



pointsrc

April 16, 2023

Abstract

Calculates the xspec normalization per square arcminute for the Cosmic X-ray background after removal of point sources to some limiting level (`min_flux`). ELF is shorthand for the logN-logS. This task was originally a subtask of the SAS *esas* task named *point_source* 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

Calculates the xspec normalization per square arcminute for the Cosmic X-ray background after removal of point sources to some limiting level (`min_flux`). ELF is shorthand for the logN-logS.

We assume that $\text{integral}[\text{ELF}]$ from 0 to infinity is less than `cxb_norm`, or that:

$$\text{CXRb} = X + \text{integral}[\text{ELF}]_0^{\text{infinity}}.$$

Therefore, for any given “blank sky” observation where the brightest point source has a flux `smax`, the total X-ray emission in the field would be:

$$X + \text{integral}[\text{ELF}]_0^{\text{smax}}.$$

The currently available functions are:

`hms`: Hasinger, Miyaji, & Schmidt (2005), from ROSAT, XMM, & Chandra):

`mushotzky`: (???)

`cappelluti`: Cappelluti et al (2008), from COSMOS:

`mateos`: Mateos et al (2008), from XMM



Output: Xspec normalization for power law in units of photons/cm²/s/am²/keV

Examples:

pointsrc func=mateos minsrcflux=5.e-14 cxrbnorm=10.6 index=1.40

4 Parameters

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

Parameter	Mand	Type	Default	Constraints
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func	yes	string	mateos	
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Name of logN-logS function.

hms (Hasinger, Miyaji, & Schmidt 2005)

mushotzky (REF TBD)

cappelluti (Cappelluti et al. 2008)

mateos (Mateos et al. 2008)

minsrcflux	yes	real	1.0e-14	
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Source flux cutoff in erg/cm²/s.

cxrbnorm	yes	real	10.6	
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Normalization of the cosmic X-ray background.

index	yes	real	1.46	
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Photon power law index.

5 Input Files

None

6 Output Files

None

Outputs to screen the Xspec normalization for power law in units of photons/cm²/s/am²/keV

7 Algorithm

Read in:



Name of logN-logS function

Choices: Hasinger, Mushotzky, Cappelluti, or Mateos

Source flux cutoff

Normalization of the Cosmic XRB

Photon power law index of the Cosmic XRB

Return Xspec Normalization for power law

Call subroutine based on user selected function choice

Returns:

Integral from 0-infinity

Integral from 0-(source flux cutoff)

numb/deg2

0.5-2.0 keV flux/deg2

Variance in flux

Calculate tot_flux, min_flux

Calculate conversion from energy in 0.5-2.0 keV to normalization

Calculate the energy in 0.5-2.0 in keV

Convert keV to erg

Convert erg/cm2/s/sr to keV/cm2/s/sr/keV

Calculate the bias: $\text{bias} = \text{cxrb_norm} - \text{tot_flux}$

Calculate the Xspec normalization:

$\text{xnorm} = \text{bias} + \text{tot_flux}$

Convert to per arcmin:

$\text{xnorm} = \text{xnorm}/\text{degree_per_ster}/3600.$

Output xnorm

8 Comments

The original code for this task appeared in the *esas* task 2009-2021 as the subtask *point_source*. 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