Bayesian Time-Resolved Spectra of GRB Pulses

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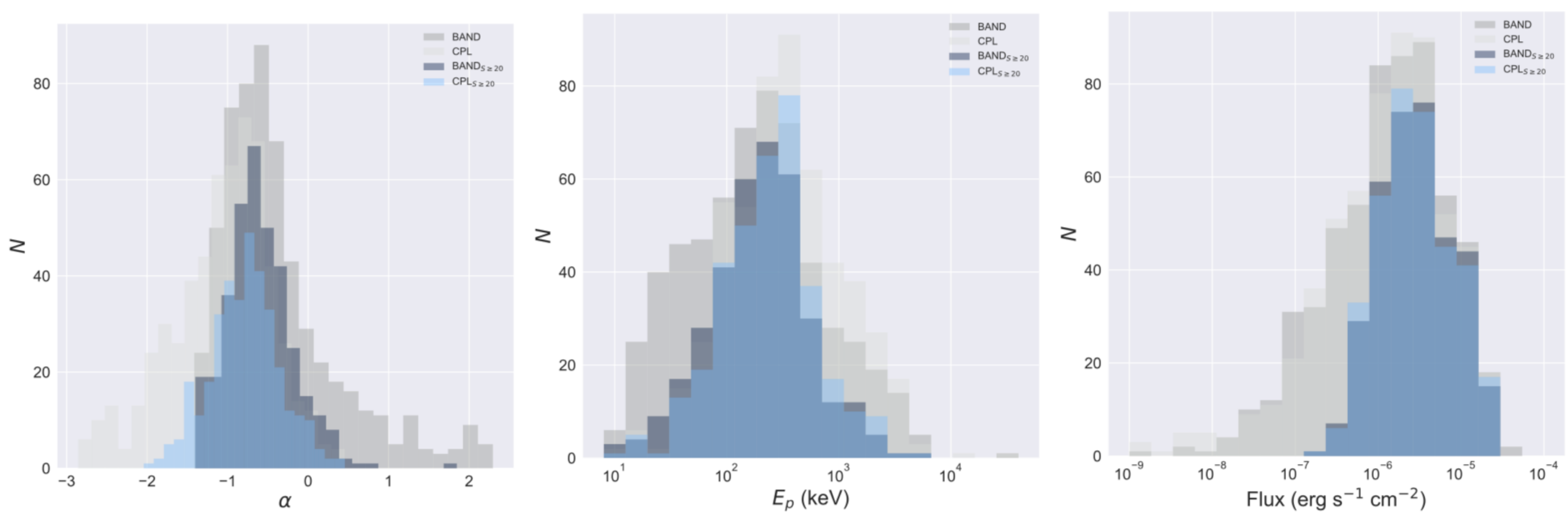
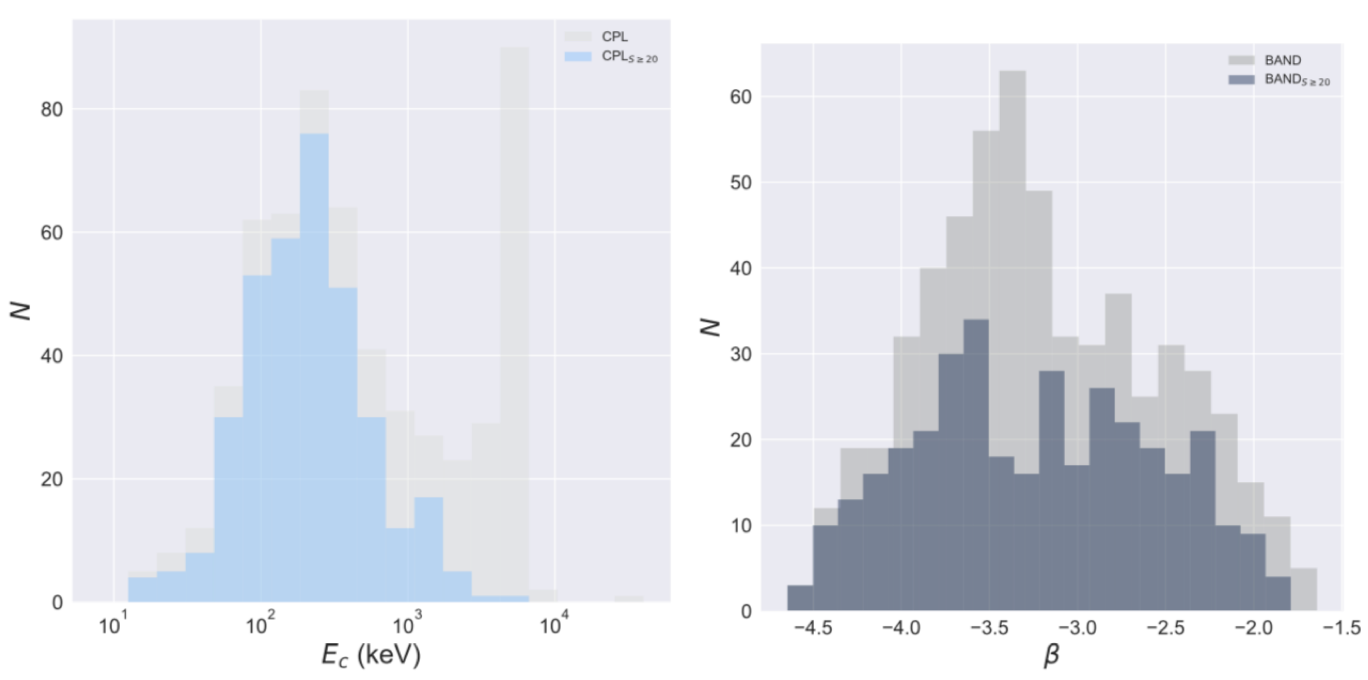
Abstract We performed Bayesian time-resolved spectroscopy on a sample of 38 single pulses from 37 gamma-ray bursts detected by the *Fermi*/Gamma-ray Burst Monitor during its first 9 years of mission. A total of 577 spectra are obtained and their properties studied using two empirical photon models, namely the cutoff power law and Band function. We present