CUC Meeting Report 10/23/14

Chandra Status Report

Roger Brissenden summarized the current status of the the Chandra mission. We are delighted to hear about the continued spacecraft health, robust operations, and the potential for a 25-year mission as assessed by Northrop-Grumman. The 15-year Symposium is a much-anticipated celebration of Chandra's contributions, and an opportunity to discuss future directions. We are enthusiastic about the CXC's efforts to gather community input, and especially recommend consideration of how to adapt to modest spacecraft constraints and emerging fields of interest.

In this presentation and those that followed, the evolution of the thermal stability of the spacecraft and the quantum efficiency of the detectors emerged as key issues that affect the long-term planning of Chandra science directions.

Observations and recommendations:

i. Thermal stability of some spacecraft components has been addressed thoughtfully and in great detail, ensuring optimal observing efficiency even under strong spacecraft operation constraints. In particular, continuous changes in the pitch angle have been employed in scheduling the observations such that the temperature of spacecraft components can be maintained within acceptable limits. This has required and will continue to require an increasing number of carefully planned split observations. Both the software and the source catalog teams have already developed techniques for dealing with this. We encourage them to consider this to be the standard observing mode for the future, and to make the user community more aware of this reality. In addition, we strongly endorse maintaining the staffing levels in the current science and flight mission planning teams since this is essential for the optimal operation of Chandra and for ensuring broad science returns.

ii. The loss of low-energy response due to the contamination of the ACIS filters has been significant. This might indicate that observations requiring these wavelengths should be performed sooner, rather than later. This development could be highlighted during the community discussions and peer review.

iii. In light of the strategies required to maintain thermal stability, supporting the ToO and constrained observations now requires more effort. We recognize the difficulty this causes in scheduling and highlight the importance of maintaining staffing so that the current ability to execute ToOs and constrained observations is sustained. In a period when the community is likely to move increasingly towards time-domain investigations, the potential demand for more such observations should be a topic of discussion in the upcoming symposium, and the CXC should consider the additional resources and trade-offs which would be necessary to support these science directions.

The effects of evolving spacecraft constraints dominate the ability to carry out constrained and TOO observations while maintaining high overall observing efficiency. The Mission Planning team continues to investigate scenarios to accomplish these potentially-conflicting requirements, most recently extending the time period over which detailed schedules are generated (from one-week to two-week scheduling intervals) in order to better manage thermal constraints with long time constants. Experience with TOO programs under this new scenario is still being acquired, but will be assessed following a longer period of operation.

We have recently developed code for tracking trends in meeting observing constraints and preferences that we are using to better understand future prospects in this area. In addition, we have begun an assessment of past TOO response times and scheduling difficulties in order to consider factors that may impact future abilities. Along with these investigations, we will work with the Flight Operations Team to consider other potential streamlining of the planning and replanning process in order to support such observations. We will provide the CUC with updates based on these investigations. We note that responses to fast replanning requests is largely set by the overall spacecraft and mission design. With long maneuver times and limited spacecraft communications, it is unlikely that the fastest possible response time for TOOs can be improved significantly, for example.

iv. The CUC strongly endorses the current public outreach program, which continues to have an impressive visibility on social media, via award-winning podcasts, traveling exhibits, and through a highly engaging website. We also strongly support the efforts by the CXC Management to restore funding for outreach, which was inadvertently cut in FY14 along with Education funds. This program is a crucial component of the scientific mission and should be funded at a level which preserves our ability to inform the public of new discoveries and teach a new generation.

Chandra Source Catalog Version 2

Ian Evans updated the CUC on progress toward the release of version 2.0 of the source catalog. This next version of the catalog will differ from the prior catalog in numerous ways, but most importantly that it will dive deeply into stacked observations to enable robust detections of faint sources.

The project is far behind schedule. It has slipped another 6 months within the last 12 months. The CUC learned that *algorithm development* is “mostly finished” and that production would start in December 2014, with an eventual full release in late 2015. This schedule, and others presented to the CUC, assume that no difficulties or bugs will arise with various algorithms and the production process. Other projections, e.g., the time required for quality assurance prior to release, seem equally optimistic.

