PSR J1023+0038
spinning down faster or
slower than as a radio pulsar?

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Task force!

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Radio Timing Solution

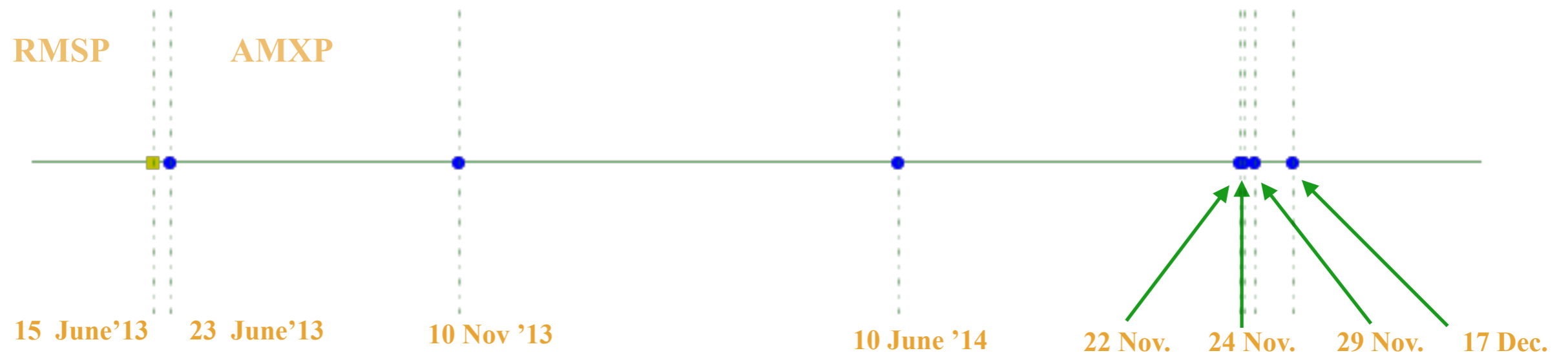| Fit and data-set	
Pulsar name	J1023+0038
MJD range	54766.5—56146.6
Number of TOAs	7478
Rms timing residual (μs)	114.0
Weighted fit	No
Measured Quantities	
Pulse frequency, ν (s^{-1})	592.42145906986(10)
First derivative of pulse frequency, $\dot{\nu}$ (s^{-2})	$-2.432(3) \times 10^{-15}$
Orbital period, P_b (d)	0.1980963569(3)
Epoch of periastron, T_0 (MJD)	54905.9713992(3)
Projected semi-major axis of orbit, x (lt-s)	0.343343(3)
First derivative of orbital period, $\dot{P_b}$	$-7.32(6) \times 10^{-11}$
Set Quantities	
Right ascension, α	10:23:47.687198
Declination, δ	+00:38:40.84551
Epoch of frequency determination (MJD)	54906
Epoch of position determination (MJD)	54995
Dispersion measure, DM ($cm^{-3}pc$)	14.3308
Proper motion in right ascension, μ_α (mas yr^{-1})	4.76
Proper motion in declination, μ_δ (mas yr^{-1})	-17.34
Parallax, π (mas)	0.000731
Orbital eccentricity, e	0