the obtained parameter distributions, spectral evolution properties, and parameter correlations. The results are consistent with previous GRB spectral catalogues, in particular, the fact that the cutoff power law consistently fits most of the spectra. However, compared to previous works, we find that the high-energy power-law index of the Band function, is in general softer for the single pulses in this work. Finally, we find that the parameter correlations show a variety of behaviours. Most noteworthy is, though, the fact that the relation between the low-energy power-law index and the energy flux is very similar for all the bursts, independent of the evolution of the other parameters.

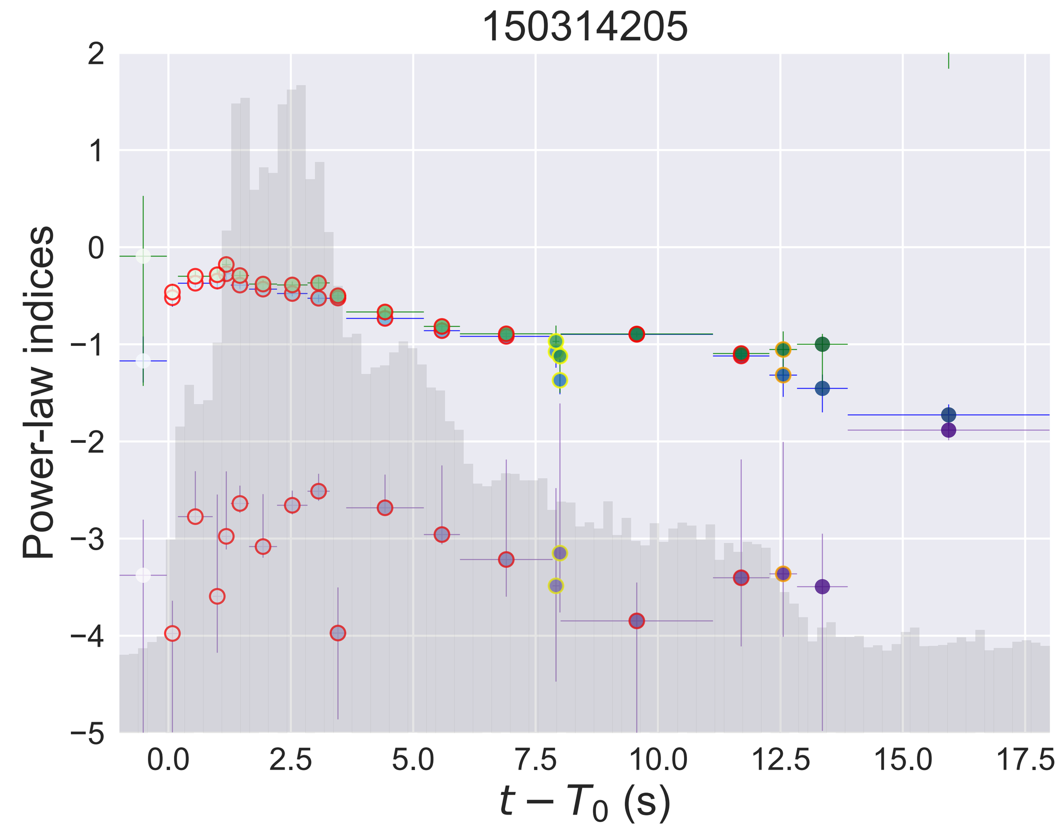
Highlight of Results – Parameter Distributions & Spectral Evolution

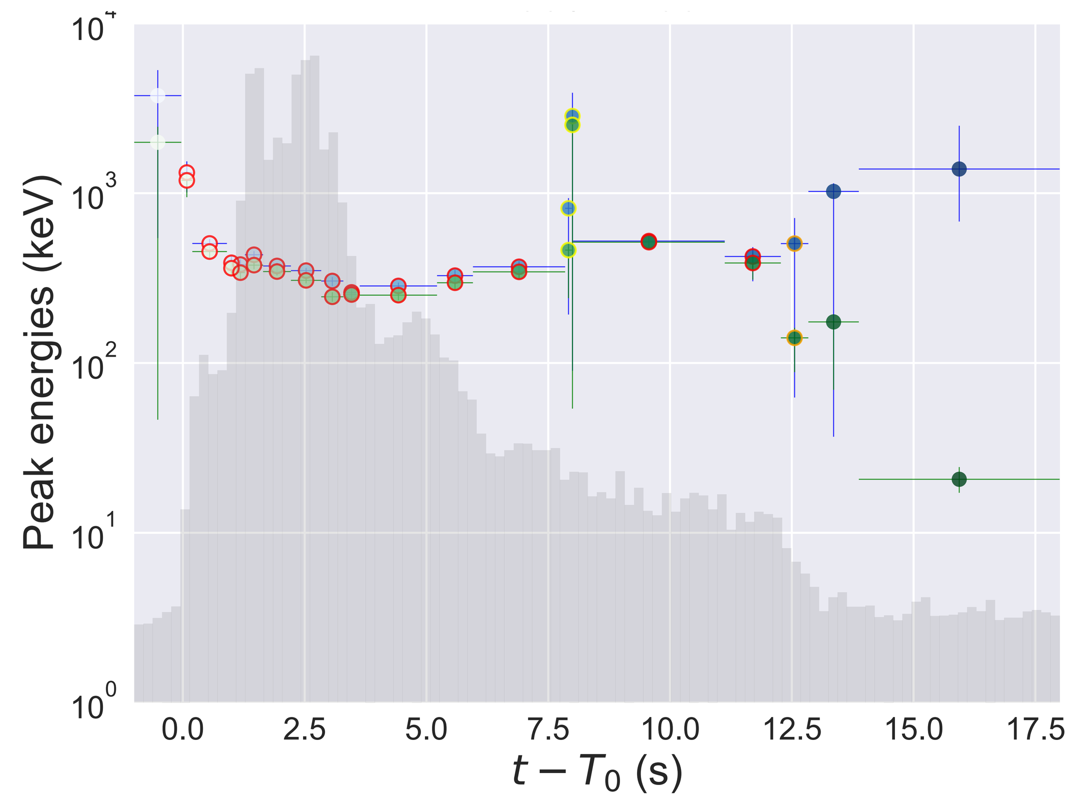
Model	α	$\log_{10}(E_p/\mathrm{keV})$	$\log_{10}(F/10^{-6}\ \mathrm{erg^{-1}\ s^{-1}\ cm^{-2}})$	$\log_{10}(E_c/\mathrm{keV})$	β
CPL	-1.07 ± 0.63	$\log_{10}(333) \pm 0.51$	$\log_{10}(1.17) \pm 0.77$	$\log_{10}(454) \pm 0.68$	...
