URL: http://cxc.harvard.edu/ciao3.4/xs.html
Last modified: December 2006

AHELP for CIAO 3.4 **xs** Context: sherpa

Jump to: Description Unavailable XSPEC Models and Commands Available XSPEC Models Bugs See Also

Synopsis

XSpec model functions.

Description

Sherpa includes the "additive" and "multiplicative" models of XSpec version 11.3. To use these models, simply prefix the original XSpec name by "xs"; for example, the name xsphabs represents the XSpec phabs model. To define a composite XSpec model such as

```
phabs * apec
```

do the following:

```
sherpa> xsphabs[abs1]
sherpa> xsapec[gas1]
sherpa> source 1 = abs1 * gas1
```

(Of course, one can use names other than "abs1" and "gas1" to represent these model components.)

Note that XSPEC models are always integrated over a bin and so require binned data.

Important Note:

XSpec models based on physical processes (e.g. line models such as raymond or absorption models such as wabs) assume that the dataspace is defined in keV. On the other hand Sherpa models are always calculated based on the input data scale. Thus when XSpec models are combined with Sherpa models, the user should be careful to ensure that both components have the same dataspace units; otherwise, calculated model amplitudes may be incorrect.

These models also expect that the x−values will always be energy bins. When the analysis setting is using non−energy bins (e.g., ANALYSIS WAVE) and an XSPEC model is defined, Sherpa converts the bins to energy before sending them to the XSPEC model. After the XSPEC model finishes, Sherpa converts back to the original units. Sherpa also scales the model values appropriately (e.g., if counts/keV came out of the XSPEC model, and Sherpa is working with wavelength bins, then Sherpa scales the output of the XSPEC model to counts/Angstrom).

Unavailable XSPEC Models and Commands

The following XSPEC components are NOT included in CIAO 3.2:

* the bkn2pow (three−segment broken power law) and kerrd (optically thick extreme−Kerr disk) models
* the xset command: this means that users cannot currently modify certain XSPEC internal switches.
* the atable, etable, and mtable models

Available XSPEC Models

The available XSpec models are listed below. Please see either the ahelp page for each model (e.g. "ahelp xsabsori") or the XSpec User's Guide for more information about each of these models. Note that the ahelp files describe the version of the XSpec model included in CIAO, while the XSpec User's Guide may reference a newer version with different options.

<xspecname>	**Description**
absori	Ionized absorber
acisabs	Decay in the ACIS quantum efficiency
apec	APEC thermal plasma model
bapec	APEC thermal plasma model with velocity broadening as a free parameter
bbody	Blackbody spectrum
bbodyrad	Blackbody spectrum with norm proportional to surface area
bexrav	E−folded broken power law reflected from neutral matter
bexriv	E−folded broken power law reflected from ionized matter
bknpower	Broken power law
bmc	Comptonization by relativistically moving matter
bremss	Thermal bremsstrahlung
bvapec	APEC thermal plasma model with variable abundances and velocity broadening as a free parameter
c6mekl	6th−order Chebyshev polynomial DEM using mekal
c6pmekl	Exponential of 6th−order Chebyshev polynomial DEM using mekal
c6pvmkl	Variable abundance version of c6pmekl
c6vmekl	Variable abundance version of c6mekl
cabs	Compton scattering (non−relativistic)
cemekl	Multi−temperature mekal
cevmkl	Multi−temperature vmeka
cflow	Cooling flow model
compbb	Comptonized blackbody spectrum after Nishimura et al. (1986)
compls	Comptonization spectrum after Lamb and Sanford (1979)
compst	Comptonization spectrum after Sunyaev and Titarchuk (1980)
comptt	Comptonization spectrum after Titarchuk (1994)
constant	Energy−independent multiplicative factor
cutoffpl	Power law with high energy exponential cutoff
cyclabs	Cyclotron absorption line
disk	Disk model
diskbb	Multiple blackbody disk model
diskline	Line emission from relativistic accretion disk
diskm	Disk model with gas pressure viscosity
disko	Modified blackbody disk model

diskpn	Accretion disk around a black hole
dust	Dust scattering out of the beam
edge	Absorption edge
equil	Equilibrium ionization collisional plasma model from Borkowski
expabs	Low−energy exponential cutoff
expdec	Exponential decay
expfac	Exponential factor
gabs	Multiplicative gaussian absorption line
gaussian	Simple gaussian line profile
gnei	Generalized single ionization NEI plasma model
grad	GR accretion disk around a black hole
grbm	Gamma−ray burst model
highecut	High energy cutoff
hrefl	Simple reflection model good up to 15 keV
laor	Line from accretion disk around a black hole
lorentz	Lorentzian line profile
meka	Mewe−Gronenschild−Kaastra thermal plasma (1992)
mekal	Mewe−Kaastra−Liedahl thermal plasma (1995)
mkcflow	Cooling flow model based on mekal
nei	Simple nonequilibrium ionization plasma model
notch	Notch line absorption
npshock	Plane−parallel shock with ion and electron temperatures
nsa	Spectra in the X−ray range (0.05−10 keV) emitted from a hydrogen atmosphere of a neutron star.
nteea	Pair plasma model
pcfabs	Partial covering fraction absorption
pegpwrlw	Power law with pegged normalization
pexrav	Exponentially cutoff power law reflected from neutral matter
pexriv	Exponentially cutoff power law reflected from ionized matter
phabs	Photo−electric absorption
plabs	Absorption model with power law dependence on energy
plcabs	Cutoff power law observed through dense, cold matter
posm	Positronium continuum
powerlaw	Simple photon power law
pshock	Constant temperature, plane−parallel shock plasma model
pwab	Extension of partial covering fraction absorption into a power−law distribution of covering fraction
raymond	Raymond−Smith thermal plasma
redden	IR/optical/UV extinction from Cardelli et al. (1989)
redge	Recombination edge
refsch	E−folded power law reflected from an ionized relativistic disk
sedov	Sedov model with electron and ion temperatures
smedge	Smoothed absorption edge
spline	Spline multiplicative factor
srcut	Synchrotron radiation from cutoff electron distribution