Coherent X-ray pulsations
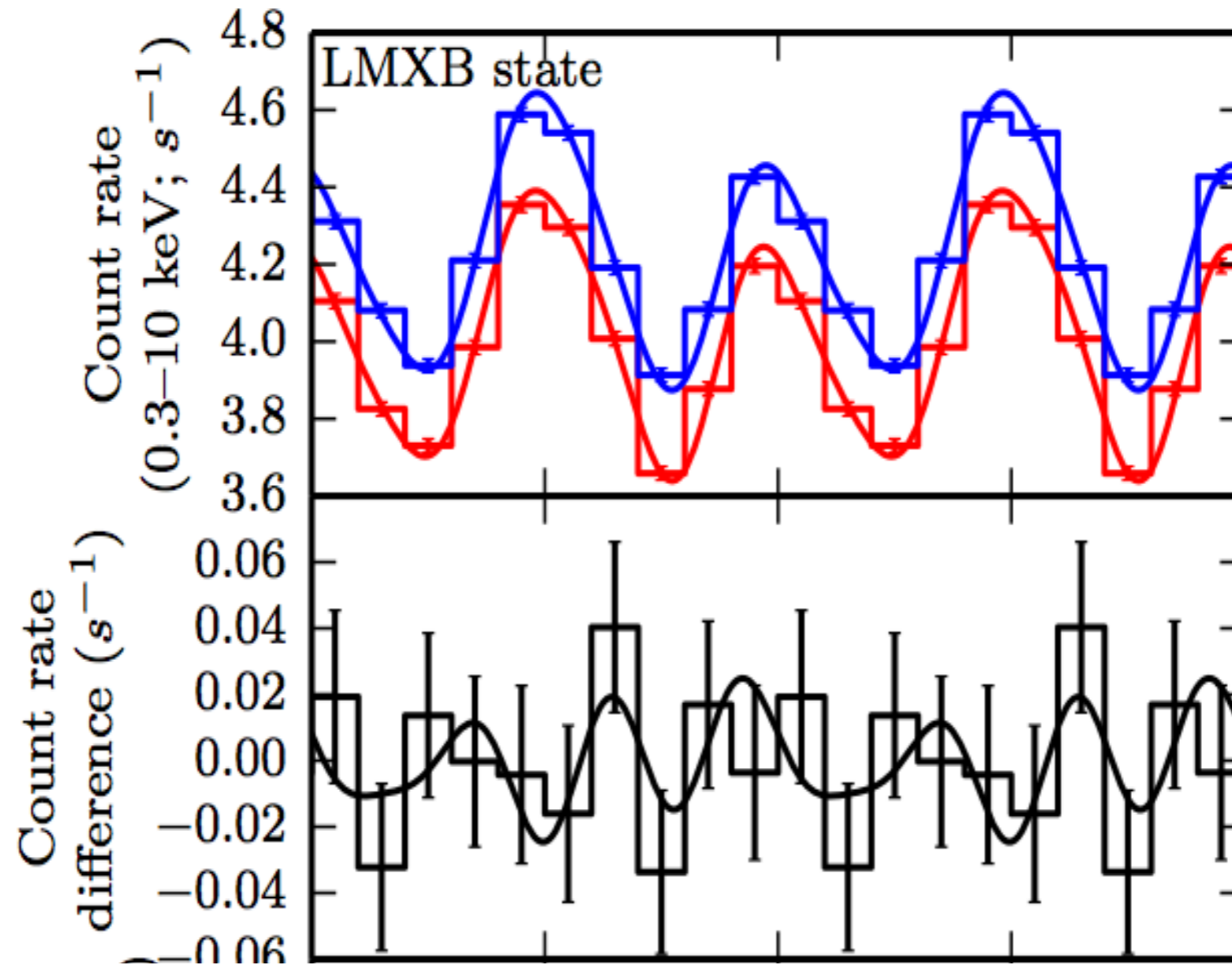
Pulse profiles

