2021 Nov 10

IACHEC Virtual Fall Meeting: November Plenary

Calibration Statistics (Vinay Kashyap*/Sam Sweere/Herman Marshall)

Clusters of Galaxies (Eric Miller)

Coordinated Observations (Karl Forster)

Communications & Discussion (Kristin Madsen)

6-8am PST / 9-11am EST / 2-4pm GMT / 15:00-17:00 CET / 7:30-9:30pm IST / 9-11pm JST

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Calibration Statistics Working Group

Status report, *Vinay Kashyap (CXC/CfA)*

AI-Assisted Super-Resolution and De-Noising for XMM-Newton EPIC-pn, *Sam Sweere (XMM SOC/ESAC)*

Concordance Update, *Herman Marshall (CXC/MIT)*

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Previously, on Cal Stats WG…

- See the Pandemic report (Madsen et al. 2021, arXiv:2111.01613) for details.
- Virtual WG meetings, special session at AAS, talks at AAS, JSM, CHASC
- Several sub-group meetings, mostly on Concordance, also on Cal Uncertainties.

- Website: https://iachec.org/calibration-statistics/
- Slack channel #calstats
- Mailing list: iachec-calstats@cfa.harvard.edu

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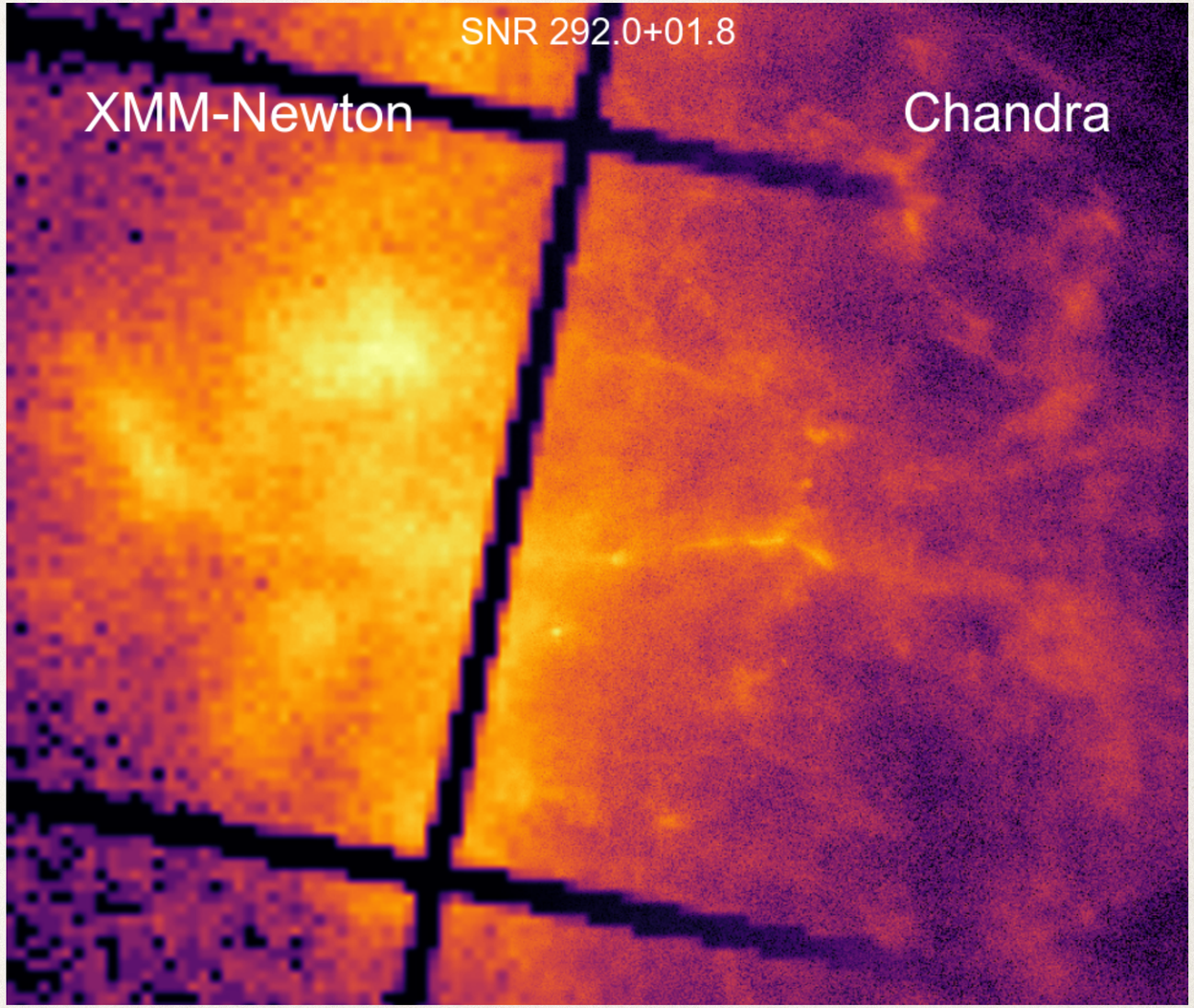
Today: teaser trailer for ML talk

