Gamma-ray Variability of Low-luminosity AGN

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Introduction

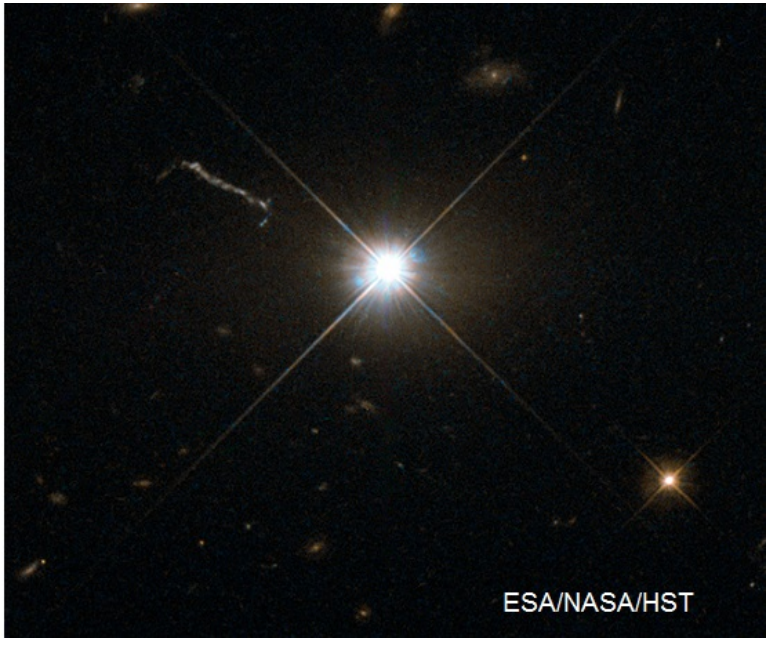
- LLAGNs: why are these targets special?
- Gamma-ray flares
- Periodicities
- Behind 3FGL

Low-luminosity AGNs

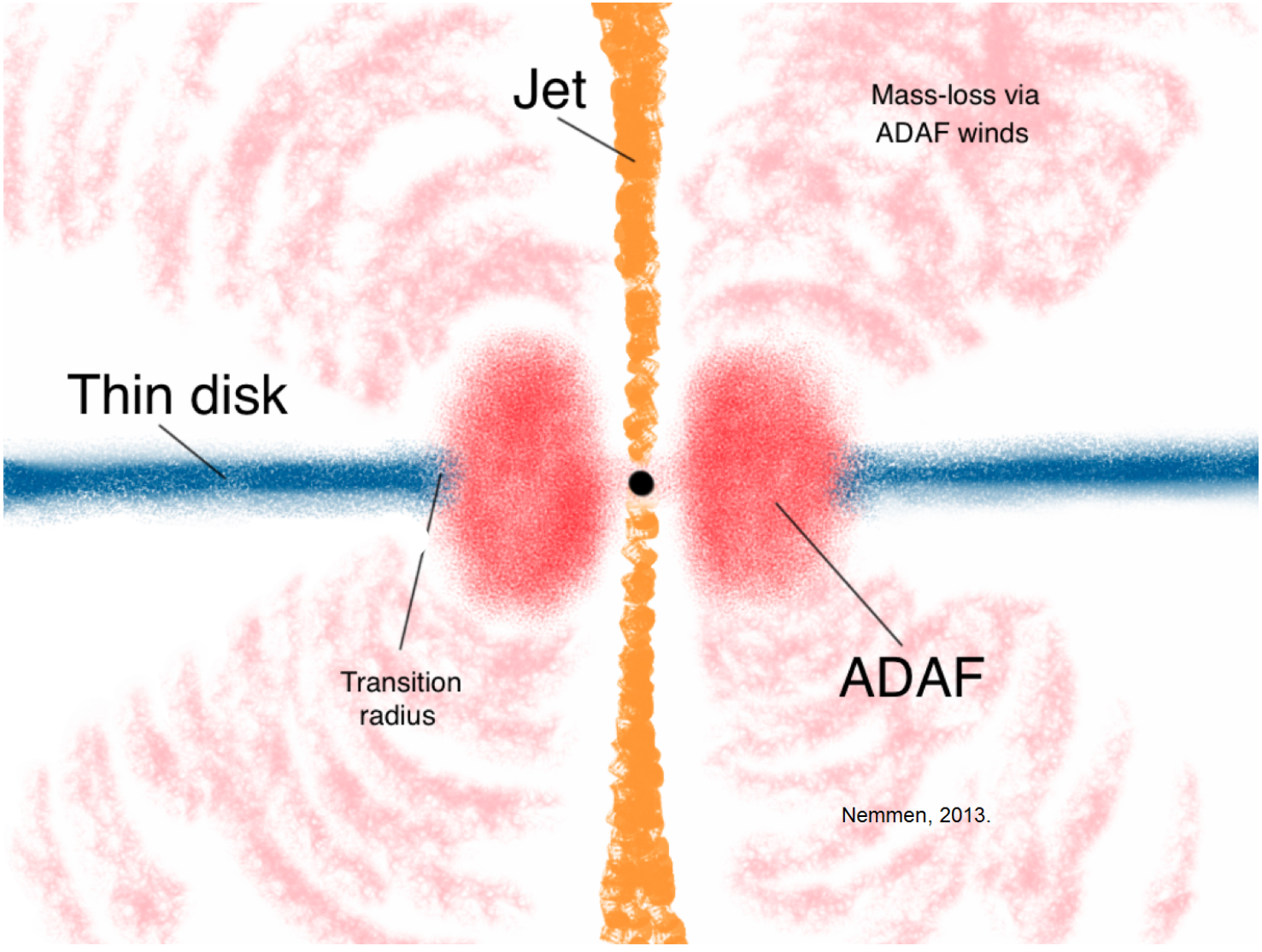
LLAGN

X

FSR Quasar



From the flow or from the jet?

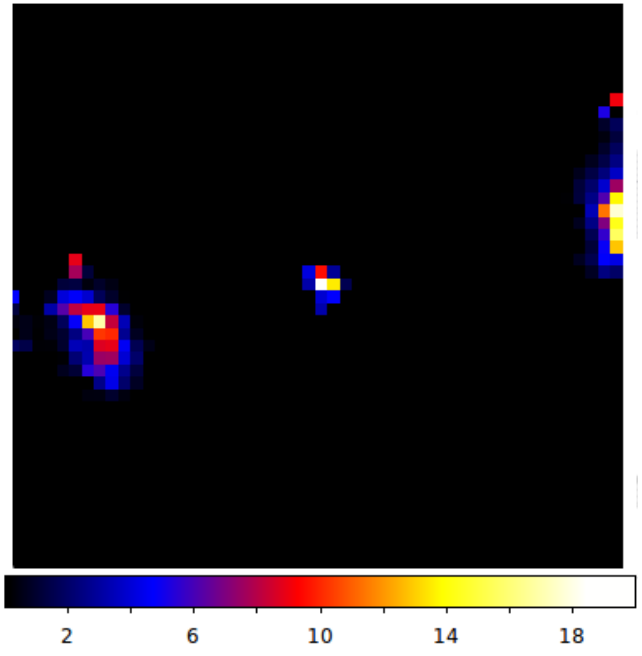


Analysis

- Pass 8 data
- Science tools v10r0p5
- 0.1 to 300 GeV
- 2008 to 2015

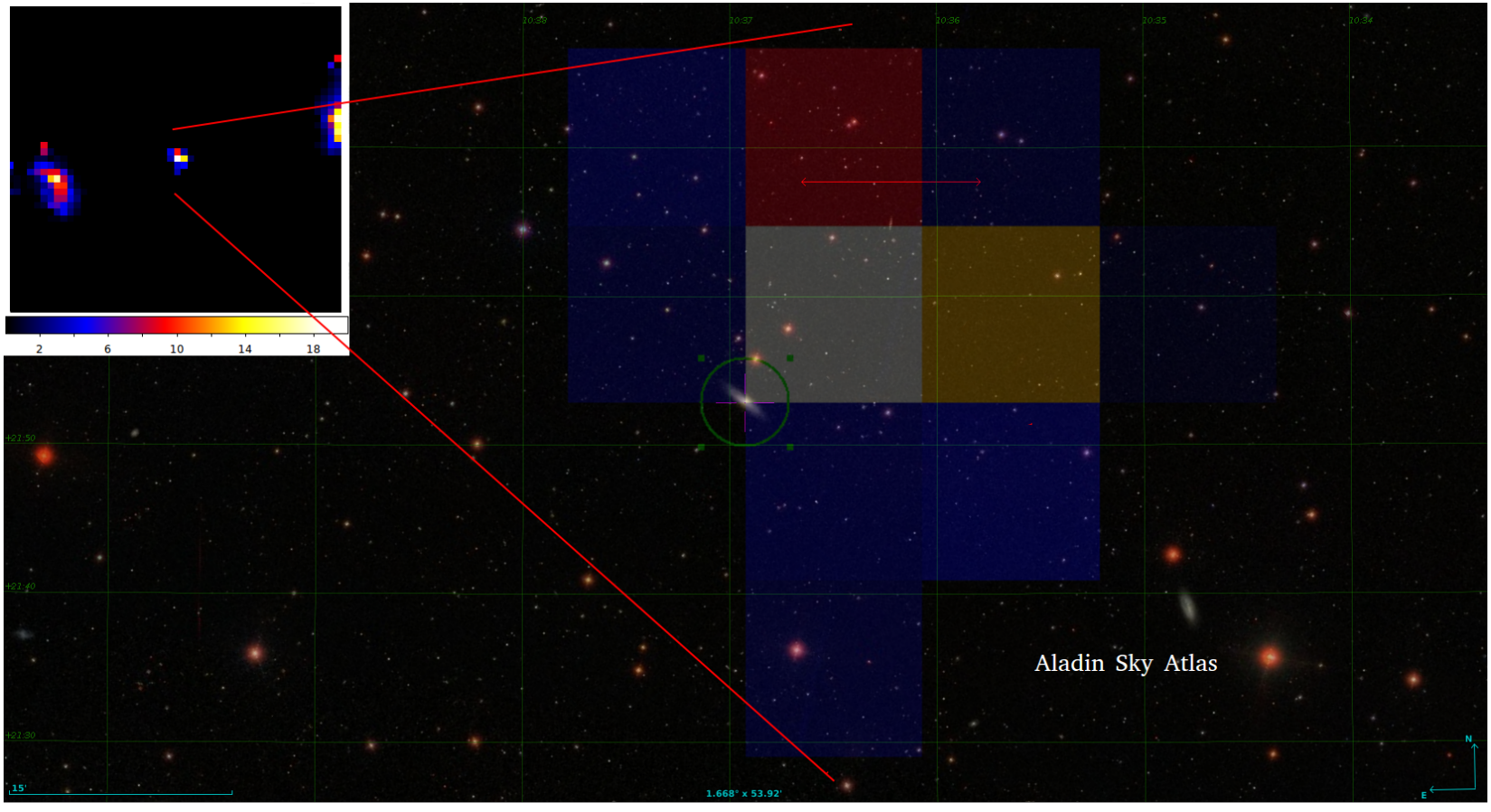
- 10 brightest AGN from Palomar Survey

Weak sources (NGC 3301)