$\mathrm{CPL}_{S\geq20}$	-0.79 ± 0.43	$\log_{10}(239) \pm 0.42$	$\log_{10}(2.87) \pm 0.44$	$\log_{10}(206) \pm 0.42$	...
BAND	-0.35 ± 0.75	$\log_{10}(178) \pm 0.61$	$\log_{10}(1.27) \pm 0.72$	...	-3.20 ± 0.65
$\mathrm{BAND}_{S\geq20}$	-0.60 ± 0.42	$\log_{10}(193) \pm 0.45$	$\log_{10}(2.89) \pm 0.43$	...	-3.24 ± 0.67

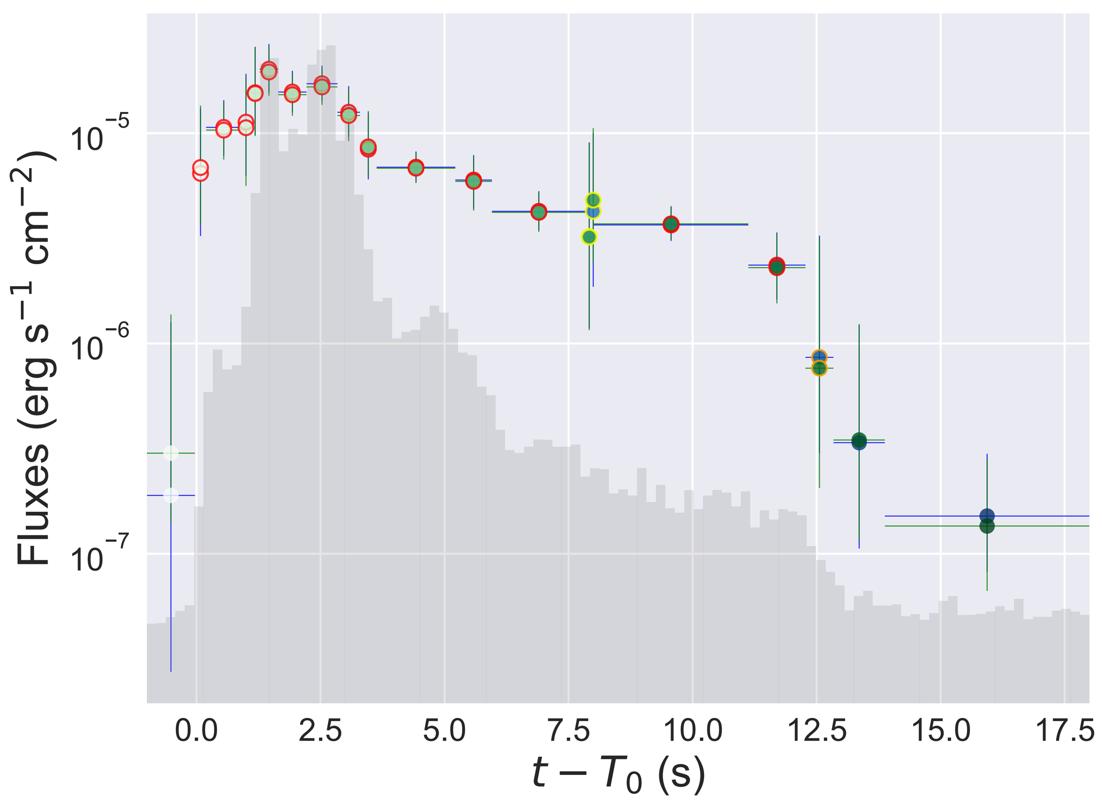
S is statistical significance for Poisson source and Gaussian background, see Vianello, G. 2018, ApJS, 236, 17





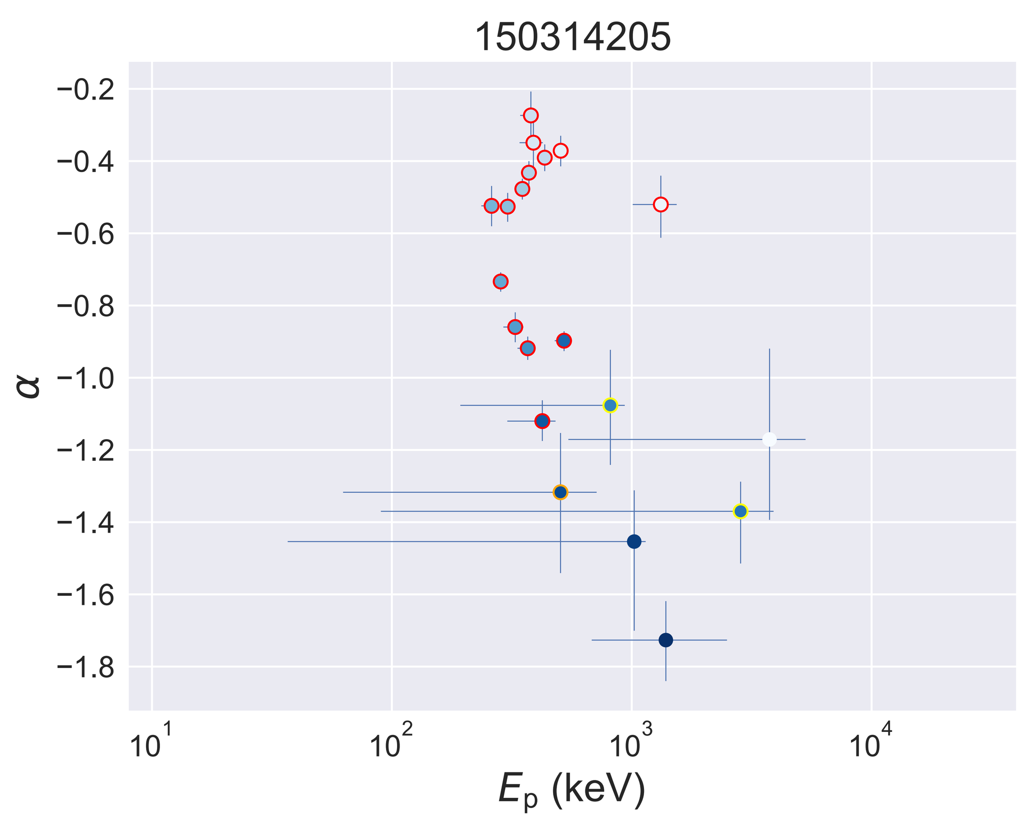