Comments and Recommendations:

i. The CUC feels that this project has been very ambitious in scope from its inception, and that opportunities to revise goals or to adopt faster strategies have not been pursued. Within the constraints of a flat budget, it is not clear that the current approach can reach a conclusion before competing pressures cause it to be abandoned.

The content of release 2 of the CSC was guided by the highest priority updates requested by the CUC following release 1, with significant descopes applied by the CXC in areas that we thought would not be feasible in a reasonable time. We recognized at the time this would require a complete migration from the release 1 pipeline, since the latter was based on CIAO 3 era infrastructure and could not be maintained simultaneously with the development of the new system.

As noted in the CUC meeting presentation, algorithm development and implementation through candidate source detection and evaluation is completed, although some "corner-case" bugs have been identified and have been/are being fixed. Pre-production simulations necessary to calibrate some of the algorithm parameters was underway (and is now mostly finished), and the final pre-production test runs and feedback had begun (and are now well underway). The schedule has slipped ~6 months since the previous year, although (also as noted in the CUC meeting presentation) roughly half of that delay was due to computer hardware and network issues that were beyond the scope of the CSC team to address.

ii. We recommend that the CXC consider focusing an initial release on large contiguous programs where the data are obtained in a homogeneous manner and therefore easier to process to source catalogs. There may also be fields that have *not* been observed multiple times, obviating difficulties of stacking etc. The CXC should also consider processing these simple fields as part of a separate and/or rapid-release catalog.

As described in the CUC meeting presentation, we plan to make available per-stack detections to the user community in FITS binary table format as phase 1 production progresses. The algorithms that implement detections on stacked datasets are in place and have been extensively-tested, so the suggested prioritization offers no significant benefit.

An example of detections on a stack of 44 observations of Sgr A is attached (see below).*

iii. The CXC Management should identify means of making sure that the catalog personnel are full-time on the catalog. The CXC Management should also identify personnel that can help to speed along completion of the catalog without requiring significant training. Sherpa and CHIPS development can reasonably wait until the catalog has advanced.

As discussed at the CUC meeting, personnel working on the CSC all have other duties; most of the senior catalog team members have key CXC operational

roles in support of the live Chandra mission. We will adjust the priorities for non-operations-critical work to ensure that the CSC moves forward as fast as possible.

iv. We recommend that the catalog team report directly to the mission director at a high cadence.

The full catalog team meets each week to ensure that the catalog work is proceeding and to quickly address any issues. At the director's request, we will provide a brief report of current actions, issues, and schedule to the director following each meeting.

v. The volunteer team that is looking into the quality of the output for 150 sources from a very early trial should be retained, and should also be asked to help speed along the any rapid-release catalogs. Once this QA is finished, a wise decision can be made as to whether any algorithmic changes are truly necessary before a catalog release. We recommend allowing for a significant period of time after release to respond to critiques and suggestions from the community and possibly an updated minimal catalog release before continuing on to develop more complex data products. This period will provide a powerful assessment and functional improvement of the catalog by the most committed users.

The evaluation of the pre-production test run of 150 stacks of observations by the volunteer team was very positive and yielded very few unexpected results (the most significant of which was due to ongoing network issues that resulted in detections being lost - a circumstance that we now check for). This was the response that we expected, because the process we use to develop the catalog pipelines includes continuous testing, review, and quality assurance, so there should be very few anomalies remaining at this stage. The independent external check provides additional confidence that we are ready to go to production for release 2 in the near term.

We follow a front-loaded testing and quality assurance process because phase 1 production (candidate source detection and evaluation) of release 2 will require several months to complete. An iterative approach based on post-production feedback is simply not feasible (cf. XMM catalog production, which runs much more quickly and can therefore use of an iterative process). BTW, this also explains why post- production quality assurance does not require a significant amount of time essentially all quality assurance is performed during the development and production phases so any issues are caught and fixed early. Since this same front-loaded approach was used for release 1, the production and quality assurance workloads for release 2 can be scaled directly from that experience.

vi. The CUC expects that production should be underway by April 2015 and requests a telecon at that time, to discuss and assess progress on the catalog.

