

ctools - Bug #2954

Correct handling of flux for cube sky models in csspec

07/11/2019 03:51 PM - Martin Pierrick

Status:	Closed	Start date:	07/11/2019
Priority:	Normal	Due date:	
Assigned To:	Martin Pierrick	% Done:	100%
Category:		Estimated time:	1.00 hour
Target version:	1.6.2		
Description			
<p>When used with a cube sky model (GModelSpatialDiffuseCube), csspec currently returns normalization best-fit values and errors (multiplied by bin energy in MeV and bin energy in erg).</p> <p>We would like to have physical fluxes instead, obtained from multiplying the normalization by the cube flux integrated over that bin. Note: the upper limit computed by csspec are correct so everything is correctly implemented in ctulimit. I attach an example csspec log file.</p> <p>The code should include these bits:</p> <ol style="list-style-type: none">1. Make sure total cube spectrum is computed and cached if model.spatial().type() 'DiffuseMapCube': model.spatial().set_mc_cone(GSkyDir(),180.0)2. Multiply normalization by flux in cube at this energy if model.spatial().type() 'DiffuseMapCube': spectrum[i] *= model.spatial().spectrum().eval(energy[i],GTime())			

History

#1 - 07/12/2019 04:02 PM - Knödseder Jürgen

- Target version set to 1.6.2

#2 - 07/16/2019 10:11 AM - Knödseder Jürgen

- File models.xml added

- File cube.fits added

I setup a test run using attachment:models.xml and attachment:cube.fits files. A 30 min simulation for a pointing at the Crab position gave the following csspec result:

```
2019-07-16T08:08:06: +=====+
2019-07-16T08:08:06: | Generate spectrum |
2019-07-16T08:08:06: +=====+
2019-07-16T08:08:06: === GEbounds ===
2019-07-16T08:08:06: Number of intervals .....: 10
2019-07-16T08:08:06: Energy range .....: 100 GeV - 100 TeV
2019-07-16T08:08:46: Bin 1 .....: 1.602177e-10 +/- 4.421024e-12 erg/cm2/s
2019-07-16T08:08:46: Bin 2 .....: 2.742546e-08 +/- 7.623746e-09 [< 1.259704e-11] erg/cm2/s (TS = 16.325)
2019-07-16T08:08:46: Bin 3 .....: 2.062850e-07 +/- 1.437324e-08 [< 1.441020e-10] erg/cm2/s (TS = 609.284)
2019-07-16T08:08:46: Bin 4 .....: 1.841667e-07 +/- 1.140676e-08 [< 1.822600e-10] erg/cm2/s (TS = 1310.556)
2019-07-16T08:08:46: Bin 5 .....: 1.902318e-07 +/- 1.443690e-08 [< 1.410683e-10] erg/cm2/s (TS = 554.006)
2019-07-16T08:08:46: Bin 6 .....: 1.715272e-07 +/- 1.714087e-08 [< 9.521660e-11] erg/cm2/s (TS = 206.144)
2019-07-16T08:08:46: Bin 7 .....: 1.807496e-07 +/- 2.406497e-08 [< 8.060233e-11] erg/cm2/s (TS = 103.523)
2019-07-16T08:08:46: Bin 8 .....: 8.352029e-08 +/- 2.119759e-08 [< 3.329548e-11] erg/cm2/s (TS = 31.199)
2019-07-16T08:08:46: Bin 9 .....: 5.385808e-08 +/- 1.608778e-08 [< 1.990545e-11] erg/cm2/s (TS = 25.012)
2019-07-16T08:08:46: Bin 10 .....: 5.647644e-09 +/- 6.757822e-03 [< 9.737229e-12] erg/cm2/s (TS = 57.810)
```

#3 - 07/16/2019 10:20 AM - Knödlseeder Jürgen

Adding the following code

```
# If the source model is a cube then multiply-in the cube
# spectrum
if source.spatial().classname() == 'GModelSpatialDiffuseCube':
    dir      = gammalib.GSkyDir()
    source.spatial().set_mc_cone(dir, 180.0)
    norm     = source.spatial().spectrum().eval(elogmean)
    fitted_flux *= norm
    e_flux    *= norm
```

gives the following result

```
2019-07-16T08:17:59: +=====+
2019-07-16T08:17:59: | Generate spectrum |
2019-07-16T08:17:59: +=====+
2019-07-16T08:17:59: === GEbounds ===
2019-07-16T08:17:59: Number of intervals .....: 10
2019-07-16T08:17:59: Energy range .....: 100 GeV - 100 TeV
2019-07-16T08:18:38: Bin 1 .....: 3.078758e-14 +/- 8.495484e-16 erg/cm2/s
2019-07-16T08:18:38: Bin 2 .....: 5.328896e-12 +/- 1.481330e-12 [< 1.259704e-11] erg/cm2/s (TS = 16.325)
2019-07-16T08:18:38: Bin 3 .....: 4.045340e-11 +/- 2.818657e-12 [< 1.441020e-10] erg/cm2/s (TS = 609.284)
2019-07-16T08:18:38: Bin 4 .....: 3.611729e-11 +/- 2.237001e-12 [< 1.822600e-10] erg/cm2/s (TS = 1310.556)
2019-07-16T08:18:38: Bin 5 .....: 3.726838e-11 +/- 2.828337e-12 [< 1.410683e-10] erg/cm2/s (TS = 554.006)
2019-07-16T08:18:38: Bin 6 .....: 3.206621e-11 +/- 3.204407e-12 [< 9.521660e-11] erg/cm2/s (TS = 206.144)
2019-07-16T08:18:38: Bin 7 .....: 2.845845e-11 +/- 3.788953e-12 [< 8.060233e-11] erg/cm2/s (TS = 103.523)
2019-07-16T08:18:38: Bin 8 .....: 1.087201e-11 +/- 2.759333e-12 [< 3.329548e-11] erg/cm2/s (TS = 31.199)
2019-07-16T08:18:38: Bin 9 .....: 5.796319e-12 +/- 1.731400e-12 [< 1.990545e-11] erg/cm2/s (TS = 25.012)
2019-07-16T08:18:38: Bin 10 .....: 5.025189e-13 +/- 6.013009e-07 [< 9.737229e-12] erg/cm2/s (TS = 57.810)
```

#4 - 07/16/2019 04:09 PM - Knödlseeder Jürgen

- Status changed from New to Closed

- % Done changed from 0 to 100

Merged into the 1.6.2 release.

Files

csspec_binned_1-10TeV_LMC-Pion.log	6.08 KB	07/11/2019	Martin Pierrick
models.xml	1.05 KB	07/16/2019	Knödseder Jürgen
cube.fits	64.7 KB	07/16/2019	Knödseder Jürgen