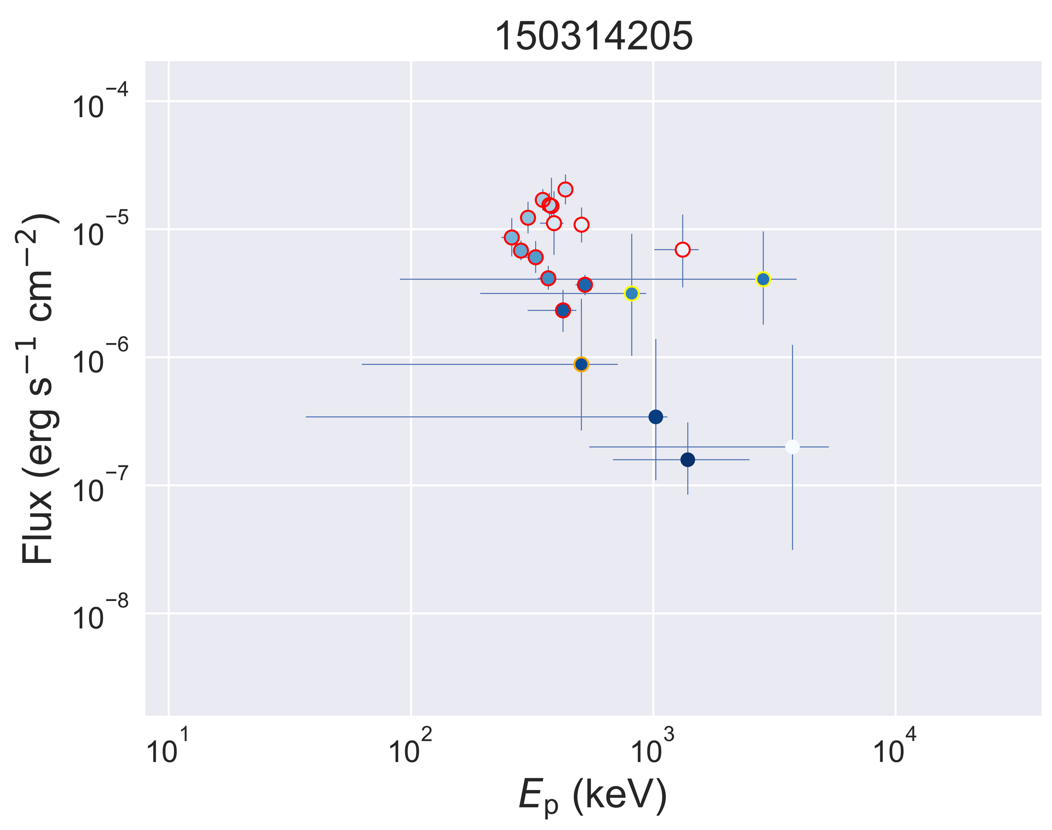


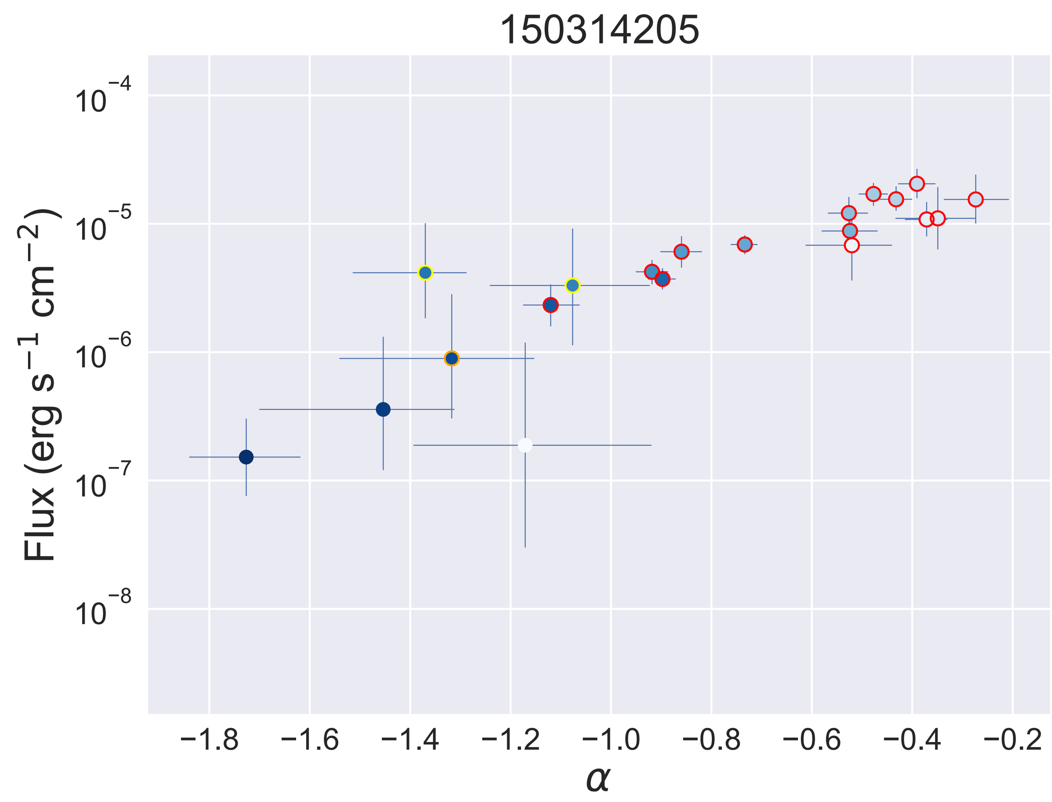


Parameter Correlations – Physical Implications?

Don't miss Felix Ryde's talk on Wednesday (Oct. 17), 3:45-4:00pm, in Loch Raven!







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