



ecubechip2sky

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Abstract

The task takes a list of CHIPCOORD images and replots them onto a single image in sky coordinates.

1 Instruments/Modes

Instrument	Mode
EPIC mos or PN	Imaging

2 Use

pipeline processing	maybe
interactive analysis	yes

3 Description

The present task is exactly the same as **eimchip2sky**, except that the input CCD images are in the form of chip cubes as defined in the task documentation for the **chipcube** library. I'll direct you to that task rather than repeating the same description. All the remaining sections are given in full however.

Why separate the two tasks? Originally there was just one task, with the option to supply the CCD images as 2-d images, 1 per chip, or as chip cubes. However, mainly because of differences in the way GTI extensions are present in the two formats, the resulting parameter tree became tangled and clunky. Separating the tasks has led to a lot of simplification. Of course, shared processing is all performed by common library functions - there is little actual duplication of code.

4 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints
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templateset	yes	dataset		
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The name of the input template image. This supplies information about the projection plane and pixel size (via WCS keywords) and pixel dimensions (via the array dimensions) of the output image.

chipcubesets	yes	dataset list		
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A list of names of input chip cubes (see the definition in the documentation for **chipcube**).

outsets	no	dataset list	outset.ds	
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The list of output images (in sky coordinates). See the documentation for **eimchip2sky** for a description of how they match up with the input cubes.

withindices	no	bool	no	
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Whether to read the **indices** parameter.

indices	yes	integer list	1	
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See the documentation for **eimchip2sky** for a description of how they work.

attstyle	no	string	template	binnedset—template—user
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As described in the documentation for **eimchip2sky**, in general the attitude (ie, pointing direction and roll angle) of the spacecraft doesn't stay fixed during the course of an exposure. This 'wandering' of the attitude can be approximated by sampling the attitude at a series of times during the exposure. A separate coordinate transform is computed for each attitude sample and the output image is build up of appropriately weighted contributions from each transform. The present parameter allows the user to choose whether to supply such a list of attitude samples (**attstyle**='binnedset') or to simply compute a single coordinate transform for the whole exposure, either at an attitude read from the **_PNT** keywords of the **templateset** (**attstyle**='template', the default) or at an attitude submitted by the user (**attstyle**='user').

binnedatttab	yes	table		
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This parameter is read (and only mandatory) if **attstyle**='binnedset'. The parameter should give the name of a dataset plus table (eg: 'mySet.ds:ATT-TAB'). The table should contain samples of the XMM spacecraft attitude in time bins (see the task **binned.att** documentation for a description of the format).

weightstyle	no	string	gti	none—binnedset—gti
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This parameter is read if **attstyle**='binnedset'. A series of attitude samples is supplied; it remains to decide how to calculate the weight for each sample. **weightstyle**='none' is only valid if there is only 1 attitude sample: the task will fail with an error otherwise. For **weightstyle**='binnedset', the task will seek for weights in a column named **WEIGHTS** in the **binnedatttab** table. If **weightstyle**='gti', the task attempts to obtain a list of Good Time Intervals (GTIs), the exact way these are supplied being dictated via the parameter **gtistyle**; these GTIs are ANDed with the attitude time bins; the net GTI in each bin provides the weight.

gtistyle	no	string	fromimages	user—kwd—fromcubes—gkitablist
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This parameter is read if **weightstyle**='gti'. In this case the task attempts to obtain a list of Good Time Intervals (GTIs); these GTIs are ANDed with the attitude time bins; the net GTI in each bin provides the weight. Note that matters are complicated by the fact that different CCDs usually have different sets of GTIs. Parameter **gtistyle** specifies the way in which GTIs are supplied. If **gtistyle**='user', the task obtains a single, simple GTI for all chip images from the parameters **tstart** and **tstop**. The same is true if **gtistyle**='kwd', except that the task expects to the start and stop times in keywords **TSTART** and **TSTOP**, (or whatever alternates are specified via parameters **tstartkwd** and **tstopkwd**), in the FITS table specified by the parameter **kwdtab**. The alternate **gtistyle**='fromcubes' tells the task to look for GTI extensions (via the **KEY2IMGS** table, see documentation for **chipcube**) in the cube sets. The final alternate, **gtistyle**='gkitablist', affords the most general and flexible specification of GTIs. In this case



the task looks for a list of GTI tables in the parameter **gtitablist**. Note that this parameter must have the same number of elements as **chipcubesets**.