sresc	Synchrotron radiation from escape−limited electron distribution
SSS_ice	Einstein Observatory SSS ice absorption
step	Step function convolved with gaussian
TBabs	Calculates the absorption of X−rays by the ISM
TBgrain	Calculates the absorption of X−rays by the ISM with variable hydrogen to H2 ratio and grain parameters
TBvarabs	Calculates the absorption of X−rays by the ISM, allowing user to vary all abundances, depletion factors, and grain properties
uvred	UV reddening
vapec	APEC thermal plasma model with variable abundances
varabs	Photoelectric absorption with variable abundances
vbremss	Thermal bremsstrahlung spectrum with variable H/He
vequil	Ionization equilibrium collisional plasma model with variable abundances
vgnei	Non−equilibrium ionization collisional plasma model with variable abundances
vmcflow	Cooling flow model based on vmekal
vmeka	M−G−K thermal plasma with variable abundances
vmekal	M−K−L thermal plasma with variable abundances
vnei	Non−equilibrium ionization collisional plasma model with variable abundances
vnpshock	Plane−parallel shock plasma model with separate ion and electron temperatures and variable abundances
vphabs	Photoelectric absorption with variable abundances
vpshock	Constant temperature, plane−parallel shock plasma model with variable abundances
vraymond	Raymond−Smith thermal plasma with variable abundances
vsedov	Sedov model with separate ion and electron temperatures and variable abundances
wabs	Photoelectric absorption (Morrison and McCammon)
wndabs	Photoelectric absorption with low energy window
xion	Reflected spectra of a photo−ionized accretion disk or ring
zbbody	Redshifted blackbody
zbremss	Redshifted thermal bremsstrahlung
zedge	Redshifted absorption edge
zgauss	Redshifted gaussian
zhighect	Redshifted high energy cutoff
zpcfabs	Redshifted partial covering absorption
zphabs	Redshifted photoelectric absorption
zpowerlw	Redshifted power law
zTBabs	Calculates the absorption of X−rays by the ISM for modeling redshifted absorption. Does not include a dust component.
zvarabs	Redshifted photoelectric absorption with variable abundances
zvfeabs	Redshifted absorption with variable iron abundance
zvphabs	Redshifted photoelectric absorption with variable abundances
zwabs	Redshifted ``Wisconsin absorption"
zwndabs	Redshifted photoelectric absorption with low energy window

Bugs

For a list of known bugs and issues with the XSpec models, please visit the XSPEC bugs page. Version 11.3.1 of the XSpec models is supplied with CIAO 3.2.

See Also

sherpa
: atten, bbody, bbodyfreq, beta1d, beta2d, box1d, box2d, bpl1d, const1d, const2d, cos, delta1d, delta2d, dered, devaucouleurs, edge, erf, erfc, farf, farf2d, fpsf, fpsf1d, frmf, gauss1d, gauss2d, gridmodel, hubble, jdpileup, linebroad, lorentz1d, lorentz2d, models, nbeta, ngauss1d, poisson, polynom1d, polynom2d, powlaw1d, ptsrc1d, ptsrc2d, rsp, rsp2d, schechter, shexp, shexp10, shlog10, shloge, sin, sqrt, stephi1d, steplo1d, tan, tpsf, tpsf1d, usermodel, xsabsori, xsacisabs, xsapec, xsbapec, xsbbody, xsbbodyrad, xsbexrav, xsbexriv, xsbknpower, xsbmc, xsbremss, xsbvapec, xsc6mekl, xsc6pmekl, xsc6pvmkl, xsc6vmekl, xscabs, xscemekl, xscevmkl, xscflow, xscompbb, xscompls, xscompst, xscomptt, xsconstant, xscutoffpl, xscyclabs, xsdisk, xsdiskbb, xsdiskline, xsdiskm, xsdisko, xsdiskpn, xsdust, xsedge, xsequil, xsexpabs, xsexpdec, xsexpfac, xsgabs, xsgaussian, xsgnei, xsgrad, xsgrbm, xshighecut, xshrefl, xslaor, xslorentz, xsmeka, xsmekal, xsmkcflow, xsnei, xsnotch, xsnpshock, xsnsa, xsnteea, xspcfabs, xspegpwrlw, xspexrav, xspexriv, xsphabs, xsplabs, xsplcabs, xsposm, xspowerlaw, xspshock, xspwab, xsraymond, xsredden, xsredge, xsrefsch, xssedov, xssmedge, xsspline, xssrcut, xssresc, xssssice, xsstep, xstbabs, xstbgrain, xstbvarabs, xsuvred, xsvapec, xsvarabs, xsvbremss, xsvequil, xsvgnei, xsvmcflow, xsvmeka, xsvmekal, xsvnei, xsvnpshock, xsvphabs, xsvpshock, xsvraymond, xsvsedov, xswabs, xswndabs, xsxion, xszbbody, xszbremss, xszedge, xszgauss, xszhighect, xszpcfabs, xszphabs, xszpowerlw, xsztbabs, xszvarabs, xszvfeabs, xszvphabs, xszwabs, xszwndabs

slang
: usermodel

URL: http://cxc.harvard.edu/ciao3.4/xs.html
Last modified: December 2006