Chandra X-ray Center

AHELP for CIAO 3.4   **acis_classify_hotpix**   Context: tools

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Synopsis

Determine whether a suspicious pixel is hot or affected by an afterglow.

Syntax

```
acis_classify_hotpix infile outfile badpixfile hotpixfile [expnothresh]
[clobber] [verbose]
```

Description

acis_classify_hotpix is one of the tools used to find hot pixels and cosmic–ray afterglows (see acis_run_hotpix). This tool is used to read the output from acis_find_hotpix and determine whether the events on suspicious pixels are associated with cosmic–ray afterglows or hot pixels. For pixels affected by afterglows, acis_classify_hotpix determines the start and stop times of the afterglow.

An "afterglow" is produced when a large amount of charge is deposited on a CCD by a cosmic ray. Most of the charge is clocked off of the CCD immediately. However, a small amount can be captured in charge traps, which release the charge relatively slowly. As a result, a sequence of events can appear in a single pixel over a few to a few dozen frames as the trapped charge is released. The events need not occur in consecutive frames. There can be gaps of a few frames with no events for the pixel. The amount of charge released per frame appears to decay exponentially with time. If the median number of frames between consecutive events on a suspicious pixel is less than expnothresh, then the pixel is most likely associated with an afterglow. The start and stop times are determined as described below (see expnothresh). Legitimate X–ray events may be identified as afterglow events if the X–ray source is relatively faint except during some time interval which is short compared to the period of the dither.

A suspicious pixel is defined to be "hot" if the median number of frames between consecutive events on the pixel is greater than or equal to expnothresh.

The pixels that are identified as hot or affected by an afterglow are written to the output file in addition to the bad pixels and columns in the input bad–pixel file. The values of STATUS (see acis_build_badpix) and the start and stop times of afterglows are set appropriately. The tool acis_build_badpix should be rerun on the output of acis_classify_hotpix to make sure that pixels adjacent to the newly–identified pixels are handled properly.

Example

```
acis_classify_hotpix acisf00732_000N002_evt1.fits tmp2_bpix1.fits
badpixfile="tmp1_bpix1.fits" hotpixfile="suspicious_pixels.fits"
```

This example shows the default use of the tool acis_classify_hotpix. The input files acisf00732_000N002_evt1.fits and suspicious_pixels.fits are read and used to determine whether a pixel is hot or affected by a cosmic−ray afterglow. These pixels are added to the list of known bad pixels (tmp1_bpix1.fits, which was produced by acis_build_badpix) and written to the output file tmp2_bpix1.fits. The output file should be used as input to the tool acis_build_badpix.

Parameters

name	type	ftype	def	min	max	reqd	stacks
infile	file	input				yes	yes
outfile	file	output				yes	
badpixfile	file	input				yes	
hotpixfile	file	input				yes	
expnothresh	integer		10	2	10000	no	
clobber	boolean		no			no	
verbose	integer		0	0	5	no	

Detailed Parameter Descriptions

Parameter=infile `(file required filetype=input stacks=yes)`

The name(s) of the input event data file(s). acis_classify_hotpix can read Level 0, Level 1 and Level 2 files, but users are urged to use Level 1 files because these files contain all of the events. Some of the events are excluded from Level 2 files.

The event data is used to determine when an afterglow begins and ends.

Parameter=outfile `(file required filetype=output)`

The name of the output bad−pixel file that contains information about each bad pixel, including the values of SHAPE ("point" or "rectangle"), COMPONENT (a sequential ID number), CHIPX, CHIPY, TIME (the beginning of the observation or afterglow), TIME_STOP (the end of the observation or afterglow), STATUS (a bit−encoded description of the reason the pixel is identified as bad, see acis_build_badpix). This output file contains a list of the newly−identified bad pixels as well as the bad pixels and columns in the input bad−pixel file. The tool acis_build_badpix should be rerun on the output file to make sure that pixels adjacent to the newly−identified pixels are handled properly.

Parameter=badpixfile `(file required filetype=input)`

The name of the input bad–pixel file, which contains a list of pixels known to be bad. Pixels that are hot or affected by afterglows are added to the list and written to the output file.

Parameter=hotpixfile `(file required filetype=input)`

The name of the input file that contains information about each suspicious pixel, including the values of CCD_ID, CHIPX, CHIPY, the number of events on the pixel (S), the expected number of events on the pixel (R), the number of pixels used to compute R (N), the probability of obtaining S events for an expected number R (P), the mean number of events per pixel on the node (M) and the probability of obtaining R events for an expected number M (P_EXP). This file, which is produced by the tool acis_find_hotpix, must be sorted in ascending order by CHIPX (first) and CHIPY (second). Although the input does not need to be sorted by CCD_ID, all of the suspicious pixels for a CCD, must be grouped together in the file.

Parameter=expnothresh `(integer not required default=10 min=2 max=10000)`

This parameter is used to distinguish between pixels associated with cosmic–ray afterglows and hot pixels. If the median number of frames between consecutive events is less than expnothresh, then a suspicious pixel is most likely affected by an afterglow. Otherwise, the suspicious pixel is identified as a hot pixel. The default value of this parameter should be adequate in most cases. Be cautious about using some other value.

The start and stop times of an afterglow are defined as follows. If the events on a suspicious pixel have frame numbers EXPNO_1, EXPNO_2, ..., EXPNO_n, then the start of an afterglow is the beginning of the first frame i that satisfies the relation EXPNO_i+1 – EXPNO_i < expnothresh. The end of the afterglow is the end of the first frame i (after the start time) that satisfies the relation EXPNO_i+1 – EXPNO_i >= expnothresh. Events on the pixel that do not occur during afterglow are considered valid X–ray events.

Parameter=clobber `(boolean not required default=no)`

If clobber=yes and a file exists that has the same name as the name of the output file, then the existing file is overwritten. If clobber=no and a file exists that has the same name as the name of the output file, then an output file is not created.

Parameter=verbose `(integer not required default=0 min=0 max=5)`

This parameter determines the amount of messages that is generated by acis_classify_hotpix. If verbose=0, very few messages are reported. If verbose=5, the largest amount of messages is produced.

Bugs

See the bugs page for this tool on the CIAO website for an up–to–date listing of known bugs.

See Also

chandra
> level

tools
> acis_build_badpix, acis_detect_afterglow, acis_find_hotpix, acis_process_events, acis_run_hotpix, acisreadcorr, destreak

Parameter=badpixfile (file required filetype=input)