Chandra X-ray Center

CIAO 3.2.2 Release Notes

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How CIAO 3.2.2 and CALDB 3.1.0 Affect Your Analysis

Some tool changes and calibration released in CIAO 3.2.2 and CALDB 3.1.0 affect analyses in progress, i.e. certain processing steps should be run again for greater accuracy. This section of the release notes describes those changes, as well as the affected tasks.

Calibration Improvements for ACIS Front–Illuminated Chips

- There are several important calibration changes released in CALDB 3.1.0 which apply to the front–illuminated ACIS chips (I0–3, S0, S2, S4–5). All of the following calibration updates apply to −120 observations only.

  If you are ***beginning a new analysis***, reprocess your data with `acis_process_events` to apply the newest calibration. You will then be able to use `mkacisrmf` to create any RMF files necessary for your analysis.

  If you ***have an analysis in progress***, use the information in this section to evaluate whether or not the calibration updates will significantly impact your data. Applying the new calibration means redoing your entire analysis from the level=1 event file, and some users may not benefit from the updates.

- The following calibration changes for −120 data were released in CALDB 3.1.0:

  ♦ ***Time–dependent gain adjustment:*** new TGAIN calibration files contain improvements to the calibration for data taken after August 1, 2004 or *any* observations done with the S0, S4, and S5 chips. Prior to this release, there was no TGAIN adjustment available for those three chips.
  ♦ ***CTI correction:*** new calibration files to correct for the charge transfer inefficiency (CTI). Prior to this release, there was no CTI correction available for the S0, S4, and S5 chips.
  ♦ ***`mkacisrmf` "phase 2" response and gain files:*** new response files represent a 0.5% change from the existing calibration. A corresponding "phase 2" gain file (version 4) was also released.

    In conjunction with the CTI and TGAIN improvements, the `mkacisrmf` tool can now be used to create RMFs for all −120 observations, regardless of detector configuration.

    A `mkacisrmf` software fix in the CIAO 3.2.2 release also repairs the "***SegV for ACIS−1 on***

node–1" bug listed on the `mkacisrmf` bug page.
None of the calibration files for the back–illuminated chips (S1, S3) have changed in the CALDB 3.1.0 release.

Please note that the CALDB 3.0.0 calibration improvements highlighted in the "***New method for creating ACIS imaging RMFs***" section of How CIAO 3.2 and CALDB 3.0.0 Affect Your Analysis still apply.

- ***Who Should Reprocess***

Anyone wishing to use `mkacisrmf` needs to reprocess the data with `acis_process_events` and the default CALDB 3.1.0 gain file (version 4). Otherwise there will be calibration inconsistencies between the gain file and `mkacisrmf` response files applied to the data.

The following users should also reprocess their data:

- ♦ all users working with –120 data on S0, S4, and/or S5 should reprocess their data to apply the CTI and TGAIN corrections.
- ♦ users working with –120 data on I0–3 and S2 that was observed August 1, 2004 or later will benefit from reprocessing with the TGAIN improvements.

- ***Who Does NOT Need to Reprocess***

Since the changes in the `mkacisrmf` response files were small (~0.5%), it is unnecessary to re–make RMFs for chips I0–I3 and S2 that were created in CIAO 3.2/CALDB 3.0.3.

- For detailed information on the tools and calibration discussed here, refer to the following documentation.

Time–dependent gain adjustment:
     · Apply the Time–Dependent ACIS Gain Correction
     · ACIS Time–dependent Gain why topic
CTI correction:
     · Apply the ACIS CTI Correction
     · ACIS CTI Correction why topic
`mkacisrmf`:
     · Creating ACIS RMFs with mkacisrmf thread
     · Creating ACIS RMFs in CIAO 3.2 why topic

Bad Pixel Identification in VFAINT Mode Data

- The `acis_build_badpix` tool – which is called by `acis_run_hotpix` – no longer identifies pixels belonging to the outer 5x5 pixel island in VFAINT mode as bad. It will also clear those bits from an input file.

Originally, all of the outer 24 pixels of a 5x5 island in VFAINT mode were checked to make sure that the "adjacent" pixels to the center were not bad. However, only the center 3x3 is used to compute the pulse height and grade; the outer 16 pixels of the 5x5 are only used to search for potential cosmic–ray events if `check_vf_pha=yes`. To avoid discarding more events unnecessarily, the code was changed to only consider the central pixel and the eight pixels adjacent to the central pixel when searching for events where one of the pixels is bad.

This change also became part of SDP at version DS 7.6.

Users working with VFAINT mode data should:

1. run `acis_build_badpix` in CIAO 3.2.2 (assuming the data was processed with an SDP version lower than DS 7.6)
2. reprocess the event file with `acis_process_events` using the new bad pixel file in the `acis_process_events badpixfile` parameter
3. recreate any images or spectra from that event file

It is not necessary to remake ARFs, instrument maps, or exposure maps, as the outer 16 pixels of a 5x5 island are not accounted for during those processes. You may wish to do so regardless, for the sake of consistency.