Archibald et al. 2014, arXiv:1412.1306
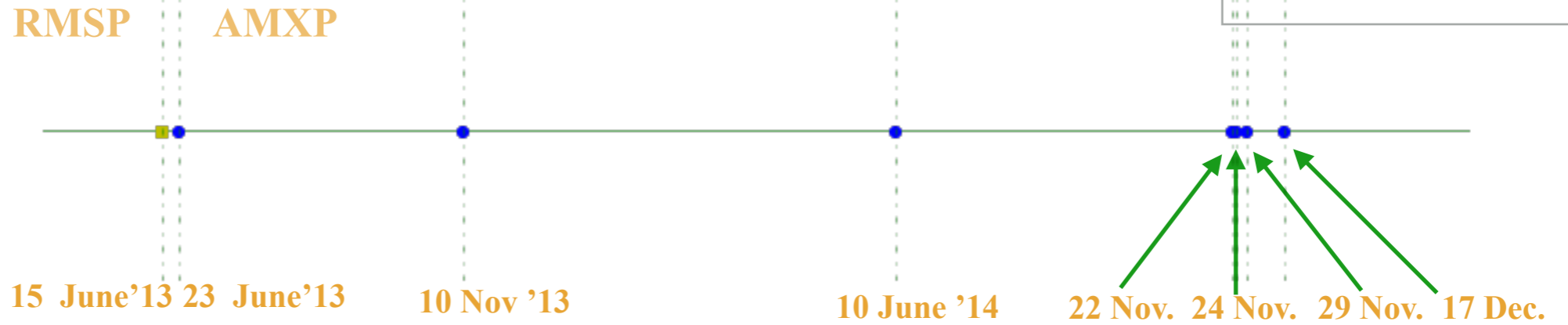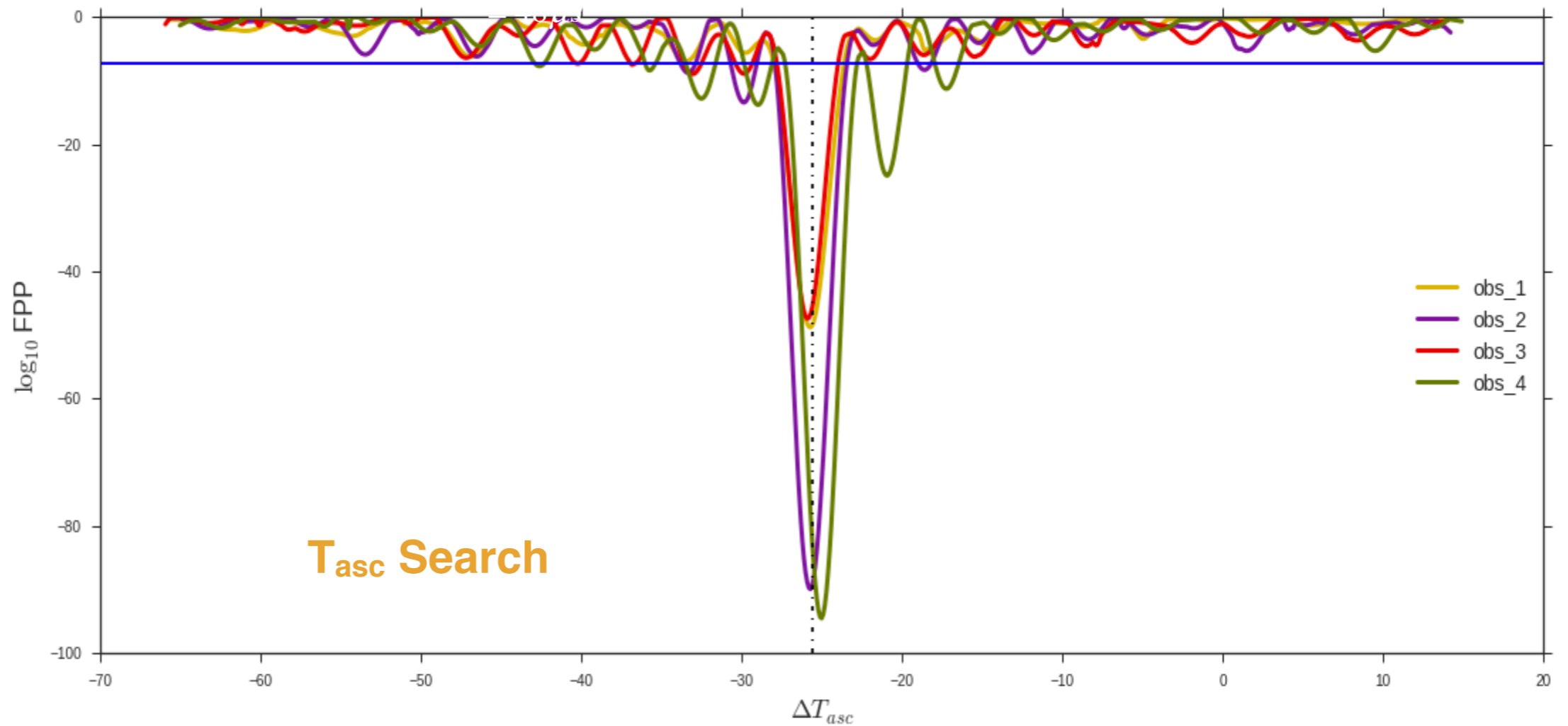Bogdanov et al. 2014, arXiv:1412.5145

