

GammaLib - Bug #1801

Energy dispersion does not work for stacked analysis

06/22/2016 05:55 PM - Mayer Michael

Status:	Closed	Start date:	06/22/2016
Priority:	High	Due date:	
Assigned To:	Knödlseider Jürgen	% Done:	100%
Category:		Estimated time:	0.00 hour
Target version:	1.1.0		
Description			
I have checked the usage of energy dispersion and I always get the same warnings when edisp is turned on:			
Parameter "Prefactor" has zero curvature. Fix parameter.			
Parameter "Index" has zero curvature. Fix parameter.			
As a result, the fit parameter don't change in the fit.			
I added a script and a file such that this can be reproduced (file and script have to be in the same folder).			

History

#1 - 06/22/2016 09:49 PM - Knödlseider Jürgen

- Assigned To set to Knödlseider Jürgen
- Target version set to 1.1.0

I will look into that.

#2 - 06/23/2016 12:11 AM - Knödlseider Jürgen

It turned out that there were several bugs in GCTACubeEdisp that prevented a correct computation of the energy dispersion for stacked analysis. Probably, these bugs have always existed. They comprised:

- An incorrect computation of migra in GCTACubeEdisp::set and GCTACubeEdisp::fill (minus sign should be a plus sign)
- Usage of an incorrect edisp function in GCTACubeEdisp::set and GCTACubeEdisp::fill
- Omission of the set_eng_axis() method in GCTACubeEdisp::read (a node array was not setup correctly)
- Wrong looping condition in GCTACubeEdisp::compute_ebounds() (prevented computation of maximum energy)
- Division instead of multiplication by migra in GCTACubeEdisp::compute_ebounds()

All these bugs have been fixed and the script runs successfully, giving the following results:

```
2016-06-22T21:55:05: +=====+
2016-06-22T21:55:05: | Maximum likelihood optimisation |
2016-06-22T21:55:05: +=====+
2016-06-22T21:55:13: >Iteration 0: -logL=3845.721, Lambda=1.0e-03
2016-06-22T21:55:21: >Iteration 1: -logL=3844.454, Lambda=1.0e-03, delta=1.267, max(|grad|)=6.198178 [Index:3]
2016-06-22T21:55:30: >Iteration 2: -logL=3844.451, Lambda=1.0e-04, delta=0.004, max(|grad|)=0.008839 [Index:3]
2016-06-22T21:55:30:
2016-06-22T21:55:30: +=====+
2016-06-22T21:55:30: | Curvature matrix |
2016-06-22T21:55:30: +=====+
2016-06-22T21:55:30: === GMatrixSparse ===
2016-06-22T21:55:30: Number of rows .....: 10
2016-06-22T21:55:30: Number of columns .....: 10
2016-06-22T21:55:30: Number of nonzero elements : 16
2016-06-22T21:55:30: Number of allocated cells .: 528
2016-06-22T21:55:30: Memory block size .....: 512
2016-06-22T21:55:30: Sparse matrix fill .....: 0.16
2016-06-22T21:55:30: Pending element .....: 0
2016-06-22T21:55:30: Fill stack size .....: 0 (none)
2016-06-22T21:55:30: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2016-06-22T21:55:30: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
```