The catalog team as a whole is working very hard to complete release 2 of the CSC. Members of the CSC science team are voluntarily donating their own research time to complete the catalog. Similarly many of the technical staff (e.g., software developers)

are voluntarily working additional hours to ensure that release 2 development remains on track and production commences in the near term.

vii. We recommend advertising the upcoming catalog release at the 15 years of Science with Chandra Symposium, at the Winter 2015 AAS, and then widely to the community (depending on the outcome of the April 2015 progress report).

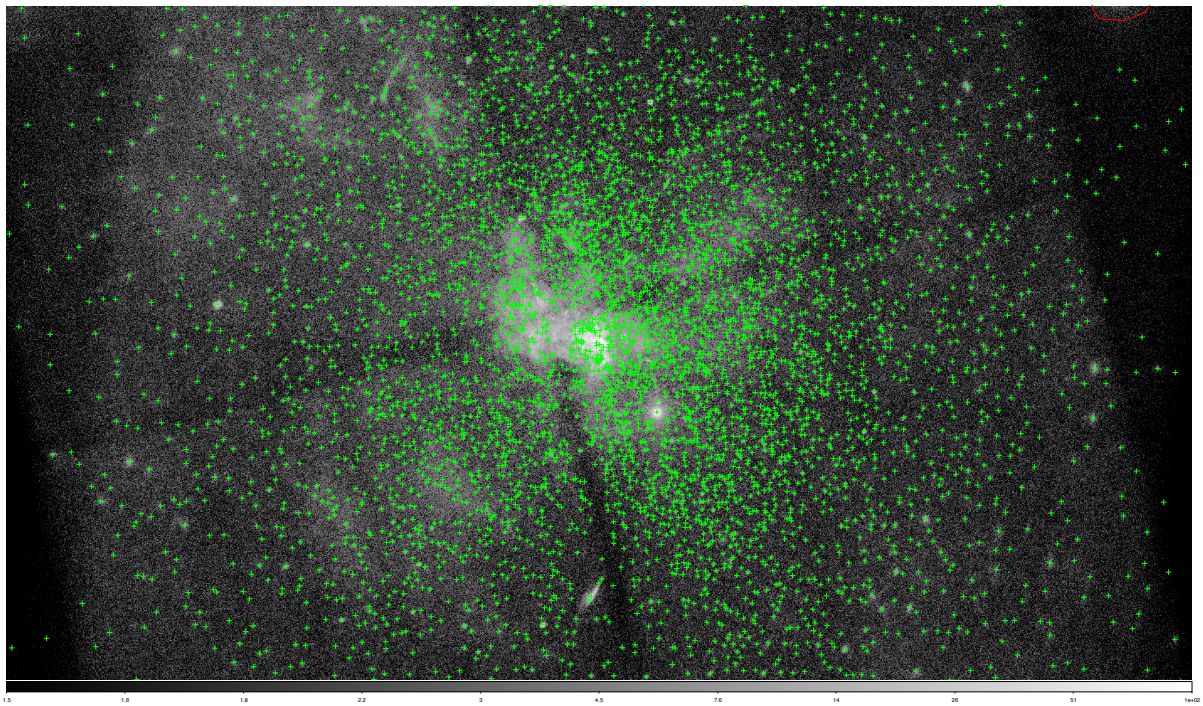
We had a poster advertising release 2 of the CSC at the Chandra booth at both the 15 Years symposium and the winter AAS. We are planning a more detailed announcement at the summer AAS and in our regular e-bulletins once results from phase 1 production are available.