tstart	yes	real		
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This parameter is read if **gtistyle**='user'. Specifies the start of the single, universal GTI.

tstop	yes	real		
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This parameter is read if **gtistyle**='user'. Specifies the end of the single, universal GTI.

kwddtab	yes	table		
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This parameter is read if **gtistyle**='kwd'. It gives the FITS table description in which to find the GTI start and stop keywords.

tstartkwd	no	string	TSTART	
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This parameter is read if **gtistyle**='kwd'. Name of the keyword in **kwddtab** which specifies the start of the single, universal GTI.

tstopkwd	no	string	TSTOP	
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This parameter is read if **gtistyle**='kwd'. Name of the keyword in **kwddtab** which specifies the end of the single, universal GTI.

gtitablist	yes	table		
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This parameter is read if **gtistyle**='gtitablist'. A list of FITS table descriptions, 1 per input image, which should contain GTI lists.

ra	yes	real		
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This parameter is read (and only mandatory) if **attstyle**='user'.

dec	yes	real		
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This parameter is read (and only mandatory) if **attstyle**='user'.

apos	yes	real		
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This parameter is read (and only mandatory) if **attstyle**='user'.

usefast	no	bool	yes	
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Whether to use a fast, approximate or slow and accurate regridding algorithm.

conserveflux	no	bool	yes	
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A CCD pixel covers, in general, a different amount of sky to a sky-image pixel. With some sorts of quantities (eg background rate per pixel) this change of area matters; for others (eg exposure time) it does not. In the former case you should set **conserveflux** to 'yes', in the latter, 'no'.

withnormalize	no	bool	no	
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I am no longer sure what this is about. Best to leave it at default!

tempset	no	dataset	tempset.ds	
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Name of a temporary dataset. If you are running more than 1 invocation of the task in the same working directory, you should name this uniquely for each invocation, to avoid crosstalk.



5 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

badAttStyle (*error*)

The value of `attstyle` was not recognized.

badGtiStyle (*error*)

The value of `gtistyle` was not recognized.

badNumIndices (*error*)

The number of elements in `indices` must equal the number in `chipcubesets`.

badNumberGtiTabNames (*error*)

The number of elements in `gtitablist` must equal the number in `chipcubesets`.

badWeightStyle (*error*)

The value of `weightstyle` was not recognized.

duplicateCcds (*error*)

More than one CCD was found with the same combination of instrument, CCD number and `indices` value.

noWeightColumn (*error*)

You set `weightstyle` to 'binnedset', but no `WEIGHT` column was found in the binned attitude set.

tooManyAttBins (*error*)

You set `weightstyle` to 'none', but this can't work because there is more than one row in the binned-attitude file.

noGtiBlock (*warning*)

corrective action: this is the corrective action

6 Input Files

1. A template image. Its array header must contain WCS keywords (see [?] for a recent description of these). The output image(s) will be the same size as the template image and projected onto the same celestial projection plane. Note that the data contained in the template image are not read by **ecubechip2sky**.

If `attstyle`='template', the template image array header must also contain `RA_PNT`, `DEC_PNT` and `PA_PNT` keywords.

2. A list of FITS chip-cube datasets (see format description in **chipcube**). These images are supplied via the `chipcubesets` parameter.
3. If `attstyle`='binnedset': a dataset containing a table of samples of the spacecraft attitude. The table format is described in the documentation to sas library **binned_att**.
4. If `attstyle`='binnedset', `weightstyle`='gti' and `gtistyle`='kwd': A dataset+table which contains `tstartkwd` and `tstopkwd` keywords.



5. If `attstyle='binnedset'`, `weightstyle='gti'` and `gtistyle='gtitablist'`: a list of datasets, 1 per input image, each of which contains a GTI table.

7 Output Files

1. Each output file contains an image array, which has the same pixel size and dimensions, and is projected onto the same plane, as the input template image. The data type of the output image is 4-byte real. The output image contains a copy of all the keywords in the template image.

See documentation of task **eimchip2sky** for a description of how multiple output images match up with the input images.

References