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2016-06-22T21:55:30: 0, 0, 71.4554, -729.518, 0, 0, 2.4137, 0.0744688, 0, 0
2016-06-22T21:55:30: 0, 0, -729.518, 9114.55, 0, 0, -17.6776, -4.02596, 0, 0
2016-06-22T21:55:30: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2016-06-22T21:55:30: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2016-06-22T21:55:30: 0, 0, 2.4137, -17.6776, 0, 0, 862.199, 26.5778, 0, 0
2016-06-22T21:55:30: 0, 0, 0.0744688, -4.02596, 0, 0, 26.5778, 218.022, 0, 0
2016-06-22T21:55:30: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2016-06-22T21:55:30: 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2016-06-22T21:55:38:
2016-06-22T21:55:38: +=====+
2016-06-22T21:55:38: | Maximum likelihood optimisation results |
2016-06-22T21:55:38: +=====+
2016-06-22T21:55:38: === GOptimizerLM ===
2016-06-22T21:55:38: Optimized function value ...: 3844.451
2016-06-22T21:55:38: Absolute precision .....: 0.005
2016-06-22T21:55:38: Acceptable value decrease ..: 2
2016-06-22T21:55:38: Optimization status .....: converged
2016-06-22T21:55:38: Number of parameters .....: 10
2016-06-22T21:55:38: Number of free parameters ..: 4
2016-06-22T21:55:38: Number of iterations .....: 2
2016-06-22T21:55:38: Lambda .....: 1e-05
2016-06-22T21:55:38: Maximum log likelihood ....: -3844.451
2016-06-22T21:55:38: Observed events (Nobs) ...: 3417.000
2016-06-22T21:55:38: Predicted events (Npred) ...: 3416.993 (Nobs - Npred = 0.00721418)
2016-06-22T21:55:38: === GModels ===
2016-06-22T21:55:38: Number of models .....: 2
2016-06-22T21:55:38: Number of parameters .....: 10
2016-06-22T21:55:38: === GModelSky ===
2016-06-22T21:55:38: Name .....: Crab
2016-06-22T21:55:38: Instruments .....: all
2016-06-22T21:55:38: Instrument scale factors ...: unity
2016-06-22T21:55:38: Observation identifiers ...: all
2016-06-22T21:55:38: Model type .....: PointSource
2016-06-22T21:55:38: Model components .....: "SkyDirFunction" * "PowerLaw" * "Constant"
2016-06-22T21:55:38: Number of parameters .....: 6
2016-06-22T21:55:38: Number of spatial par's ...: 2
2016-06-22T21:55:38: RA .....: 83.6331 [-360,360] deg (fixed,scale=1)
2016-06-22T21:55:38: DEC .....: 22.0145 [-90,90] deg (fixed,scale=1)
2016-06-22T21:55:38: Number of spectral par's ...: 3
2016-06-22T21:55:38: Prefactor .....: 5.98652e-16 +/- 2.76669e-17 [1e-23,1e-13] ph/cm2/s/MeV (free,scale=1e-16,gradient)
2016-06-22T21:55:38: Index .....: -2.5052 +/- 0.0244963 [-0,-5] (free,scale=-1,gradient)
2016-06-22T21:55:38: PivotEnergy .....: 300000 [10000,1e+09] MeV (fixed,scale=1e+06,gradient)
2016-06-22T21:55:38: Number of temporal par's ...: 1
2016-06-22T21:55:38: Normalization .....: 1 (relative value) (fixed,scale=1,gradient)
2016-06-22T21:55:38: === GCTAModelCubeBackground ===
2016-06-22T21:55:38: Name .....: BackgroundModel
2016-06-22T21:55:38: Instruments .....: CTA, HESS, MAGIC, VERITAS
2016-06-22T21:55:38: Instrument scale factors ...: unity
2016-06-22T21:55:38: Observation identifiers ...: all
2016-06-22T21:55:38: Model type .....: "PowerLaw" * "Constant"
2016-06-22T21:55:38: Number of parameters .....: 4
2016-06-22T21:55:38: Number of spectral par's ...: 3
2016-06-22T21:55:38: Prefactor .....: 0.979871 +/- 0.0341226 [0.01,100] ph/cm2/s/MeV (free,scale=1,gradient)
2016-06-22T21:55:38: Index .....: -0.0655904 +/- 0.0678538 [-5,5] (free,scale=1,gradient)
2016-06-22T21:55:38: PivotEnergy .....: 1e+06 MeV (fixed,scale=1e+06,gradient)
2016-06-22T21:55:38: Number of temporal par's ...: 1
2016-06-22T21:55:38: Normalization .....: 1 (relative value) (fixed,scale=1,gradient)

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#3 - 06/23/2016 12:31 AM - Knödseder Jürgen

- Status changed from New to Closed
- % Done changed from 0 to 100

Merged into devel.

#4 - 06/23/2016 09:20 AM - Mayer Michael

Thanks for catching this. I guess these bugs are on me smile.png

Files				
script.py	2.8 KB	06/22/2016	Mayer Michael	
pnt.dat	55 Bytes	06/22/2016	Mayer Michael	