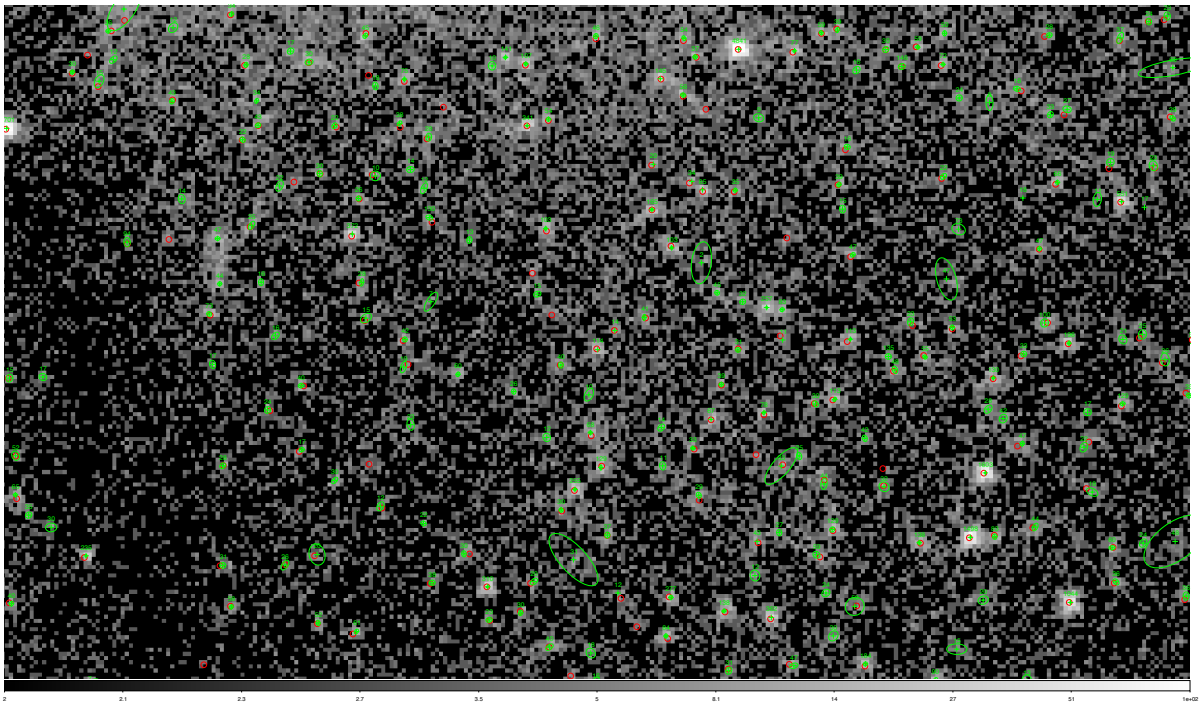
Further Details from the CSC Team

Attached are 2 PDF files that show the detections on a region of the Sgr A field, comprised on a stack of 44 ACIS observations, from a recent pipeline stress test run.*

The first image shows the stacked data, together with the positions of the detections identified. Although the significance of the likelihoods have yet to be calibrated in detail, all of the detections shown have preliminary classifications as "true" or "marginal" sources. There are roughly 28% more sources identified than in the Muno et al. (2009) catalog in the same area.

The second image zooms in on a region of the field to the South of the core. The green crosses indicate the fitted source positions, with error ellipses shown in most cases (error ellipses were not generated in all cases in this test run). The red circles shows the source positions from the Muno et al. catalog. A number of sources not present in the Muno et al. catalog are clearly visible in the stacked images, and are detected CSC test run.





Mission Planning

The CUC heard a report from Pat Slane on mission planning. Chandra now accepts up to 15% of constrained observations and up to 80 ToO observations (8 very fast, 20 fast, 26 medium, 26

slow). These restrictions on constrained and ToO observations are dictated by the complexities of scheduling the observations, which, in turn, are related to managing the attitude of the spacecraft so that it cools effectively while continuously pointing its solar panels towards the sun. In practice, the longest continuous exposures are 50 ks for a broad range of pitch angles (70-120), but longer exposures are possible for large pitch angles.

Recommendations

i. The CUC feels that the current level of ToOs and constrained observations accepted by Chandra is good and that it is important to maintain this level. With this in mind, we endorse maintaining the staffing levels in the current science and flight mission planning team since this is essential for keeping up with the ToO requests as well as planning constrained observations. We also note the general trend in the community to undertake more time-domain projects. This trend will probably increase the demand for ToO or other types of time-critical observations in future proposal cycles.

The Einstein Fellowship Program

The CUC wishes to acknowledge Andrea Prestwich for her excellent guidance and oversight of the Einstein Fellows program over the past several years.

An update on the Fellows program was given by its new director, Paul Green.

The CUC took a broad view of the program in this meeting. In the view of the CUC, the following things are clear concerning the Einstein Fellowship:

- The program is highly valued by the community, with 180-200 applications arriving annually for just 10-12 fellowships.

- The program managers and panelists have done an excellent job of ensuring that the selected fellows include a broad representation of the diverse science that is done with all of the Physics of the Cosmos missions.

- The program is essential to helping young scientists to develop science that supports the PCOS missions, and to personally develop as scientists. A very high fraction of past Chandra and Einstein fellows are now active and influential scientists, driving PCOS science forward. The contrast between this success rate and general placement rates within the field serves to demonstrate the importance of this program in fostering both science and emerging scientists.

Recommendations:

i. The CUC endorses the Einstein Fellows program in the strongest possible terms. It is an unqualified good, and is essential to the scientific future of the field in every sense.

ii. The CUC maintains that spreading expertise and promoting PCOS science and scientists broadly is very important. The limit of one fellow per host institution per year serves to help PCOS science diversify and grow, and limits destructive competition between fellows. We oppose any changes that would concentrate fellows at only a few institutes.

iii. We recommend the collection and publication of the statistics of applicants' career success; this would help to sustain the funding for this program.

iv. We recommend that the program continue to pay attention to gender balance and other criteria for the selection committee, and look into encouraging minorities to apply for the fellowship.

The CUC's enthusiastic support of the Einstein Fellowship Program is greatly appreciated. We have begun to track the career paths of former Fellows, and will work to backfill basic data for up to 10 years after each the fellowship, for statistical information as the program goes forward. The program continues to promote diversity in the program while sustaining the mission of optimizing PCOS-related science.

Proposal Cycle Results and Future Plans

Andrea Prestwich has ably taken over management of the proposal review process from Belinda Wilkes, and she presented the CUC with numerous updates and questions.

Importantly, the over-subscription of the mission remains high, at 4.8, though this number is artificially low owing to the fact that some Cycle 17 time was allocated to make room for an X-ray Visionary Projects (XVP) category.

It is also impressive that about 8% of the proposals in each cycle are submitted by first-time Chandra users. This demonstrates that Chandra continues to connect with new fields and new scientists.

Recommendations:

i. Proposal pressure in the Large Programs (LP) category remains higher than in the XVP category, and, in fact, the over-subscription of the XVP category has declined. We recommend that another round of XVP not be considered earlier than Cycle 19. This will allow the most pressing science projects in the LP category to be carried out. We also recommend that there be *no* limit on the size of LP proposals so that strong, ambitious programs can still be proposed and considered by the science panels and big-projects panel (BPP). We feel that the current practice of having LPs reviewed by the science panels and then re-considered by the BPP, which then makes the time allocation, is a good one and we recommend that it be continued. Leading up to Cycle 19, we urge a careful evaluation of scientific returns from the LP and XVP categories, in consultation with the CUC, before initiating a new XVP call.

The Cycle 17 Call for Proposals does not include XVPs and there is no limit on the size of LPs. We have started an in-depth study of the effectiveness of programs as a function of their size. We plan to have preliminary results in the summer of 2015, in time to inform the decisions for the Cycle 18 Call for Proposals.

ii. We strongly endorse the continuation of archival and theory programs, at their current funding levels. These programs return critical science at a modest cost to the mission that cannot be covered by other programs or funding agencies.

There are no plans to change the level of support for the Archive and Theory programs.

iii. The CUC reviewed the way in which funding is allocated to observing programs, and find that the formula is reasonable. The "level of difficulty" assessed by the TAC could be misinterpreted as a comment on the feasibility of the observation, rather than the level of effort required to analyze the observation. We request that wording be adopted and a verbal clarification made to peer review panels to communicate that this is an assessment related to effort and funding, not observational feasibility or importance.

The current text says "Degree of effort required to achieve analysis goals ". This will be updated to read "Degree of effort required to achieve analysis goals (flag used to adjust funding if proposal is approved)". This flag will also be mentioned specifically in the Plenary Session.

iv. We endorse the CXC Management recommendations for updating the evaluation of GTO proposals on conflicted targets in order to streamline this process. We approve of the submission of GTO proposals to the peer review panel without being "disguised" as GO proposals. As before, only the fact that there is a competing proposal with the same target(s) should be communicated to GTO teams and not the specifics of the conflicted GO observation. The GTO teams should continue to have 2 weeks to write a proposal for a competing target.

v. The Senior Review recommended the creation of "Key Programs". While Chandra has traditionally encouraged "legacy" projects, or those that require lengthy observations, creating "Key Programs" at the CXC Management level would mark a break from the way that Chandra has achieved these goals in the past. The XVP and LP categories have fulfilled this role to a large extent in past observing cycles. In the view of the CUC, these categories have the advantage of allowing the community to decide which science is most pressing, rather than taking that decision at the level of the CXC Management. In addition to continuing with current practice, the CXC Management could solicit input on key science topics at meetings, and perhaps through a call for white papers from the community.

The CXC has solicited input from the community on key science for the next 10+ years of Chandra observations in various ways:

1. *run a session at the 15 years of Chandra Science conference entitled: "The next 10+ year of Chandra Science" with invited speakers, primarily from the 2010 decadel survey panels: Roger Chevalier, Daniel Wang, Meg Urry, David Weinberg, and Eric Feigelson. The speakers summarized key science identified in the decadel survey which Chandra should/could address over the next 10+ years, followed by a discussion with the conference attendees. A summary will be developed as a guide to our future plans.*

2. *requested (verbally and by email) input from the Einstein Fellows on science Chandra should be doing over the next 10+ years so as to obtain input from young scientists in the field.*

3. *we plan to study the proposals submitted in recent and this upcoming cycle for any important topics identified by the above processes that are either not being proposed or not being approved, and thence to consider how to update our proposal categories or processes to ensure they can be proposed and selected.*

4. *we agree with the CUC that the identification of key science topics may be a useful tool to focus the community's attention on areas that we conclude are important but are not being sufficiently represented in approved proposals. We could, for example, specify a minimum amount of observing time to be allocated to proposals covering specified key science topics.*

We will plan to discuss our findings and future planning with the CUC at the next meeting.

vi. We strongly endorse the continuation of the DDT program at its current level. Presentations made to the CUC show that the DDT program greatly enhances the reach of the mission and supplements science programs that are highly time-sensitive. Accepted DDT proposals from the past year targeted a broad array of science, including: exoplanets, young and main sequence stellar science, AGN, supernovae, gamma-ray bursts, and a variety of compact objects.

vii. We encourage Chandra to continue the pursuit of a joint program with ALMA, and with the coming Astro-H observatory.

viii. Finally, we strongly encourage the mission to protect the overall level of GO funding, and only consider reduction as a last resort.

Calibration

Larry David gave a comprehensive review of the calibration updates over the past year, as well as of the plan for future calibration activities. The range of ongoing activities is impressive. It shows once again the need for a continued monitoring of the instrumental performances to ensure the highest reliability of the scientific results yielded by Chandra. The CUC was extremely pleased to see reports of new results stemming from continuous efforts to:

- Characterize the time-dependence, spatial, and spectral properties of the contaminant on the ACIS filters. The recent updates of the contamination model represent a major achievement, given the challenging nature of this problem - that the CUC fully appreciates.

- Implement the calibration of a ACIS temperature-dependent gain correction to cope with the new operational constraints imposed by the thermal stability of spacecraft components.

- Refine the LETG/HRC-S effective area by releasing new QE maps in the near future.

- Provide clear guidelines on how to reduce and analyse ACIS CC Mode data. This will ensure the optimal scientific exploitation of data taken in this mode.

- Achieve a full understanding of the internal cross-calibration status

Recommendations:

- 1 The list of future calibration activities presented by Larry David is truly impressive. The CUC encourages the Chandra project to pursue investigation on all these areas. Should the future evolution of the CXC staffing impose the need for priorities, the CUC recommends that higher priority shall be given to:

  - Continuation of the efforts to monitor the evolution of the ACIS filter contamination, and achieve a full characterization of its spectral and spatial properties.

    The calibration of the contaminant on the ACIS filters is currently one of the highest priority items within the calibration group. We agree with the CUC that the calibration of the ACIS contaminant should take precedence over other calibration issues since the vast majority of Chandra observations are carried-out with ACIS.

    As mentioned at the CUC meeting, the properties of the contaminant on the ACIS filters continue to change, probably due to the changing thermal environment of the telescope. We have already been forced to make an adjustment in calibration priorities in regards to additional calibration observations and time spent by calibration scientists improving the ACIS contamination model. Over the past two years, we have added finer grid ACIS raster scans of Abell 1795 and large dither LETG/ACIS-S observations of Mkn 421 to help calibrate spatial variations in the depth and chemical composition of the contaminant. We presently spend about 400 ksec per year (out of a total of approximately 700 ksec calibration time per year) on observations tailored to calibrate the contaminant on the ACIS filters. In the past, we released an average of one update to the ACIS contamination model per year. As shown at the CUC meeting, the basic properties of the contaminant on the ACIS filters (i.e., chemical composition, condensation rate and spatial distribution) have changed more rapidly over the past couple of years, so one update per year is no longer adequate. The calibration team has therefore decided to release at least two updates to the contamination model every year. We will also assess if more calibration time is required to fully map the properties of the contaminant across the ACIS filters.

- Investigation of the ACIS energy resolution and plate scale at high temperature, and implement a calibration thereof if required.

  The calibration team recently completed a re-analysis of ACIS external calibration source data extracted from three different epochs during the Chandra mission. The main motivation for this study was to investigate the accuracy of our current temperature-dependent CTI correction algorithm for computing ACIS detector gains at warmer operating temperatures. A summary of these results was presented at the CUC meeting which showed that the computed gains for the BI chips are already within specifications, while the computed gains for the FI chips require some improvements at the warmest operating temperatures. We are now in the process of determining if a new set of trap maps are required to improve the gain calibration, or if the gains can be corrected purely by modifications to the software. Once the gains at warmer temperatures have been corrected, we will begin a study to determine how the energy resolution of ACIS varies with warmer temperatures.

  The linear coefficient of thermal expansion for Si is 2.6×10^{-6} per degree Centigrade, so a difference of 10C will not have a significant affect on the ACIS plate scale.

- Publication of the results of the internal cross-calibration study (ideally in a refereed journal), and of the associated residual effective area uncertainties, in order to provide the user's community with a project-wide status of the systematics associated with the effective area absolute calibration. In this framework, the calibration team may consider the results derived from the multi-mission cross-calibration campaigns on PKS2155-304 and 3C273, running continuously since 2007.

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  Please see response to point 3.

- 2 Additionally, the CUC recommends completion of the calibration of the arc-like PSF feature visible in observations of bright sources: (cf. http://cxc.harvard.edu/ciao4.4/caveats/psf_artifact.html). This feature may affect the interpretation of data of moderately extended sources such as PWN and SNR, a core science for Chandra.

  We can only calibrate the arc-like PSF feature by observing faint sources. ACIS observations of bright sources are piled-up, which distorts the PSF, and HRC observations are affected by a process we call tail-gating (i.e., when two photons pass through the same pore within a short time interval, the position of the second photon is not computed as accurately due to the temporary depletion of the photo cathode after each event). Throughout the mission we have monitored the arc-like PSF feature by performing yearly HRC-I observations of AR Lac. These observations have shown that the presence of the arc-like feature is not constant. The arc-like feature was not present in the HRC-I observations acquired during the first two years of the mission and only appeared in 2002. Also, data acquired over the past two years suggest that the arc-like feature is changing. To better monitor the arc-like PSF feature, we will observe AR Lac every 6 months from now on. We have tried unsuccessfully to model the arc-like feature by perturbing the HRMA optics in the SAOTrace ray trace code. A CIAO thread was added a couple of years ago that deals with the arc-like feature in the PSF.