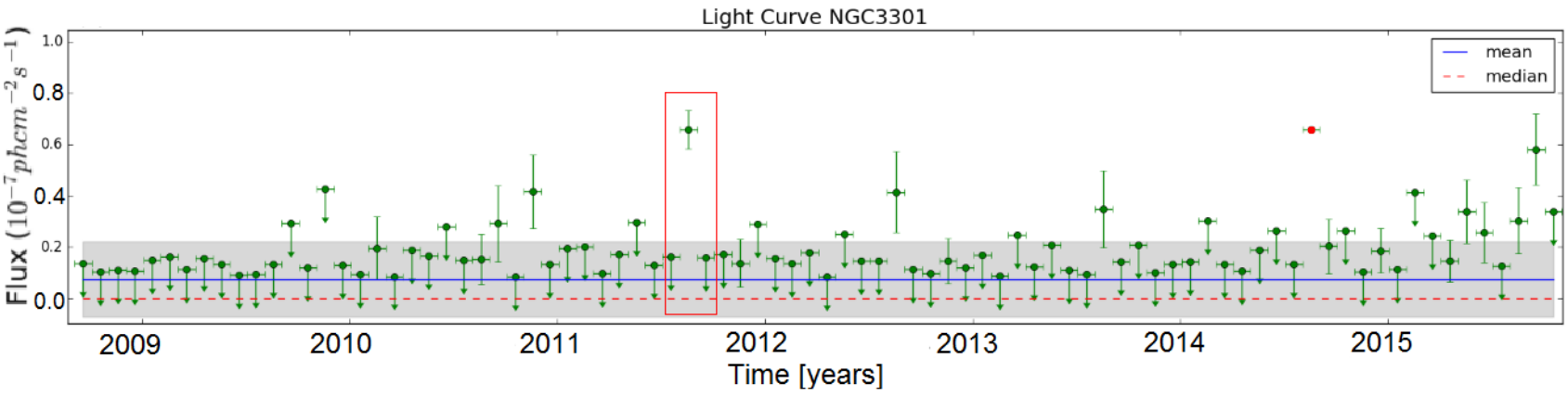
Residuals TS map
$10^o \times 10^o$ field
0.2^o per pixel

Assuming the signal is coming from the target (NGC 3301)

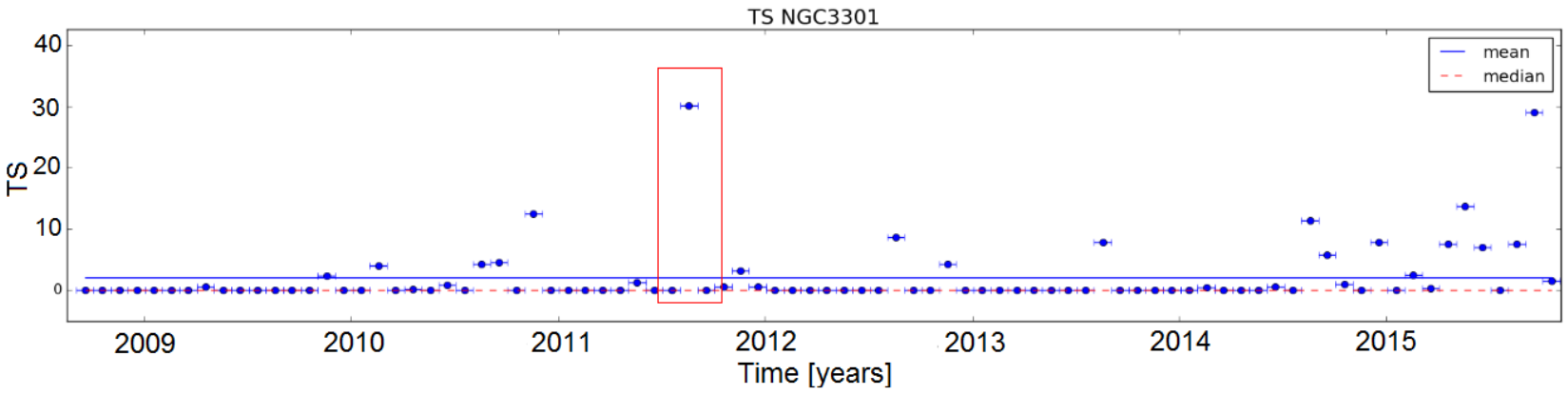


$1.67^o \times 53.9'$

NGC 3301, $d \lesssim 0.051pc$



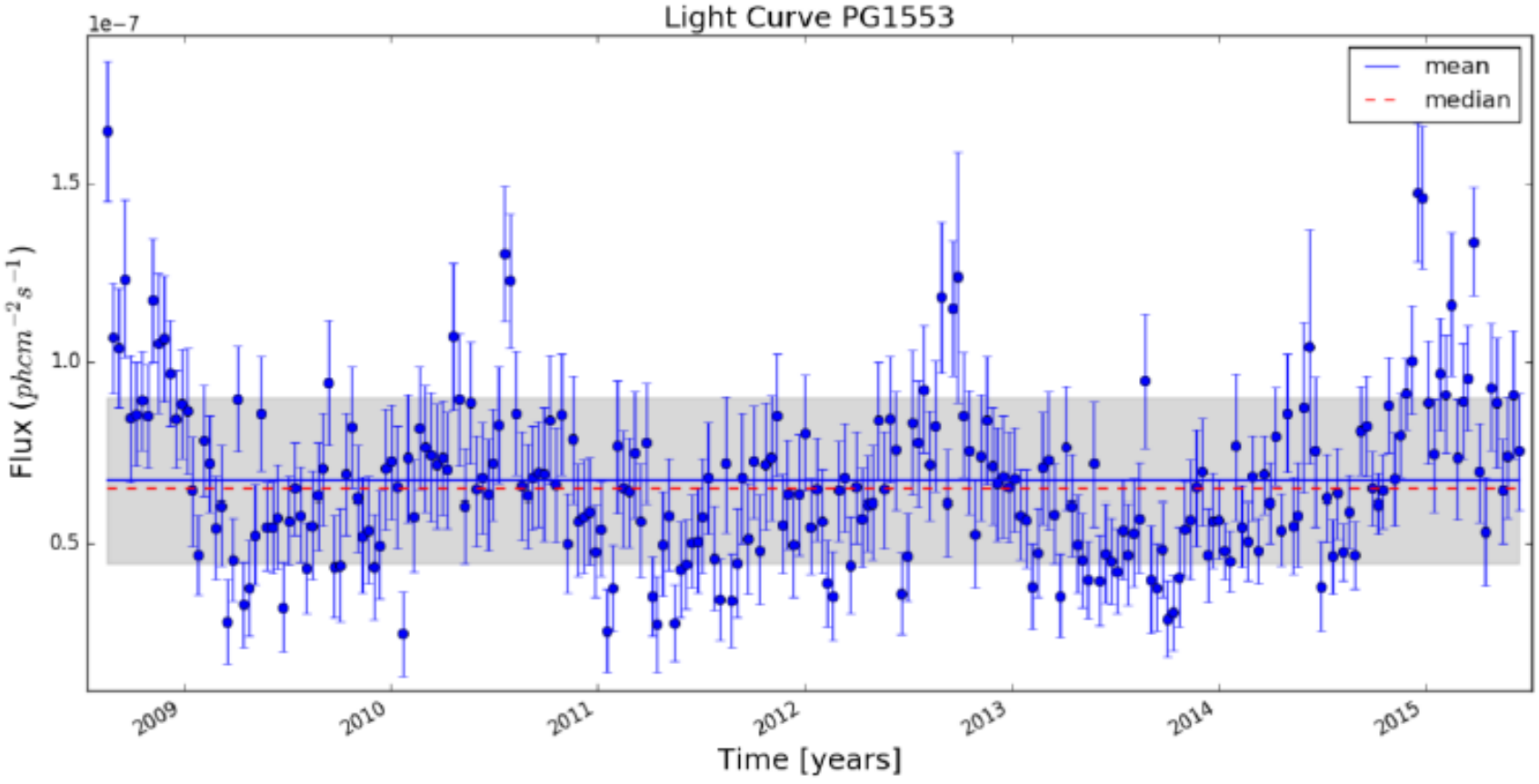
NGC 3301 - Significance above 5σ



Testing the pipeline

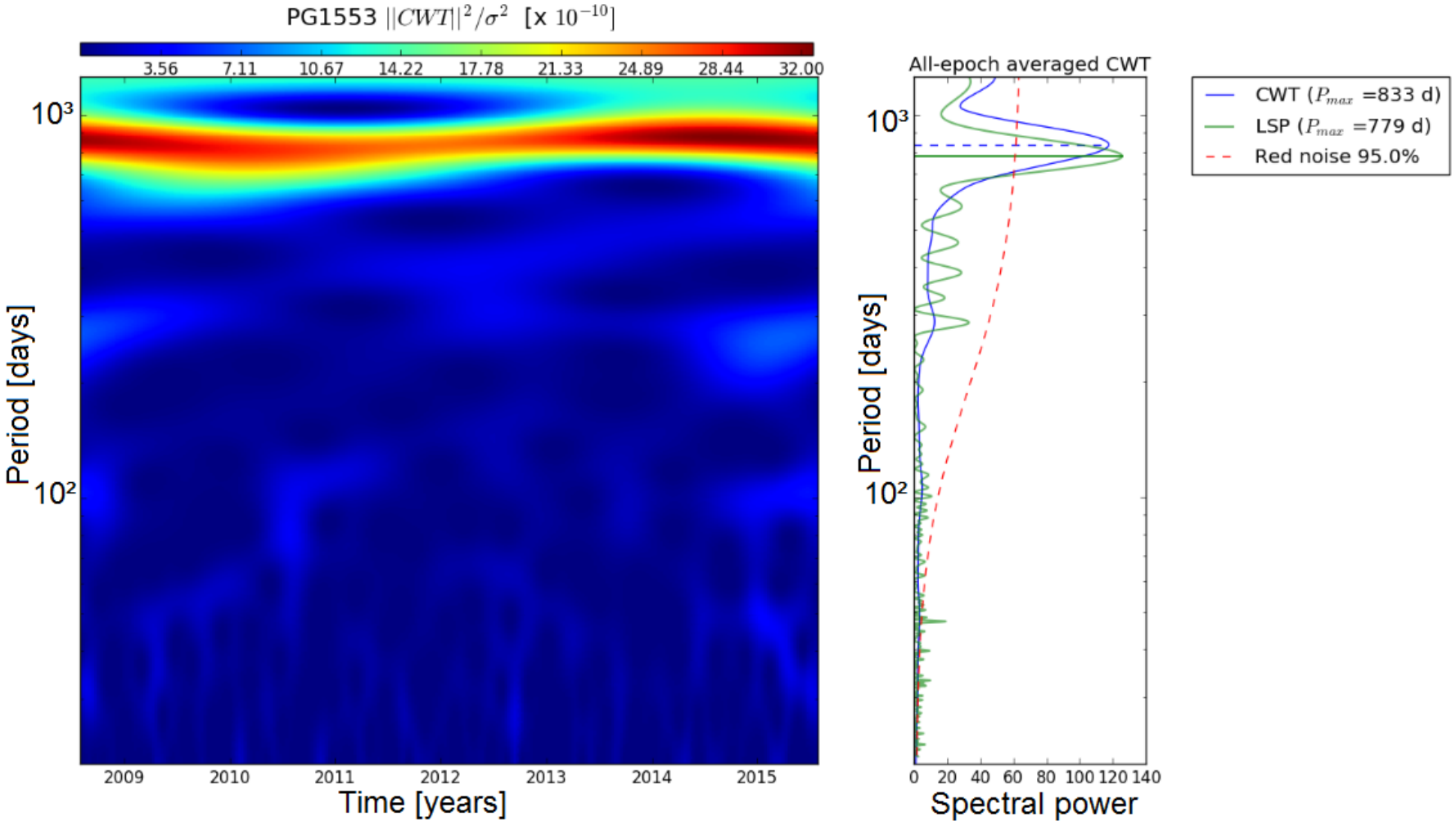
- Parallelized code for building light curves
- Is the signal periodic?
  FFT and LSP
- How does the period behaves over time?
  - A time-period representation of the signal should be useful
  - Continuous wavelet transform - CWT

PG1553+113 - LC (10 days time bins)