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XMM-Newton

- X-ray Multi-mirror satellite
  1) EPIC 2) RGS 3) OM

- Highly eccentric , 48 hour orbit
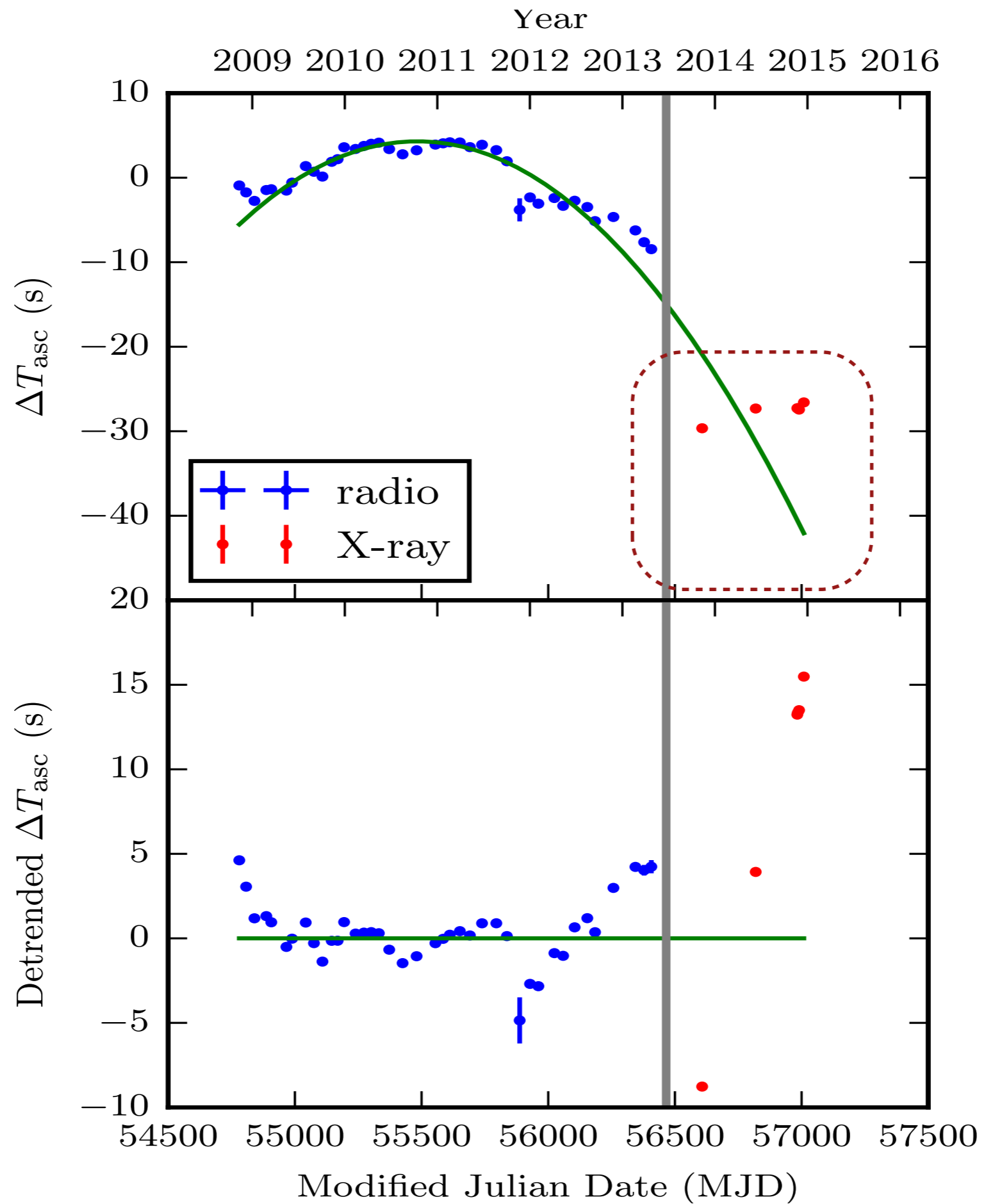
- 30 arcmin FOV, 6 arcsec resolution, 0.5-15 KeV