For now, I think the best thing the calibration team can do to assist observers with this issue is to add a PSF library to the Chandra CALDB that includes both raw and deconvolved AR Lac images (one set per year). This way users can directly compare their own data with an observation of a true point source close in time to their own observation. A CIAO thread should also be added to help users acquire the appropriate image from the CALDB.

- 3 The CUC feels that some additional effort should be spent to streamline the user's access to the calibration status. The CUC recommends that a single "calibration status document" for each instrument be published on the public CXC website, summarizing the overall calibration status per instrument. These entry-point documents should serve as loci of vital basic information and metrics, and provide links to more detailed information.

This response refers to the last item in point 1 and point 3 together.

Up till now, most of our publications have dealt with cross-calibration with other X-ray telescopes. Most of these paper have been published in Astronomy & Astrophysics, which accepts calibration papers. However, some of these papers also contain results regarding internal Chandra cross-calibration, e.g., Schellenberger et al. (2014) present a cross-calibration study between ACIS-S/ACIS-I based on a sample of clusters of galaxies. Another paper that is close to being submitted will present a cross-calibration study between XMM-Newton and Chandra that includes a cross-calibration study between the various Chandra gratings/detector combinations.

We understand the benefit of a single referred paper that summarizes all internal cross-calibration studies. One problem with published papers is that they are quickly out-of-date due to changes in the calibration. We therefore propose the following schedule to address the above mentioned items.

1. *Post a single web page that summarizes all calibration uncertainties. This will be a living document that presents the current (based on the latest released version of the CALDB) uncertainties in the effective area, gain and resolution for each detector/ grating as appropriate.*

2. *Add a link from each uncertainty to the relevant calibration memos, plots and presentations.*

3. *Most of the work in generating a referred paper will be the simultaneous completed during step 2, i.e., the compilation of all relevant materials to include in a paper.*

4. *Generate a paper to be submitted to A&A.*

5. *One question which we can discuss at the next CUC meeting, is whether to re-submit the Chandra calibration paper to A&A every few years as the calibration changes, or just keep a living paper on the Chandra web pages.*

CIAO

The CUC reaffirms its appreciation for CIAO, a powerful, user-friendly and thoroughly documented software, that has been crucial to Chandra's scientific success. Jonathan McDowell's presentation confirms that the project's development continues to be driven by scientific priorities, adapting swiftly to the changes imposed by the evolution of operations, and to the evolution of hardware platforms and operational systems. The CUC is especially pleased with the creative efforts (e.g. youtube videos) to make CIAO usable by non-experts and scientists new to the field.

CUC commends the initiative to have a one-day workshop on CIAO before the 15-year Chandra symposium, as well as the swift response by the HelpDesk to user inquiries.

Sherpa has been a crucial piece in this success story. However, the CUC expresses some reservations on the ultimate scope of the project to make of Sherpa a standalone task. While decoupling Sherpa from CIAO may help the future maintenance, the CUC is concerned that resources are being spent to make Sherpa available to a wide astronomical community without a verified potential "customer's market".

Recommendations

i. The CUC asks that a detailed outlook on the future of Sherpa is presented at the next CUC meeting.

ii. The CUC reiterates its advice to the CXC Management to perform a careful evaluation of the current priorities in CIAO development, and consider reallocating resources to scientifically higher priority tasks (*e.g.*, the source catalogue), if this can help with achieving them.

We will present a detailed plan for Sherpa (both within CIAO and standalone) for the next CUC meeting, describing in particular where Sherpa is used in mission-critical tasks and how future work will address user needs.

In terms of a "customer's market" for standalone Sherpa, We note that 38 helpdesk tickets since Apr 2012 have been identified which specifically talked about the standalone version of Sherpa or were related to situations where the standalone version would have helped.

We concur that the source catalog is a higher priority, and additional staff resources have been directed to it (in particular it has been the principal focus of the scientist responsible for Sherpa for several months). The actual level of development resources devoted to non-catalog-related aspects of Sherpa has in any case been at a low level in the past year despite the continued growth in its use by the community.