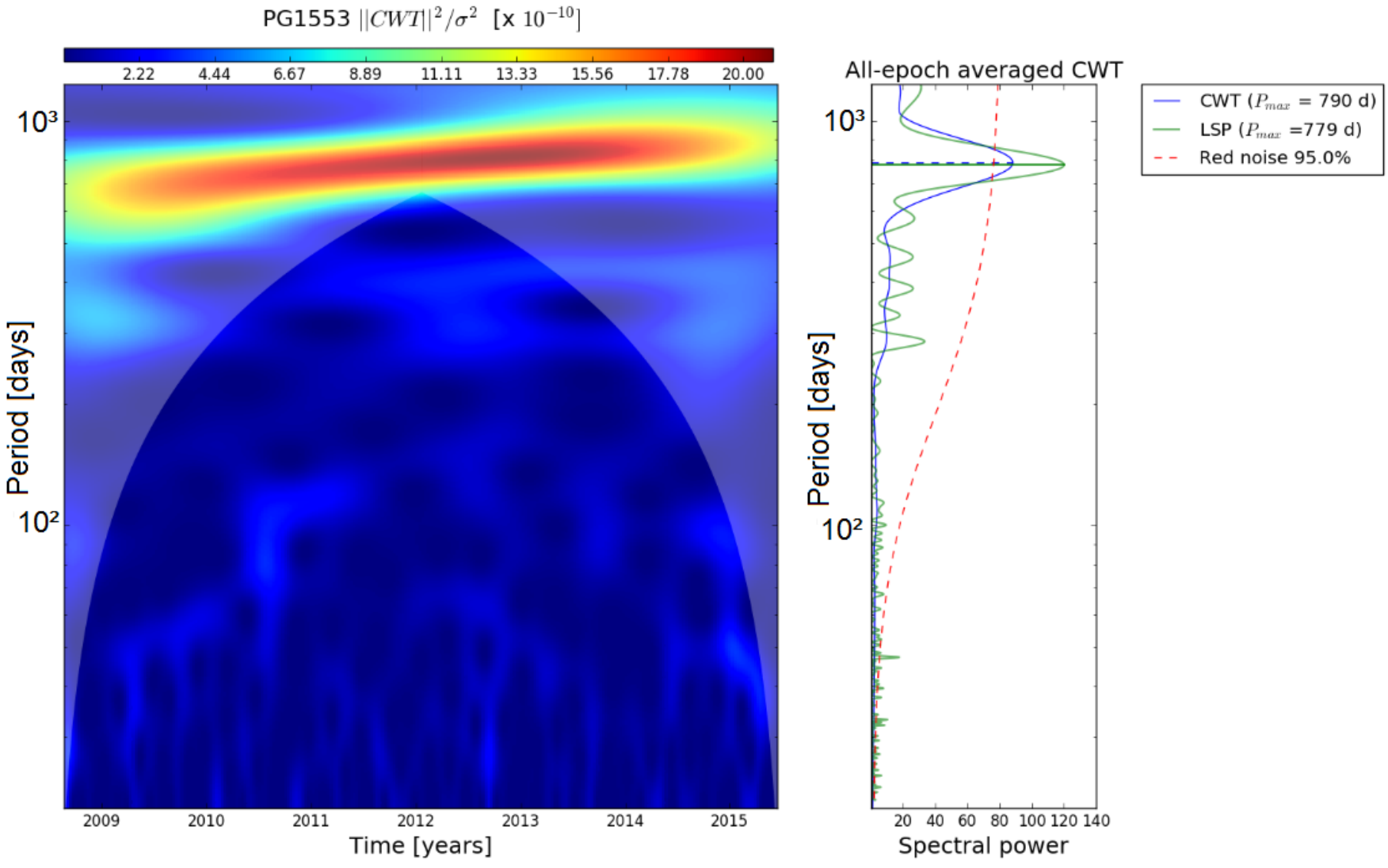


Analysis already done by M. Ackermann et al. (2015)

