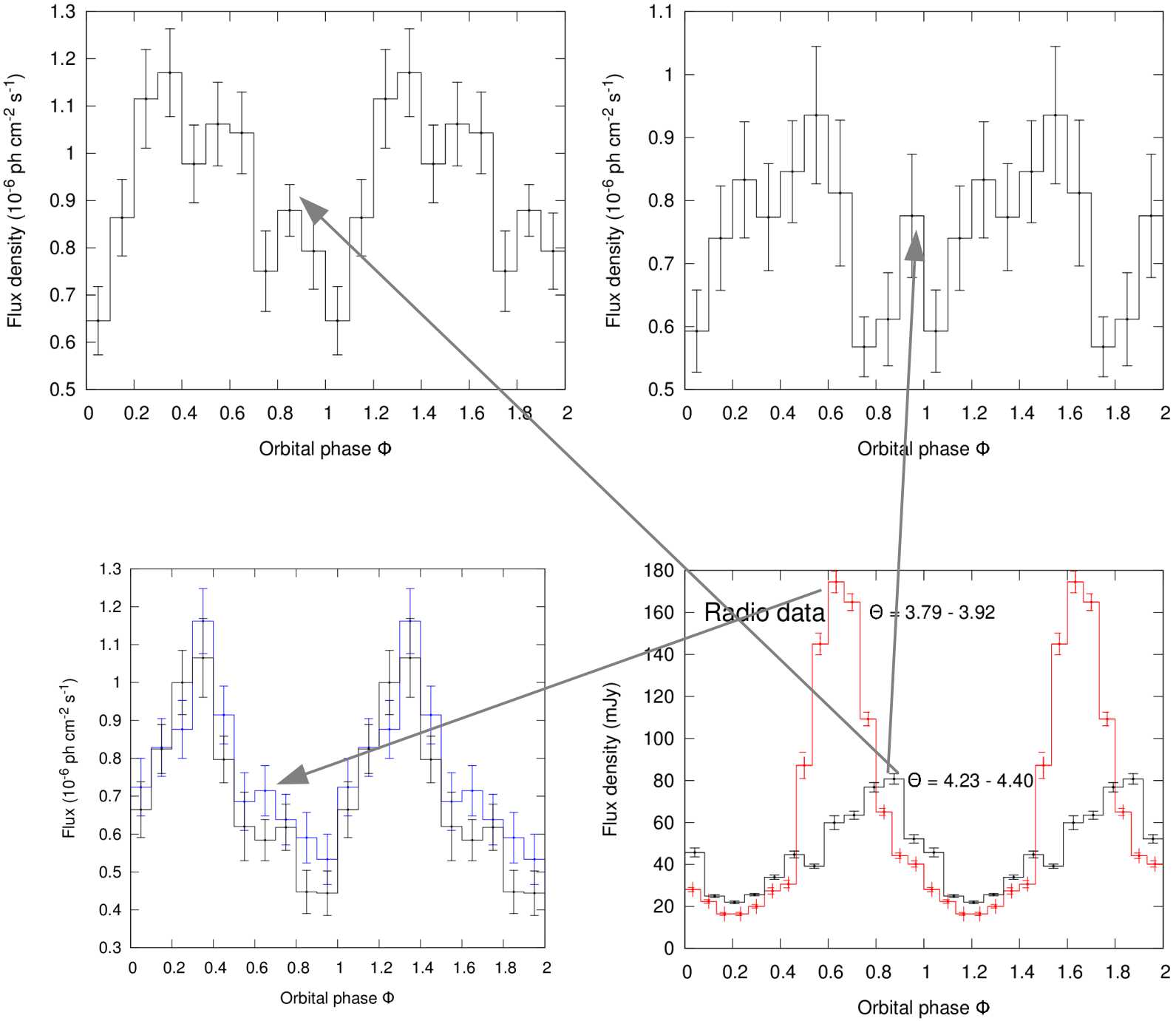
Wavelet

Φ = 0.0 - 1.0 (entire orbit)

