Introducing BLoCXS and Using it to Estimate Calibration Uncertainties

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Acknowledgement and Warnings

- Vinay Kashyap and BLoCXS developers!
- Very erroneous and unclear in many aspects, since I am NOT yet a
  - computer scientist/engineer
  - bayesian statistician
  - high energy astrophysicist.
- Interrupt me for questions, clarifications, corrections, suggestions, and lessons from your expertise.

Outlines

Main Objective: Introducing
Bayesian Low Count X-ray Spectral Analysis (BLoCXS)

1. BLoCXS Flow Charts
2. Planned calibration uncertainty studies with BLoCXS

BLoCXS Flow Charts

- Input / Output
- EM and MCMC

Change the screen

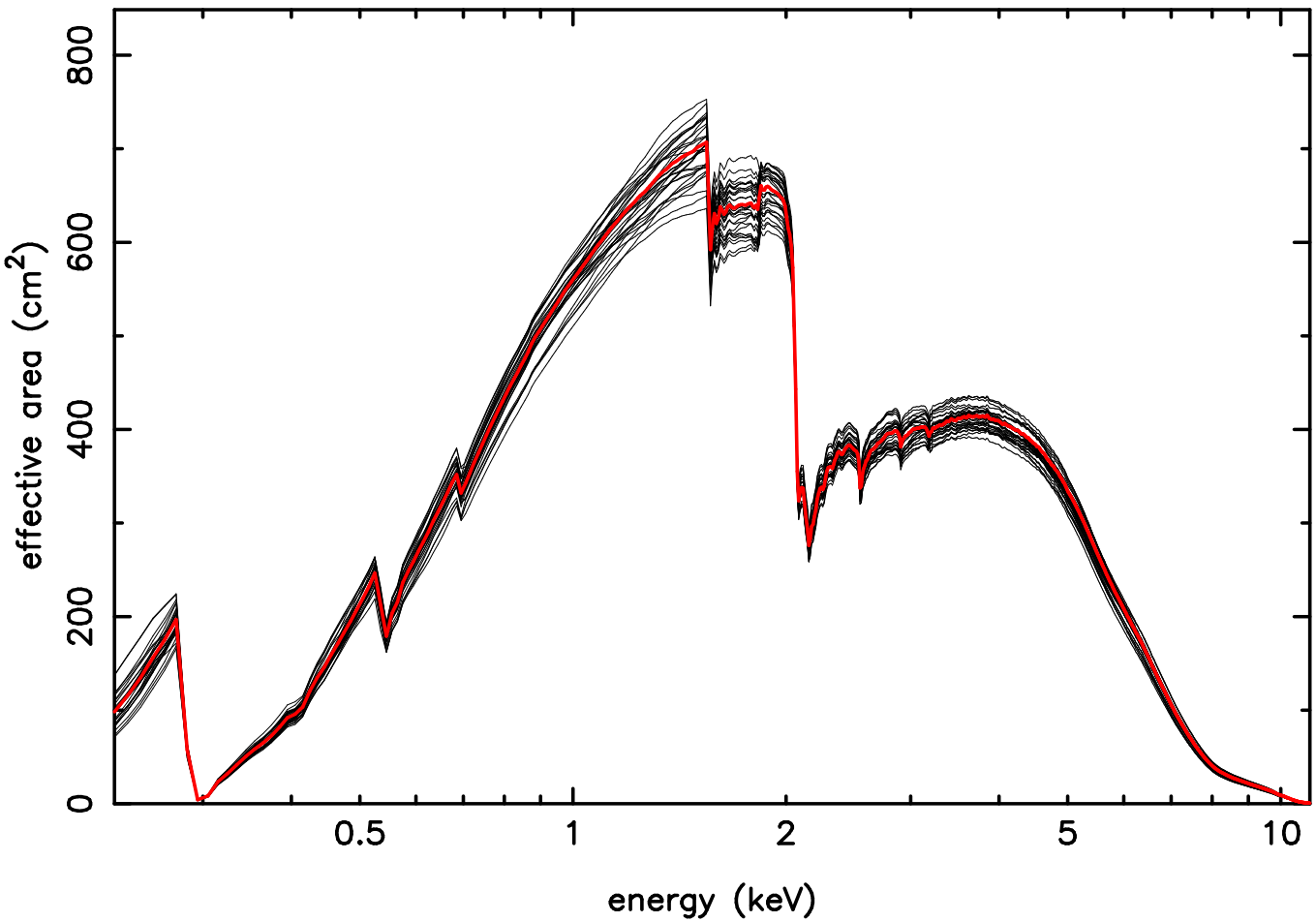
Uncertainty Calibration with BLoCXS

Changing ARFs in different ways

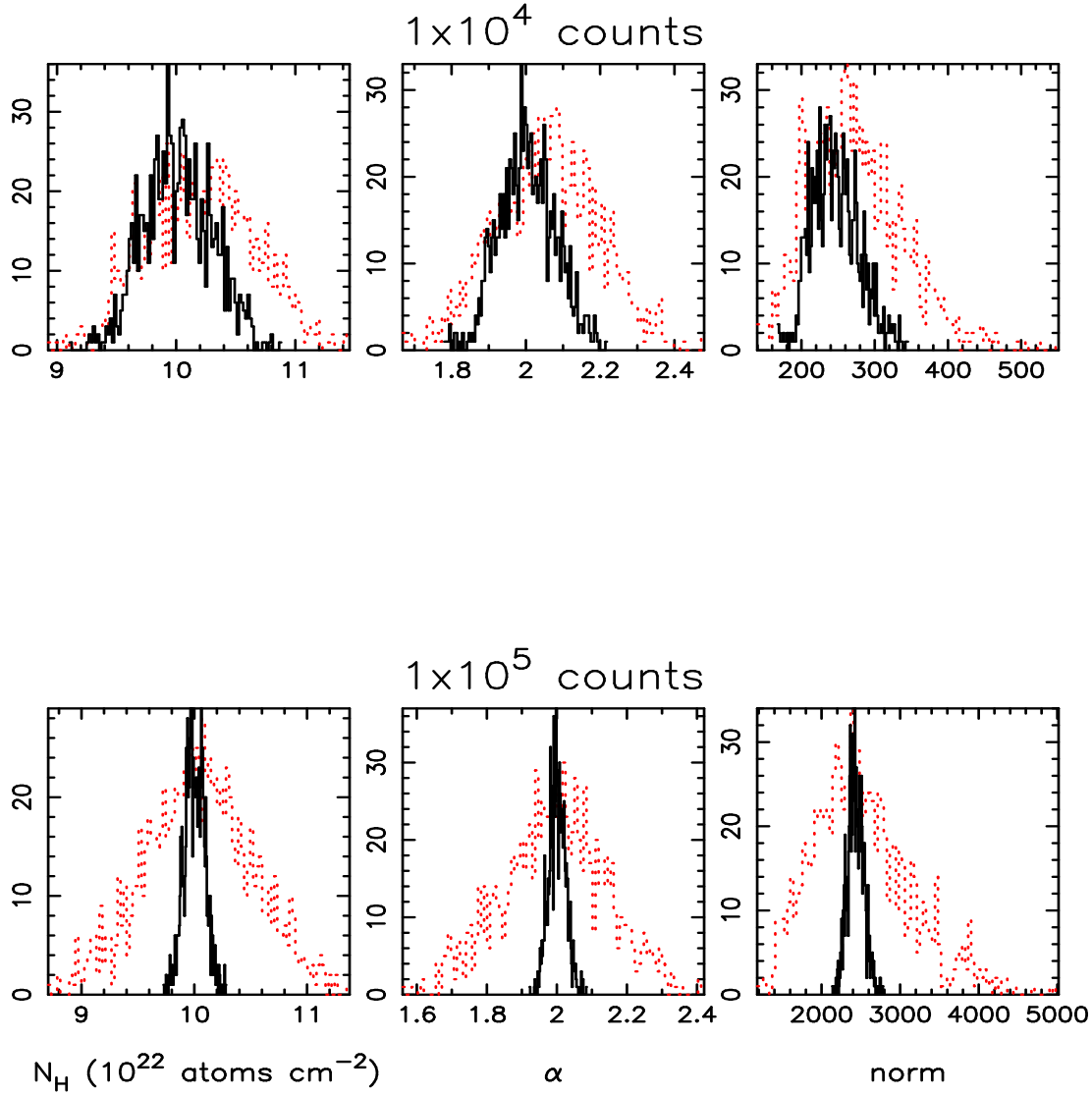
- Process with many ARFs (Multiple Imputation,?)
- Random ARFs within EM/MCMC
- Model ARFs (Rima's PCA) and use model based ARFs within EM/MCMC

Go Back to the Flow Charts

Previous Study, Drake et.al.