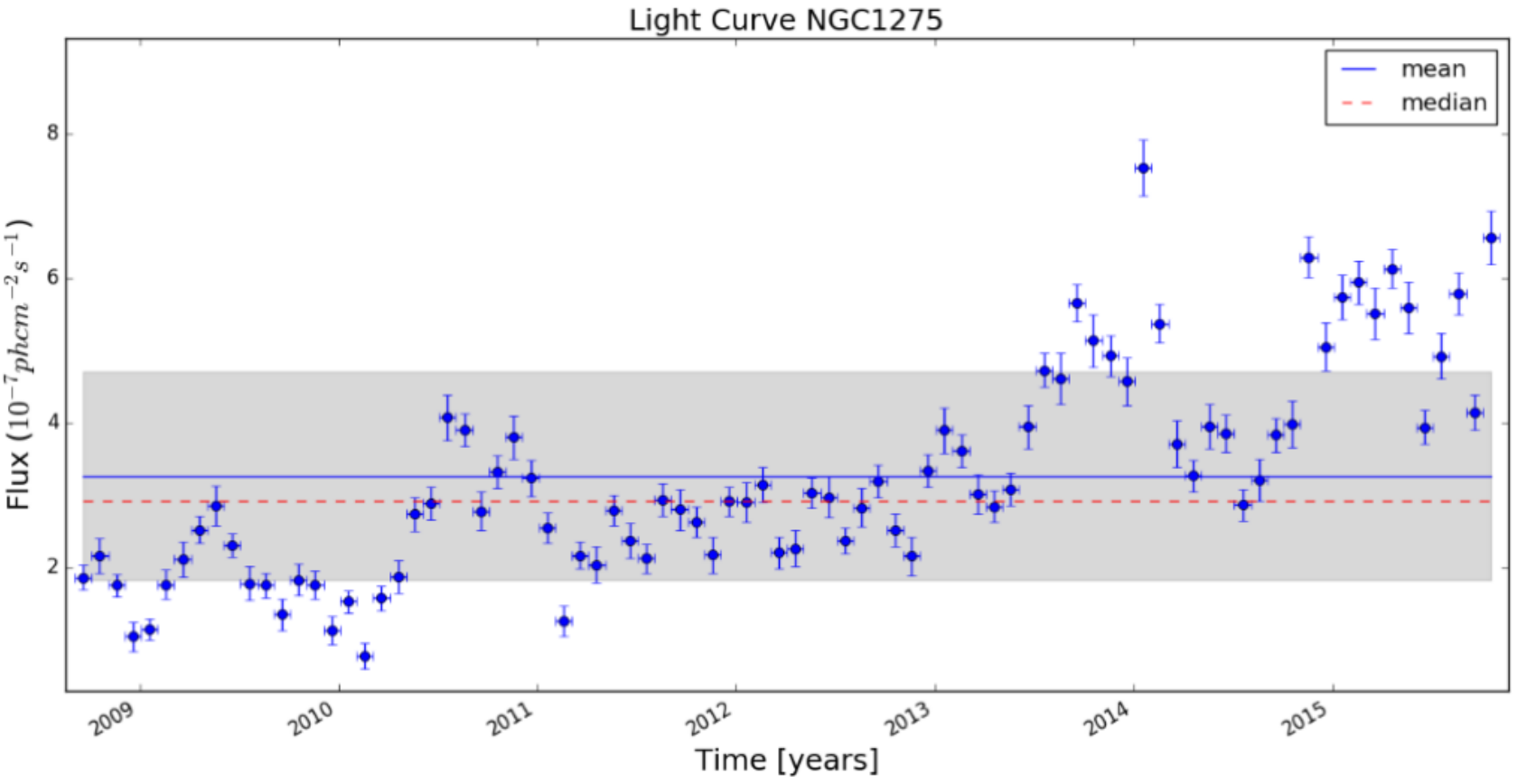
PG1553+113 - CWT: cyclic signal



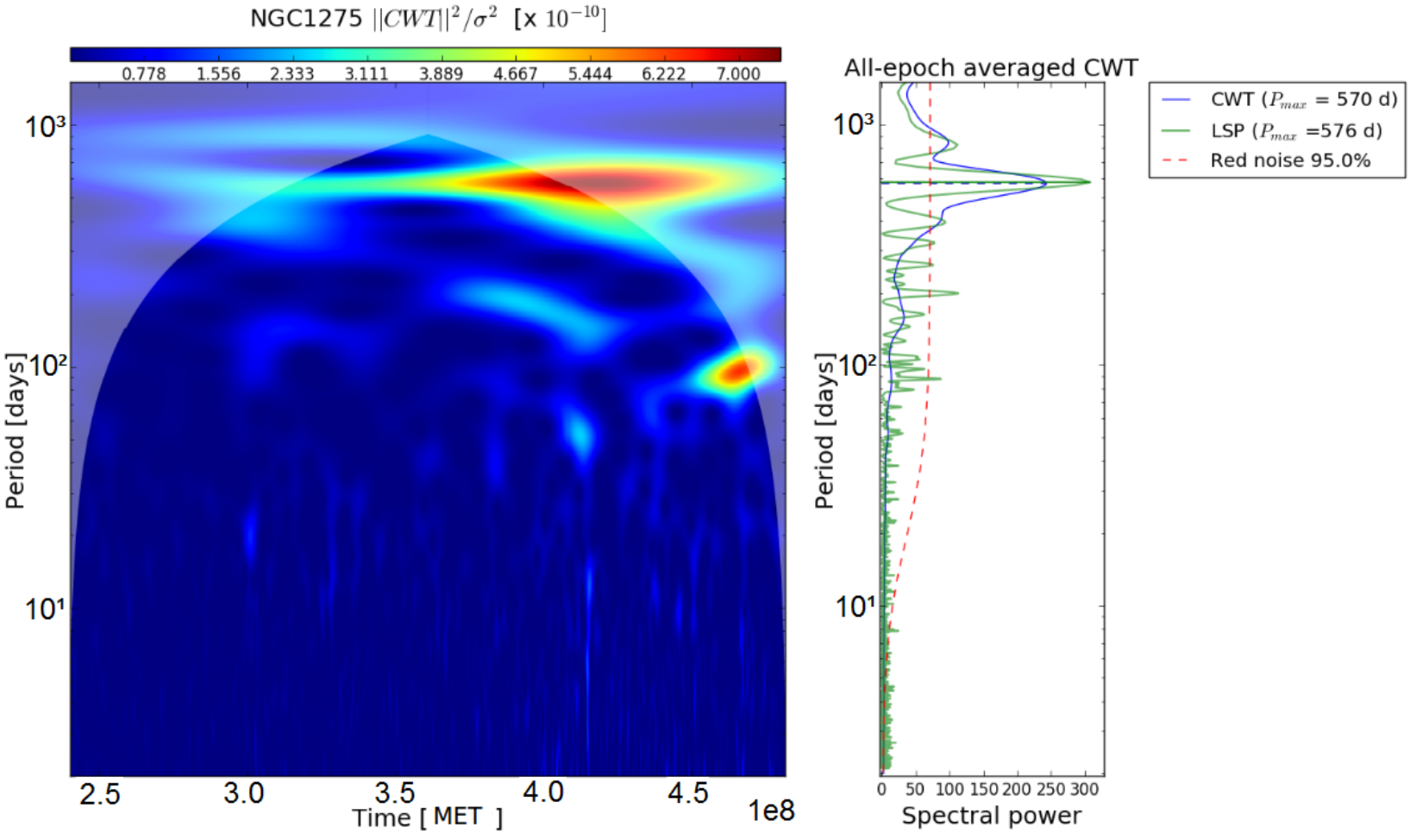
PG1553+113 - CWT: considering edge effects