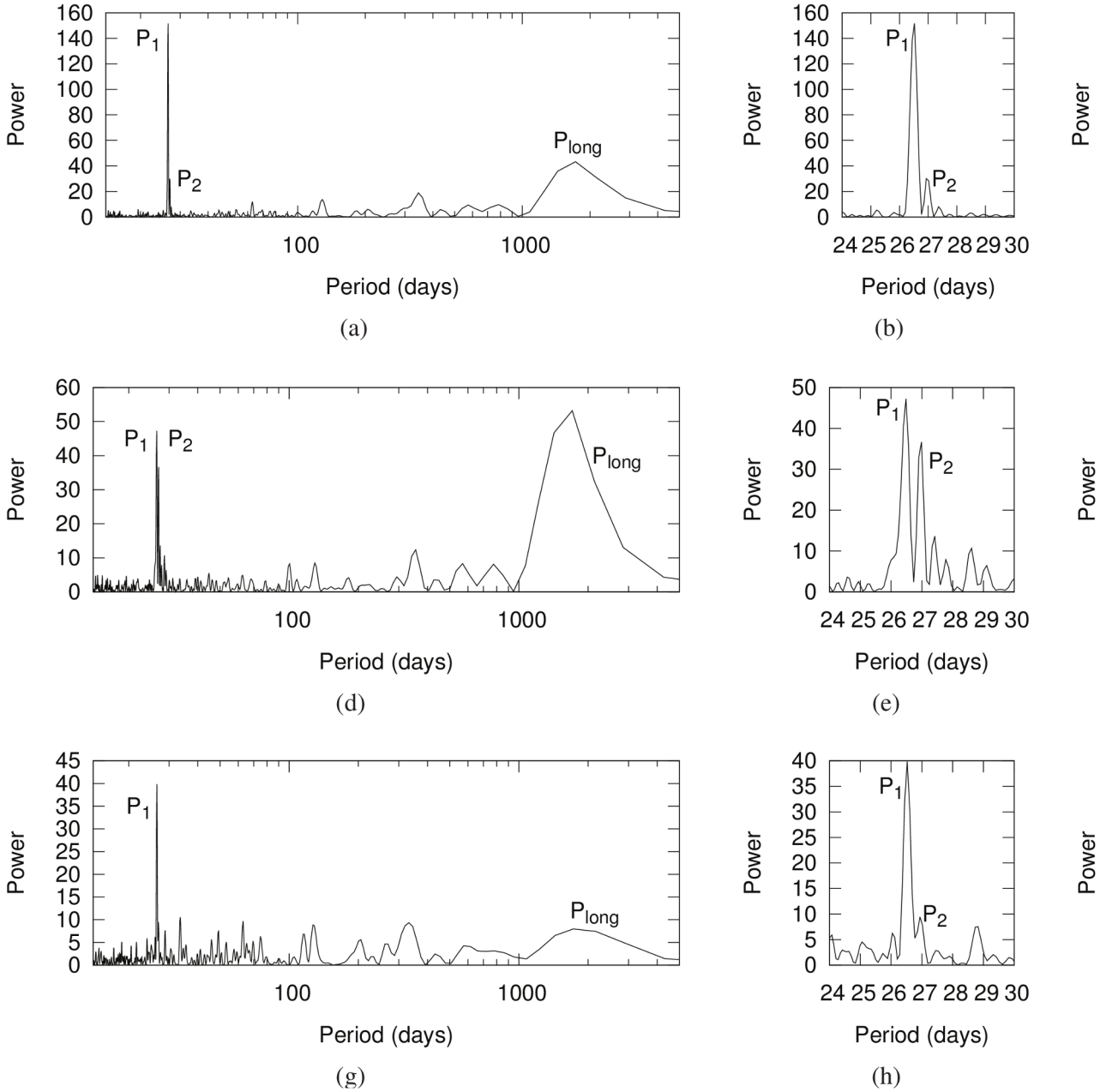
Φ = 0.5 - 1.0 (apastron)

Φ = 0.0 - 0.5 (periastron)

2. Results


Flux density (10^{-6} ph cm^{-2} s^{-1})
Orbital phase Φ
Flux density (10^{-6} ph cm^{-2} s^{-1})
Orbital phase Φ
Flux (10^{-6} ph cm^{-2} s^{-1})
Orbital phase Φ
Radio data
Θ = 3.79 - 3.92
Θ = 4.23 - 4.40
Flux density (mJy)
Orbital phase Φ

2. Results



Full orbit

Apastron
Φ = 0.5 - 1.0

Periastron
Φ = 0.0 - 0.5

Fig. 3 from Jaron & Massi (2014, A&A)

3. Conclusions

1. We found two GeV peaks along the orbit as predicted by the two-peak accretion model.

2. The apastron GeV peak has the same characteristic as the radio outburst, i.e., timing characterstic (P1, P2) and orbital shift.

Thank you!