Absorbed Power Law : $\alpha=2$, $n_H=10^{23}$



Current Goal

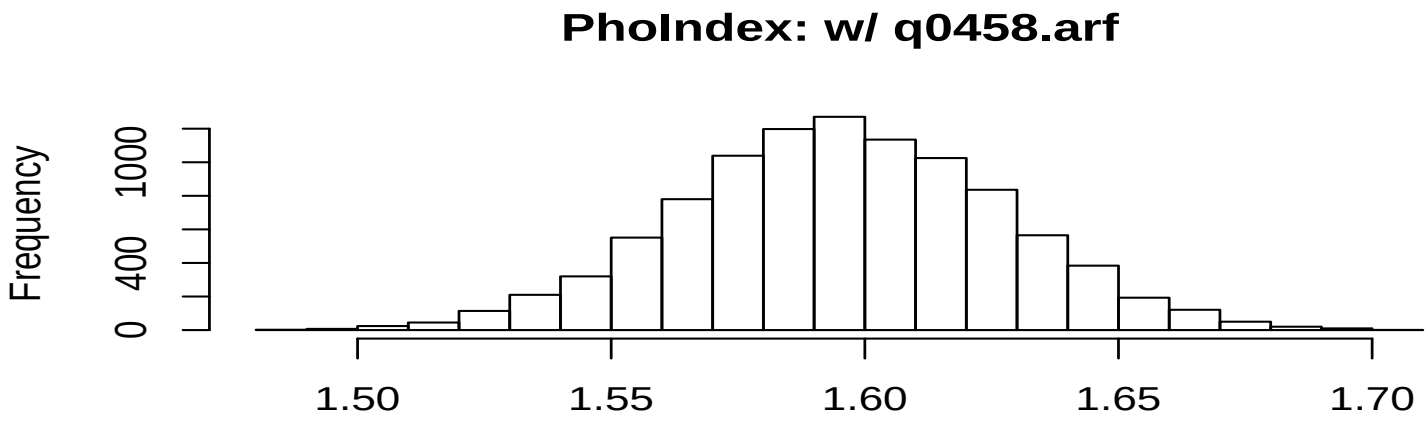
Developing Calibration Algorithms within BLoCXS!

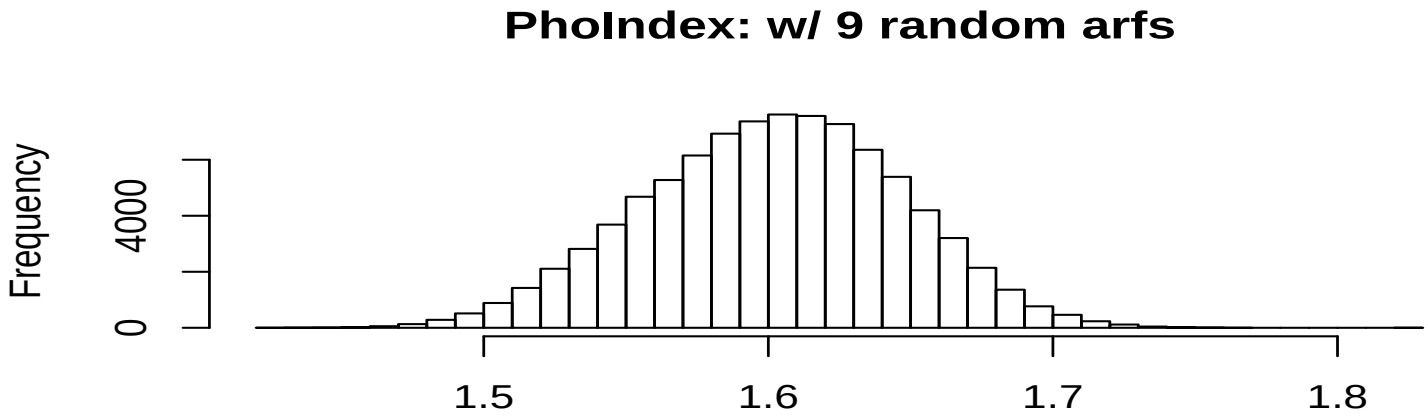
Example: q0458.pha, q0458.arf, q0458.rmf, q0458.bkg.pha (from ANETA)

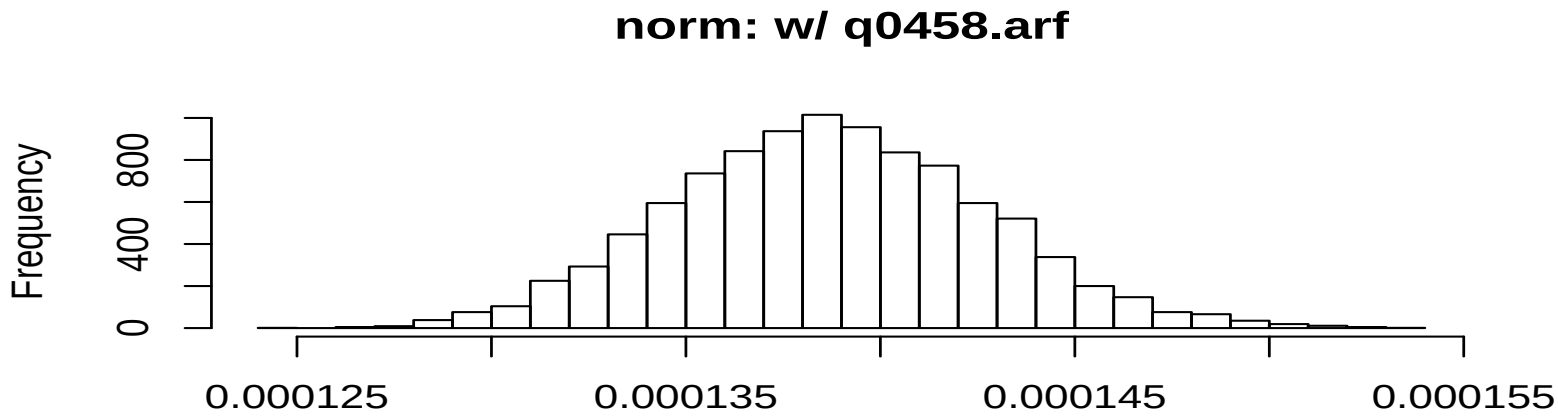
Ten peteXXXX.arf's (from Vinay)
- one arf file produced errors
(no changes in parameters and loglikelihoods)

