IACHEC-12
CalStat Working Group Report

Vinay Kashyap

Mailing list: **iachec-calerr@cfa.harvard.edu**

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2. The CalStat (née Cal Uncertainty) Working Group met on Mar 28

   - Keith Arnaud described future XSPEC updates
   - We discussed the Kaastra & Bleeker method of optimized binning of spectra and RMFs
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3. Roundtable discussion on Mar 29 with the goal of

   - identifying good datasets to use for Concordance
   - getting starting estimates for τ's from instrument teams

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CalStat

A forum for the discussion of statistical, methodological, and algorithmic issues that affect the calibration of astronomical instruments and how they are used in data analysis and interpretation of analysis results.

XSPEC updates

Keith Arnaud is planning updates to XSPEC that might be especially useful for calibration analyses:

- `mdefine` — flexible way to allow algebraic modifications to model library
- **Multiple responses** — e.g., break a grating RMF into high-resolution (mainly diagonal with few non-zero elements) and smaller, low-resolution (triangular to describe the tail down to low energies) RMFs
- **Response model** — allow parameterization and simultaneous fitting of response parameters
- **Modified RMF format** — should we include Kaastra & Bleeker prescription of average energy in bin and slope as part of RMF definition?
  - Answer: not yet, because unclear whether it is optimized for a particular type of spectrum, effect of Gaussian assumptions, and whether the problem it seeks to solve will still be one in 5 years. But we can discuss it with Jelle Kaastra at next IACHEC.

Concordance

A group of astronomers and statisticians are developing a method to formally identify how much and in which direction the effective areas of different instruments need to change to bring them into *concordance*.

The method is based on shrinking the disparate measurements from many instruments observing many common sources such that the information about the source fluxes are pooled together to gain insight into how discrepant each instrument is relative to an asymptotically perfect estimate.

Herman Marshall gave a plenary talk on Tuesday, Mar 28 introducing the concept and what it would take to achieve this goal. The key was that each instrument team would specify what they believe to be the magnitude of the systematic error in their calibration, and these numbers would be used, in conjunction with appropriate measurements in different passbands, to infer the corrections. These inferences are expected to guide the instrument teams in zeroing in on where their calibration should be changed.

A great many of these systematic error estimates, τ, were collected during the Roundtable discussion on Wednesday, Mar 29. Many more instrument teams have promised to supply well-thought out numbers in a couple of weeks. The next stage of the concordance effort will be to start gathering suitable datasets (e.g., the stacked clusters dataset from Jukka Navaleinen).

Concordance (contd.)

The immediate goal of the Concordance Project members is to publish the method in a Statistics journal, followed by exemplar applications to be published in an Astronomy journal.

Additionally, they plan to account for various complicating effects like

- gracefully handling measurement outliers using the log-t distribution in place of a log-Normal, as discussed in detail by Xufei Wang during the Working Group meeting; and
- including a measure of cross-band covariance from MCCal such that information can be usefully borrowed from measurements made in multiple passbands.

The list of τ's compiled during the Roundtable follows.

This is a preliminary version and is subject to change!

The Matrix (p. 1)

	Chandra ACIS	Chandra HETGS	XMM pn	XMM MOS1	XMM MOS2	Swift WT	Suzaku XIS0
.15-.33	3	—		20			
.33-.54	3	—		10			
.54-.8	3	0.10		5-6			
.8-1.2	3	0.05		5-6		5	
1.2-1.8	2.6	0.04		5-6		wait	
1.8-2.2	3.3	0.04		5-6			
2.2-3.5	3.3	0.04		5-6			
3.5-5.5	4.9	0.05	<6KEV: 2	5-6			
5.5-10	(MIGHT MULTIPL	0.07	>6KEV: 3	10			

The Matrix (p. 2)

	Suzaku XIS1	Suzaku XIS2	Suzaku XIS3	Astrosat SXT	spi	Swift PC	XMM RGS
.15-.33	20	—					—
.33-.54	10	—					8
.54-.8	10	10					5
.8-1.2	10	10		10		5	5
1.2-1.8	10	10		wait		wait	5
1.8-2.2	4	10					—
2.2-3.5	4	4					—
3.5-5.5	4	4					—
5.5-10	4	4			25-50kev : 2 (ask)		

The Matrix (p. 3)

	LETG HRC-S	BAT	ROSAT PSPC	RXTE PCA	INTEGRAL IBIS	NuSTAR	HX D
.15-.33			10			-	
.33-.54			10			-	
.54-.8			10			-	
.8-1.2			10				
1.2-1.8			10				
1.8-2.2			10				
2.2-3.5				5		—	
3.5-5.5				10		4	
5.5-10		20-40—4		3		3	(ask)
10-20		15		3	20-40 kev: 3 (wait)	3	20-40: