SWCX

April 16, 2023

Abstract

swcx uses the spectral fitting results from Xspec and model SWCX detector maps to create model SWCX contamination maps for a given observation. This task was originally a subtask of the SAS *esas* task also named *swcx* prior to SAS-21 and retains all of its functionality.

1 Instruments/Modes

Instrument	Mode
EPIC	Imaging

2 Use

pipeline processing	no
interactive analysis	yes

3 Description

swcx uses the spectral fitting results from Xspec and model SWCX detector maps to create model SWCX contamination maps for a given observation.

Warning and requirements: *swcx* is part of the *esas* package, integrated into SAS, but (still) limited to work within the *esas* data reduction scheme. This is specially true vis a vis input files structure and names. In particular, *swcx* assumes that another task from the package, *mosspectra* / *pnspectra*, and *mosback* / *pnback*, have been successfully run for the mos / pn exposures to be used, and that spectral fitting has been done.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints

imagefile	yes	string		

Input image file from mosback or pnback.

specfile	yes	string		

Input spectral file from mosspectra or pnspectra.

swcxmapdet	no	string	default	

User-selected output map in DET coords (derived if not entered by user).

elow	no	int	350	300 <= *elow* <= 11999

The low energy for the band in eV.

ehigh	no	int	1100	300 <= *elow* <= 12000

The high energy for the band in eV.

ccds	no	boolean	T T T T T T T	

MOS CCDs (or PN QUADS) chosen for analysis (7 for MOS, 4 for PN).

rmffile	no	string		

RMF for the region (derived if not entered by user).

arffile	no	string		

ARF for the region (derived if not entered by user).

lines	no	string	OVII OVIII OVIIIB NEIX MGXI	

SWCX line names to be included.

gnorms	no	real	0.1 0.1 0.1 0.1 0.1	0 <= *gnorms* <= 1

Gaussian normalizations from Xspec.

[Note: optional input files have the default of 'default'. If no specific filename is chosen, e.g., swcxmapdet, the task will create a filename of the form "mos1S001-swcsmapdet-350-1100.fits" based on reading INST, EXPIDSTR, and the elow, ehigh command line params.]

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.

noINST *(error)*
Instrument from image must be M1/M2/PN

elowGEehigh *(error)*

Parameter elow must be less than ehigh

linesNEgnorms *(error)*
Number of lines must equal number of Gnorm values

IMGneSPEC *(error)*
Input Image and Spectrum have different OBSID/EXPID/INST/ORBIT

PostCCD6Loss *(warning)*
CCD6 was selected but orbit after 961
corrective action: ccds(6) set to F

6 Input Files

1. FOV filtered image file (e.g. from *mosback* or *pnback*).
2. FOV filtered spectrum (e.g. from *mosspectra* or *pnspectra*).
3. Response file (RMF) for the region (e.g. mos1S001.rmf).
4. Ancillary Response file (ARF) for the region (e.g. mos1S001.arf).

7 Output Files

1. SWCX image in detector (DET) coordinates.

8 Algorithm

```
Read params
Open input SPECTRAL file, extract EXPOSURE, BACKSCAL.
Open input template IMAGE file, extract keywords and 2D array.
Configure lines and gaussian normalization (gnorm) values.
Open and read RMF.
Open and read ARF.
Loop through selected lines chosen from OVII OVIII OVIIIB NEIX MGXI.
 call CAL_swcxmap to get selected swcxMAP corresponding to that line.
 rnorm = gnorms(line) * area (from ARF) * exposure (from SPEC) * backscal
 calculate fractional area (frac) from RMF MATRIX
 rnorm = frac * rnorm / total_swcx_exposure
 do i=1,780
  do j=1,780
   outSWCXmap(i,j) = outSWCXmap(i,j) + rnorm*swcxMAP(i,j)
  enddo
 enddo
```

```
endLoop
Mask chips if desired (ccd not selected)
Create output fits image based on template (copying Attributes).
```

9 Comments

The original code for this task appeared in the *esas* task 2009-2021 as the subtask *swcx*. It was removed from the task *esas*, and modularized as a single task for SAS-21. The *esas* task was removed in SAS-21.

References