RMSP   AMXP

15 June'13   23 June'13   10 Nov '13   10 June '14   22 Nov.   24 Nov.   29 Nov.   17 Dec.

T_{asc} search

Pulse profile

Change in frequency

Period Derivative

Observations timeline

RMSP   AMXP

15 June'13 23 June'13   10 Nov '13   10 June '14   22 Nov. 24 Nov. 29 Nov. 17 Dec.

T_{asc} Search

Unambiguous presence of pulsations : FPP 10^{-90}

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Pulse profile

Background subtracted, normalised folded profiles
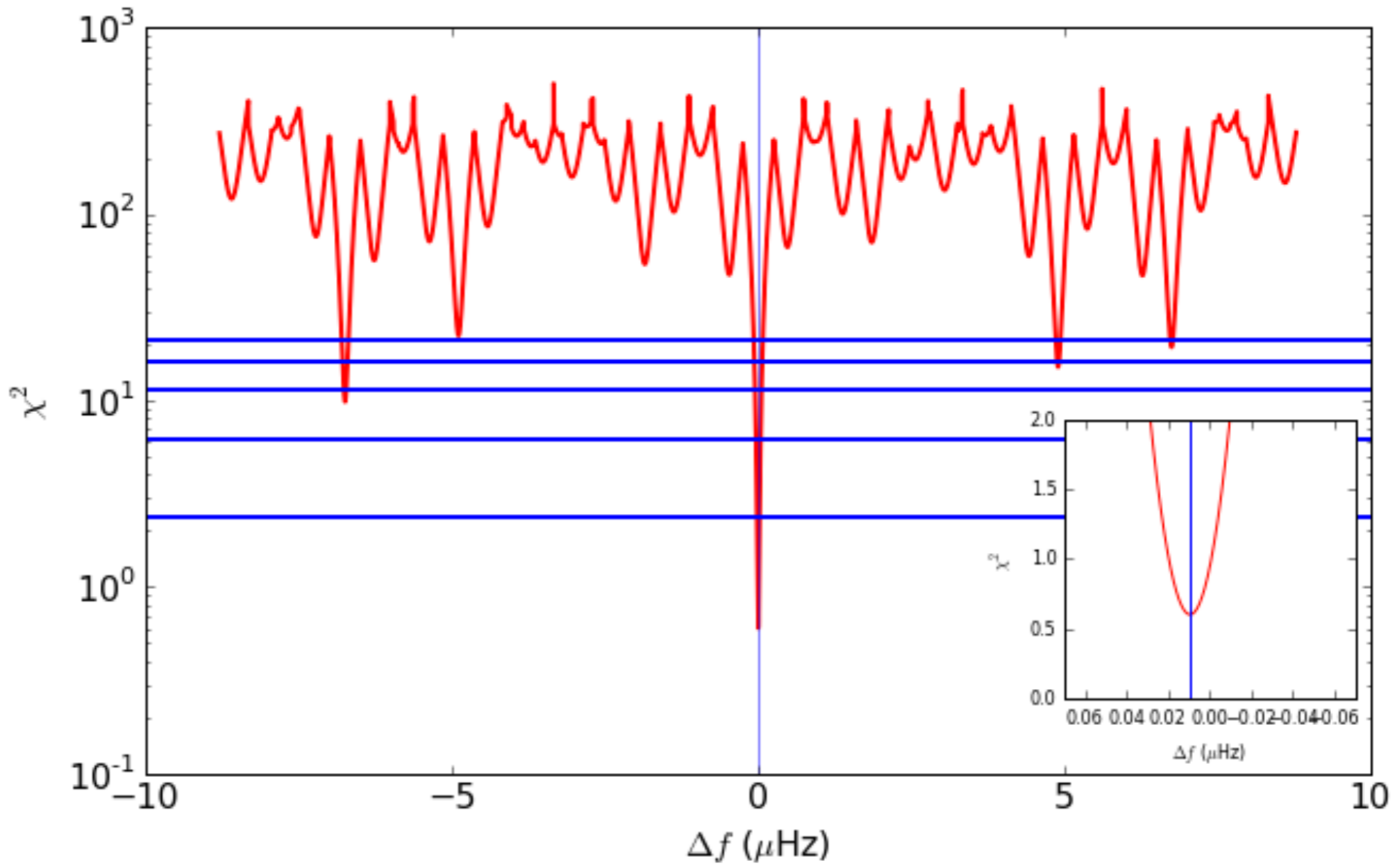based on the radio ephemerides.

