esensmap

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Abstract

Calculate EPIC sensitivity map

1 Instruments/Modes

Instrument	Mode
EPIC MOS:	IMAGING
EPIC PN:	IMAGING

2 Use

pipeline processing	yes
interactive analysis	yes

3 Description

This task creates a sensitivity map giving point source detection upper limits (vignetting corrected source count rate corresponding to the likelihood of detection as specified in the parameter file) for each image pixel. The task may either be called for individual energy bands or combinations of energy bands and instruments. The upper limits are calculated by assuming Poissonian count statistics in each 3×3 pixel detection cell, using the exposure and background values read from the input images. It is assumed that 30 upper limit calculation is meant as a reference point for a more detailed assessment of the sensitivity of the detection process to be determined through Monte Carlo simulations.

In the case of multiple input energy bands the upper limits are expressed in units of counts per seconds for the combined band (i.e. they refer to the detection sensitivity which would be acchieved by adding up the photons observed in the individual bands). Pixels outside of the detection mask used by the eboxdetect detection task as well as pixels with zero exposure time are assigned a sensitivity value of -1.0. This also holds for pixels where – due to a failure of the esplinemap backgound task – zero or negative values occure in the input background maps.

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
detmasksets	yes	filename list	detmask.fits	

Names of detection masks

expimagesets	yes	filename list	expimage.fits	

Names of exposure images

bkgimagesets	yes	filename list	bkgimage.fits	

Names of background maps

sensimageset	yes	filename	sensimage.fits	

Name of sensitivity image

mlmin	no	float	10.0	[0.1<param<20.0]

Upper limit likelihood

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.

WrongInst *(error)*
Unknown instrument ID

MissingParameter *(error)*
Missing input file name

FileMismatch *(error)*
Inconsistent number of input images

FileMismatch *(error)*
Inconsistent instruments or bands

FileMismatch *(error)*
Number of detector masks not equal number of instruments

MissingAttribute *(warning)*

corrective action: Keyword will not be copied to output file

6 Input Files

1. PPS product (from task EEXPMAP): EPIC exposure images (one per instrument)
2. from task ESPLINEMAP: Spline background maps (one per instrument per energy band)
3. from task EMASK: Detection masks (one per instrument)

7 Output Files

1. PPS product : EPIC sensitivity image

8 Algorithm

```
  subroutine esensmap
    Loop over image pixels:
      Loop over input images:
        IF detection mask == 1
          Accumulate background in 3 x 3 pixel detection cell
          Determine exposure in detection cell
        END IF
      END Loop

      Evaluate cumulative Poissonian distribution
      Subtract background and divide by exposure
      Correct for fraction of PSF outside of the detection cell

      IF exposure in pixel /= 0: Write result to output sensitivity map
    END Loop
end subroutine  esensmap
```

9 Comments

10 Future developments

References