Tools

acis_build_badpix

- No longer identifies pixels belonging to the outer 5x5 pixel island in VFAINT mode as bad. It will also clear those bits from an input file.

  Originally, all of the outer 24 pixels of a 5x5 island in VFAINT mode were checked to make sure that the "adjacent" pixels to the center were not bad. However, only the center 3x3 is used to compute the pulse height and grade; the outer 16 pixels of the 5x5 are only used to search for potential cosmic−ray events if check_vf_pha=yes. To avoid discarding more events unnecessarily, the code was changed to only consider the central pixel and the eight pixels adjacent to the central pixel when searching for events where one of the pixels is bad.

acis_process_events

- The tool was modified to read a new event− and split−threshold file, which contains two extensions (one for timed−exposure mode observations and one for continuous−clocking mode observations) instead of one. More information on the calibration file is available in the CALDB 3.1.0 release notes.

  The default value of the "threshfile" parameter is now CALDB instead of NONE. Provided there is a valid calibration file in the CALDB, the "spthresh" parameter is ignored.

  These changes were required for a new bias algorithm in CC−mode standard data processing. Users cannot reprocess their data with the new bias algorithm, and so do not need to redo any analyses because of the changes to this tool.

acis_run _hotpix

- The `acis_build_badpix` tool – which is called by `acis_run_hotpix` – no longer identifies pixels belonging to the outer 5x5 pixel island in VFAINT mode as bad. It will also clear those bits from an input file.

  Originally, all of the outer 24 pixels of a 5x5 island in VFAINT mode were checked to make sure that the "adjacent" pixels to the center were not bad. However, only the center 3x3 is used to compute the pulse height and grade; the outer 16 pixels of the 5x5 are only used to search for potential cosmic−ray events if check_vf_pha=yes. To avoid discarding more events unnecessarily, the code was changed to only consider the central pixel and the eight pixels adjacent to the central pixel when searching for events where one of the pixels is bad.

asphist

- The `asphist` tool has been rolled back to an earlier version. This was done to resolve a number of problems with multi–OBI and multi–ObsID datasets.

  The `delta_xy` and `delta_roll` parameters introduced in CIAO 3.2 were not available in this version of `asphist`, therefore have been removed from the parameter file.
- Error reporting was improved to be more consistent with other CIAO tools.

hrc_process_events

- A new degap algorithm was implemented which uses a different calibration file format. This change is transparent to users; it is not necessary at this time to reprocess data that have had the degap correction applied. The HRC–S and HRC–I Degap threads show how to apply the correction.

mkacisrmf

- mkacisrmfBug fix: for the "**SegV for ACIS–1 on node–1**" bug listed on the `mkacisrmf` bug page. When computing the ideal part of the matrix it was possible that the "shifts" would result in negative channels which would lead to corrupted data and/or a crash.
- Bug fix: user may create a PI matrix with a grid other than `1:1024:1`.
- Bug fix: a warning that the requested energy grid is outside of the data bounds is printed regardless of the verbosity setting.
- Some integer–value header keywords were being written as strings. They now have the proper datatype assigned.
- The tool exits if calibration data is not found for the requested CCD.
- The tool no longer prompts for ccd_id, chipx, and chipy values if a WMAP is specified.
- Speed enhancements for the case where a WMAP is used.

Analysis Scripts

The CIAO contributed scripts package is available from the CIAO Scripts page and is considered a required part of the installation. The script installation instructions explain where the scripts should be unpacked within the CIAO directory tree.

merge_all

- The changes to `asphist` mean it is again possible to use the `merge_all` script to create exposure maps (either single or multiple chip cases) for multiple observations. Note that no change was required in the `merge_all` script itself for this fix.

  The Use merge_all Script to Compute ACIS Exposure Maps and Fluxed Images thread has information on how to use `merge_all`.

show_tgain_corr

- Version 1.3 of the script uses the new time–dependent gain files released in CALDB 3.1.0.
- The `scriptfile` path in `show_tgain_corr.par` has also been corrected from
  `"./show_tgain_corr.sl"` to
  `"${ASCDS_CONTRIB}/share/slsh/local-packages/show_tgain_corr.sl"`.

Documentation Updates

Threads

- Creating ACIS RMFs with mkacisrmf
- Apply the ACIS CTI Correction
- Apply the Time–Dependent ACIS Gain Correction
- Identify ACIS Hot Pixels and Cosmic Ray Afterglows
- Use merge_all Script to Compute ACIS Exposure Maps and Fluxed Images

Why Topics

- Creating ACIS RMFs in CIAO 3.2
- ACIS CTI Correction
- ACIS Time–dependent Gain

Manuals

- The first version of the Chandra ABC Guide to Pileup (pileup_abc.ps) has been added to the CIAO Manual page. As knowledge of how to detect, assess, and correct for the effects of pileup improves, we will update and expand the procedures described therein.

Documentation Updates