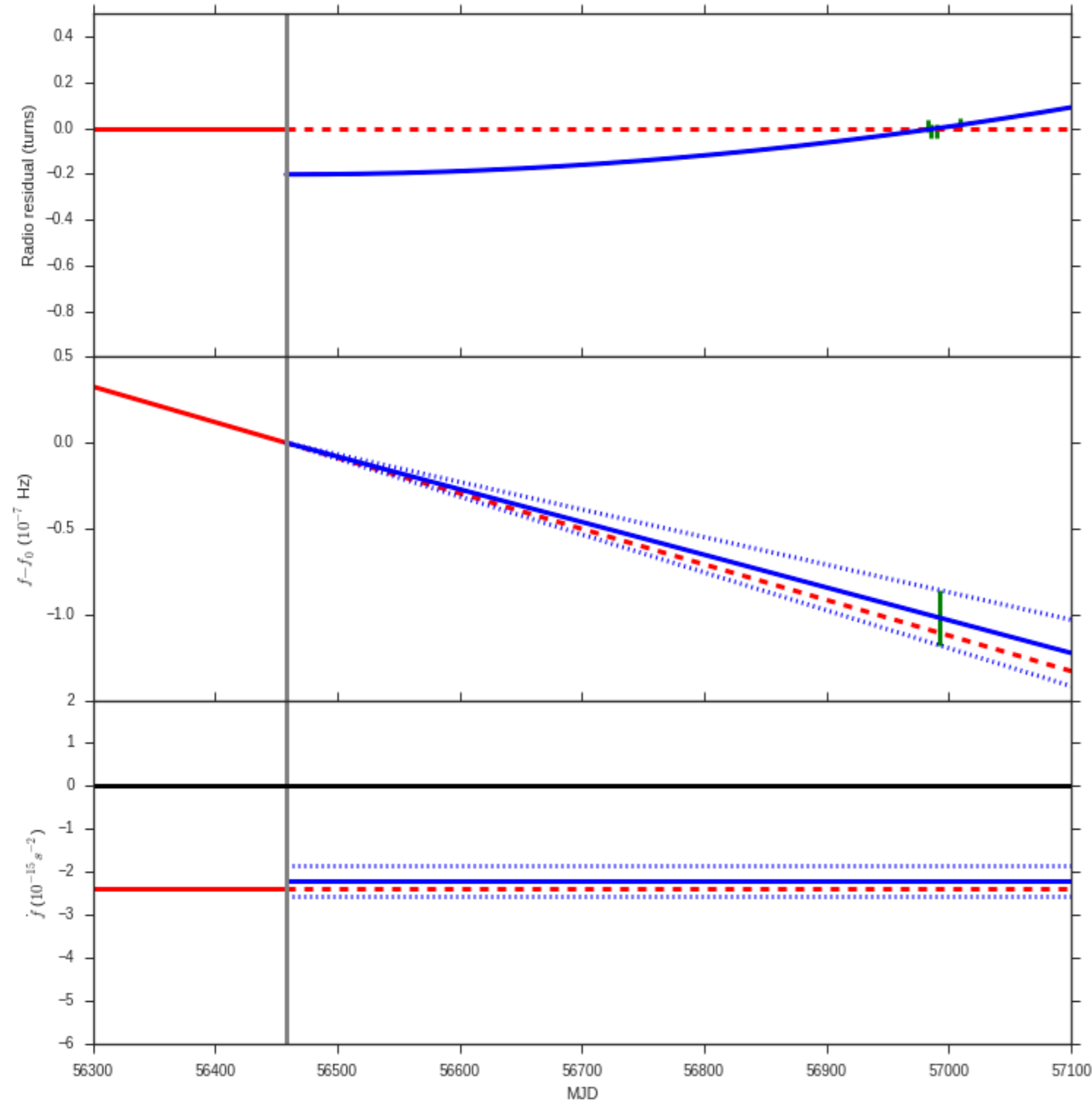
Pulse phase