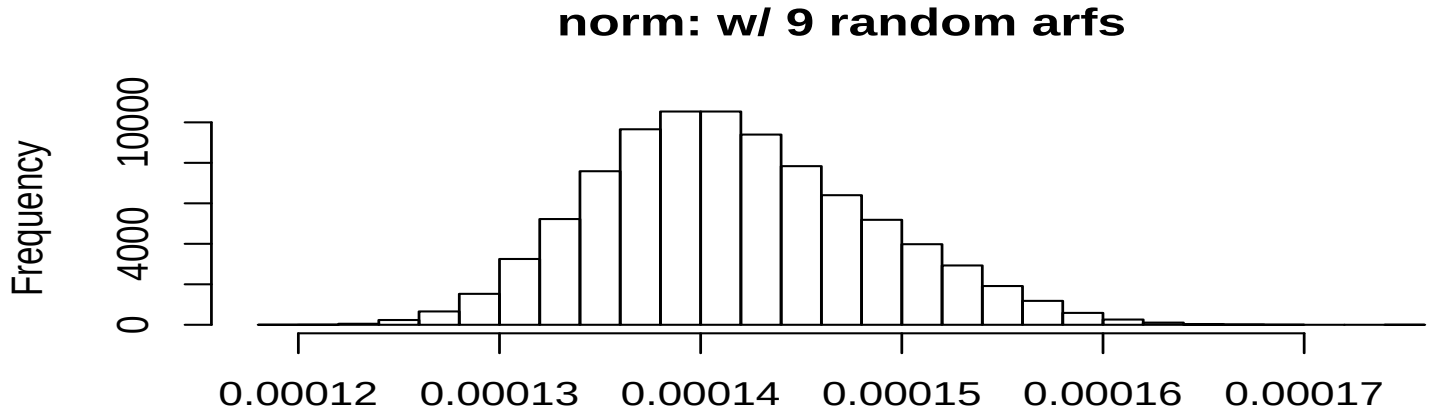
Summaries on Photon Index Draws

	mean	var	5%	25%	50%	75%	95%
q0458.arf	1.5954	0.000984	1.54305	1.57421	1.59523	1.61688	1.6467
pete0001	1.6096	0.001035	1.5569	1.58806	1.60964	1.63098	1.66276
pete0034	1.6172	0.001006	1.5658	1.59583	1.61717	1.63883	1.66975
pete0068	1.5707	0.001025	1.5184	1.54907	1.57052	1.59209	1.62435
pete0192	1.6477	0.001028	1.5952	1.62628	1.64789	1.66911	1.70106
pete0315	1.6182	0.000998	1.5673	1.5965	1.61848	1.63917	1.67065
pete0317	1.5435	0.000966	1.4928	1.52292	1.54332	1.56426	1.59538
pete0664	1.6012	0.001022	1.5484	1.57995	1.60129	1.62239	1.65373
pete0667	1.5711	0.000940	1.5202	1.55062	1.57118	1.59197	1.62151
pete0895	1.6337	0.001047	1.5807	1.61187	1.63331	1.65556	1.68721


PhoIndex: w/ q0458.arf
Frequency
0
400
1000
1.50
1.55
1.60
1.65
1.70


PhoIndex: w/ 9 random arfs
Frequency
0
4000
1.5
1.6
1.7
1.8


norm: w/ q0458.arf
Frequency
0
400
800
0.000125
0.000135
0.000145
0.000155


norm: w/ 9 random arfs
Frequency
0
4000
10000
0.00012
0.00013
0.00014
0.00015
0.00016
0.00017

Help Wanted!

- Sensible Implementation of these schemes requires feedbacks from statisticians and astronomers.
- Prior to this, thorough understanding BLoCXS is a must.
- Uncertainties in RMF, though challenges lay in matrix computation, should come along soon.