- Talk on ML by Sam Sweere (XMM SOC/ESAC): AI-Assisted Super-Resolution and De-Noising for XMM-Newton EPIC-pn
  - The field of AI image enhancement has been rapidly evolving over the last few years and is able to produce impressive results on non-astronomical images. My research looks at applying these techniques to enhance XMM-Newton X-ray images. Specifically, having an AI-model increase the resolution and denoise the images with the goal of increasing their scientific value. During the talk, I will touch on the processes, initial results, and challenges of super-resolution AI models for XMM-Newton.
  - **Full talk on Dec 1 at 9am EST/ 3pm CET**



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Today: Concordance update

Concordance: In-flight Calibration of X-Ray Telescopes without Absolute References

Herman L. Marshall[1], Yang Chen[2], Jeremy J. Drake[3], Matteo Guainazzi[4], Vinay L. Kashyap[3], Xiao-Li Meng[5], Paul P. Plucinsky[3], Peter Ratzlaff[3], David A. van Dyk[6], and Xufei Wang[5]

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Abstract

We describe a process for cross-calibrating the effective areas of X-ray telescopes that observe common targets. The targets are not assumed to be "standard candles" in the classic sense, in that we assume that the source fluxes have well-defined, but a priori unknown values. Using a technique developed by Chen et al. that involves a statistical method called *shrinkage estimation*, we determine effective area correction factors for each instrument that bring estimated fluxes into the best agreement, consistent with prior knowledge of their effective areas. We expand the technique to allow unique priors on systematic uncertainties in effective areas for each X-ray astronomy instrument and to allow correlations between effective areas in different energy bands. We demonstrate the method with several data sets from various X-ray telescopes.

Unified Astronomy Thesaurus concepts: Flux calibration (544); Astronomical methods (1043); X-ray astronomy (1810); Calibration (2179);

Cal Stats WG: Future Plans

- Looking for volunteers to become Vice Chair
- Cooperation with other IACHEC WGs
  - *Hi-Res*
    - on characterizing and incorporating atomic data uncertainties into analyses
    - on building better and faster RMFs
    - curated library
    - AAS240+LAD and HEAD-19 Special Sessions
  - *Detectors and Background*
    - to make generic background model files and modeling procedures widely available via wiki page (e.g., pointers to .xcm/.shp files like Suzuki et al.'s ACIS-I/S, see https://github.com/hiromasasuzuki/mkacispback)
    - threads on using background (e.g., Swift/XRT WT, Chandra/LETGS+HRC-S, etc.)
  - *Timing*
    - threads and descriptions of methods
- Statistics applied and theory projects:
  - Concordance enhancements (like time variability, more applications)
  - uncertainty parameterization for more instruments (MCCal for AstroSat, RMF modeling of XMM RMFs); improve pyBLoCXS compatibility to cal data
  - Make cstat goodness-of-fit more robust and generally applicable
- Continue with Statistics and Machine Learning talks of interest to IACHEC (NEXT: Sam Sweere, Dec 1)

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