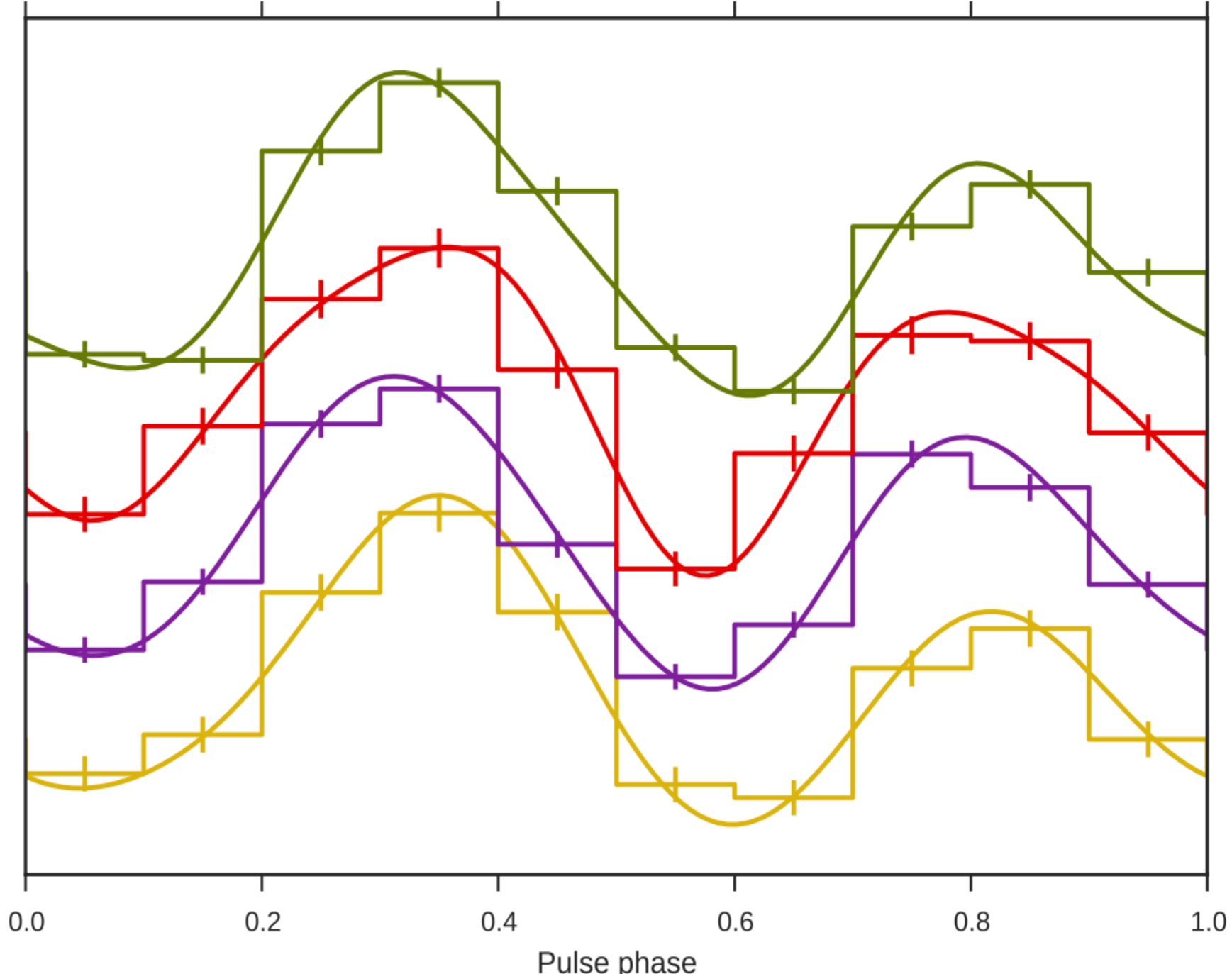
Distribution over change in frequency

Preliminary key results
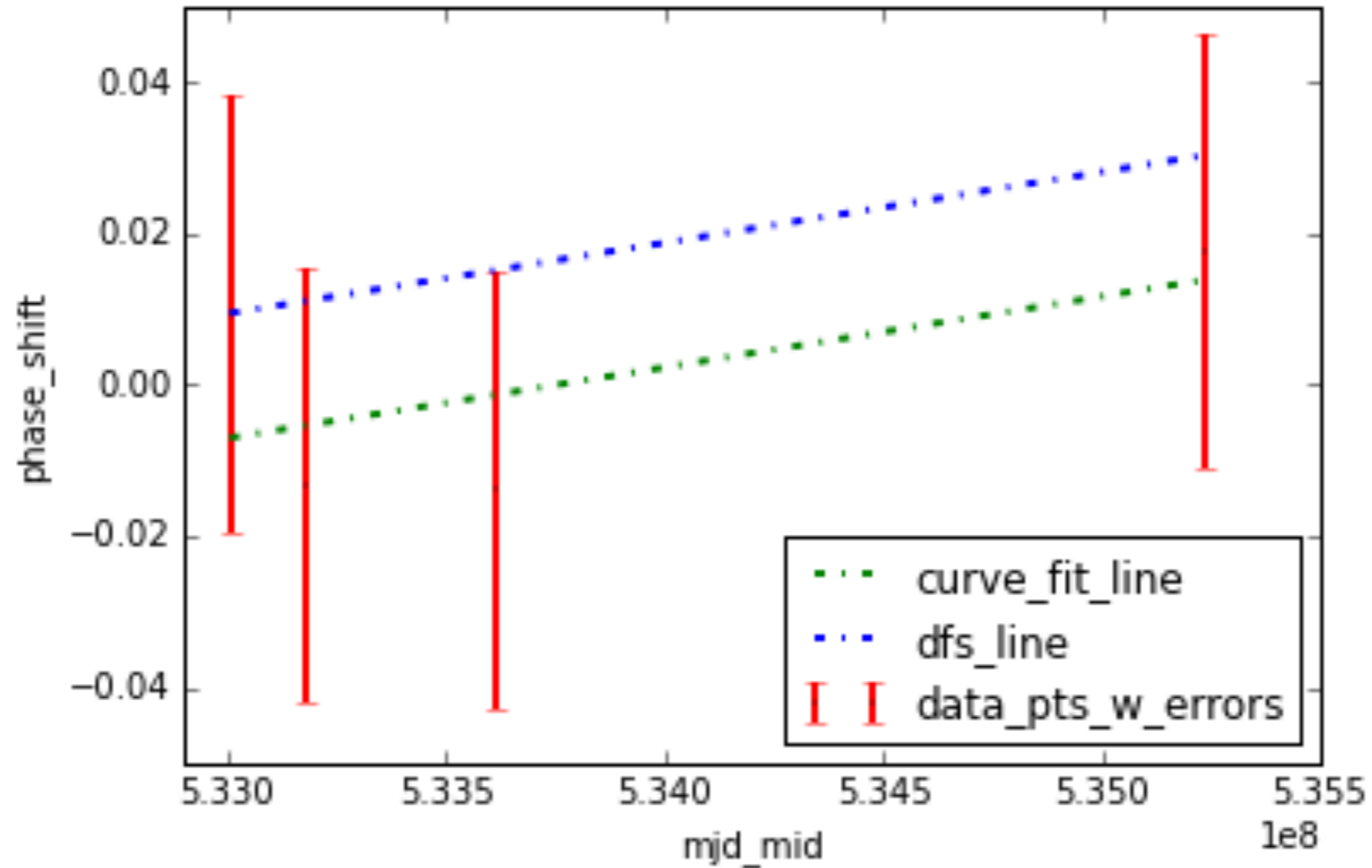
$$\dot{P}_{accr} = \dot{P}_{radio}(1 \pm 0.08)$$

Conclusions

$$\dot{f}_{accr} \approx \dot{f}_{radio}$$

- If the pulsar spin down mechanism remains active?

- At present is the pulsar wind being generated?

- Dying down of torques

- Is it "mode switching"?

- Possible models?

- See talk by Caroline D'Angelo