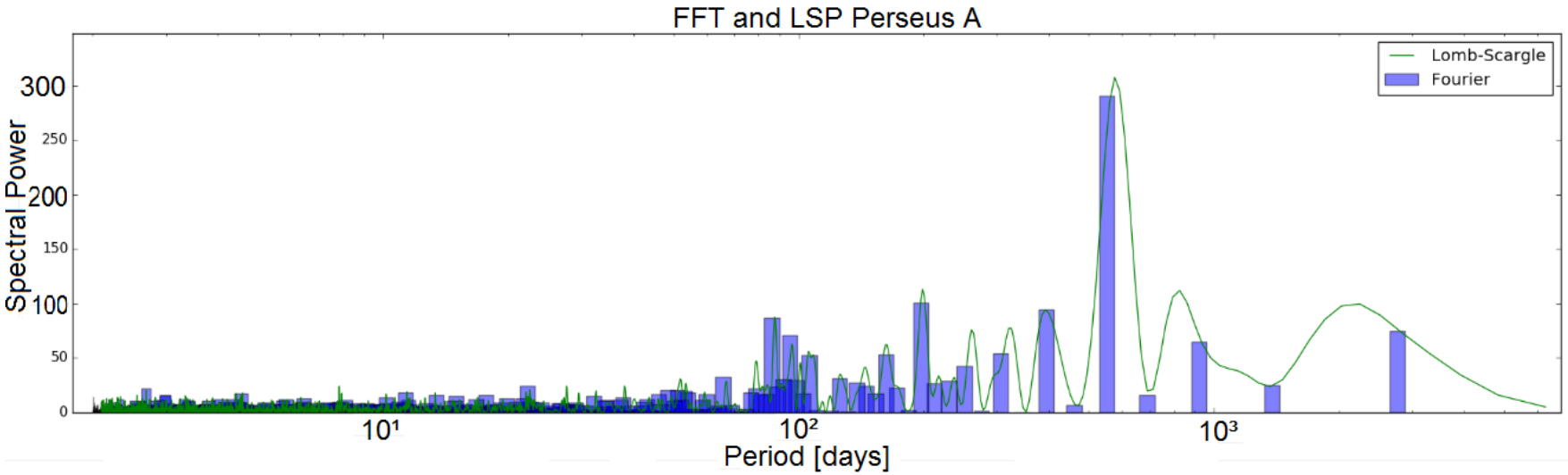
Perseus A - monthly binned LC



Perseus A - CWT

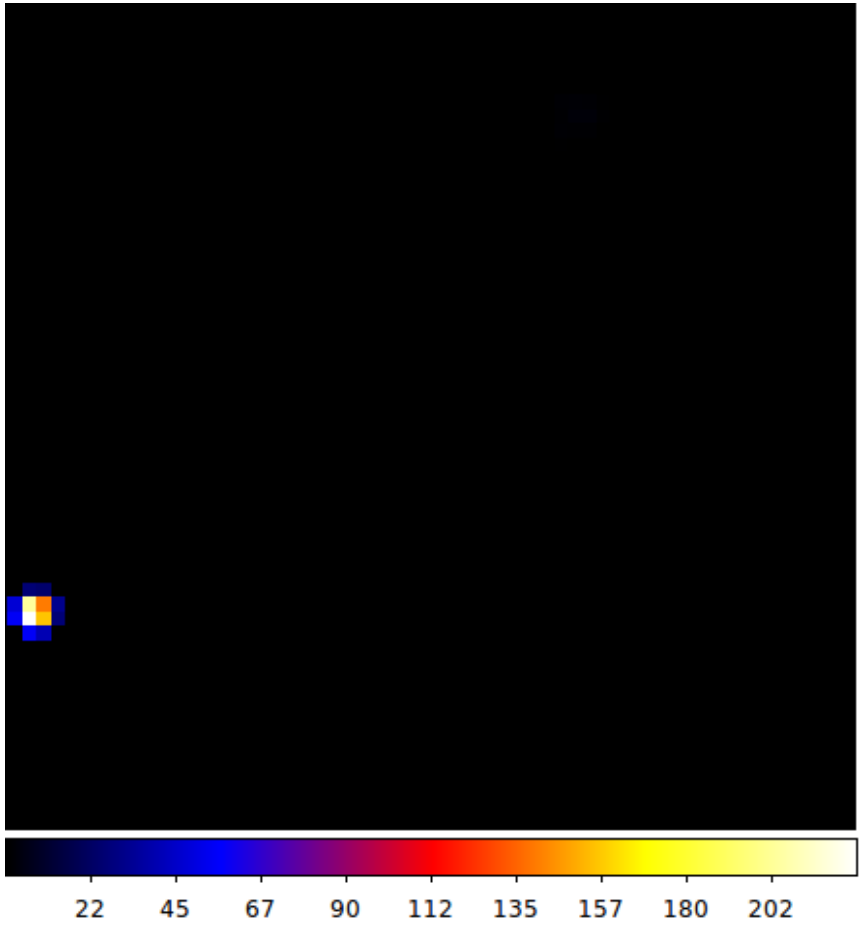


Perseus A - FFT and LSP



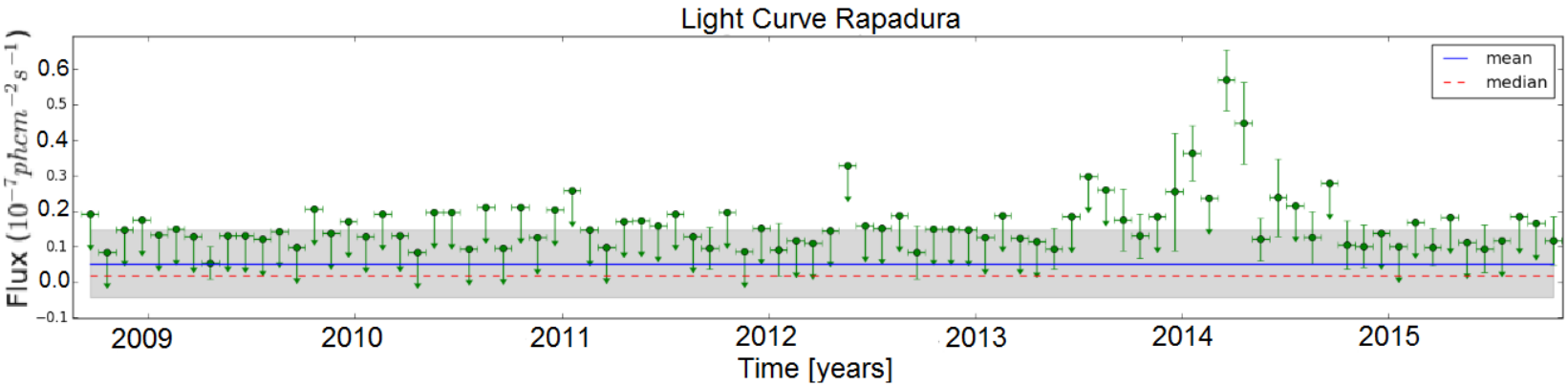
Evidence for QPO!

Serendipitous discoveries



TS map centered on NGC 5371.

A very long flare



Conclusions: γ-ray variability of LLAGNs

- Constrained the size of γ-ray emission regions
- Perseus A as a QPO candidate
- New γ-ray sources

Menezes et al. and Nemmen et al. (in preparation)

Bonus:

- Edge effects on PG1553+113 periodicity

Thank you!