

## GammaLib - Feature #1914

### Add GModelTemporalFunc class

01/24/2017 12:09 PM - Knödlseider Jürgen

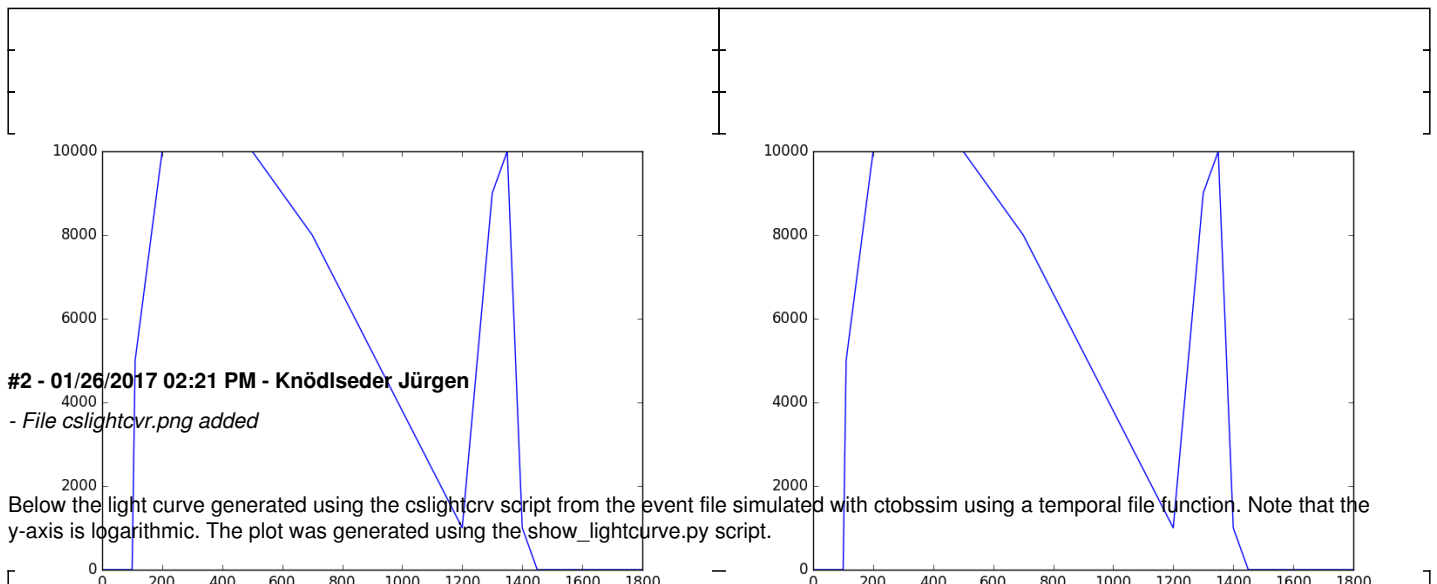
<b>Status:</b>	Closed	<b>Start date:</b>	01/24/2017
<b>Priority:</b>	Normal	<b>Due date:</b>	
<b>Assigned To:</b>	Knödlseider Jürgen	<b>% Done:</b>	100%
<b>Category:</b>		<b>Estimated time:</b>	0.00 hour
<b>Target version:</b>	1.2.0		
<b>Description</b>			
The GModelTemporalFunc should implement a temporal file function model, comprised of nodes that define the relative intensity at given times. The file function should be defined in a FITS file, including the definition of a time reference so that the value of the time column is defined in absolute times. The unit of the time column should be seconds, the file function should be unit less.			

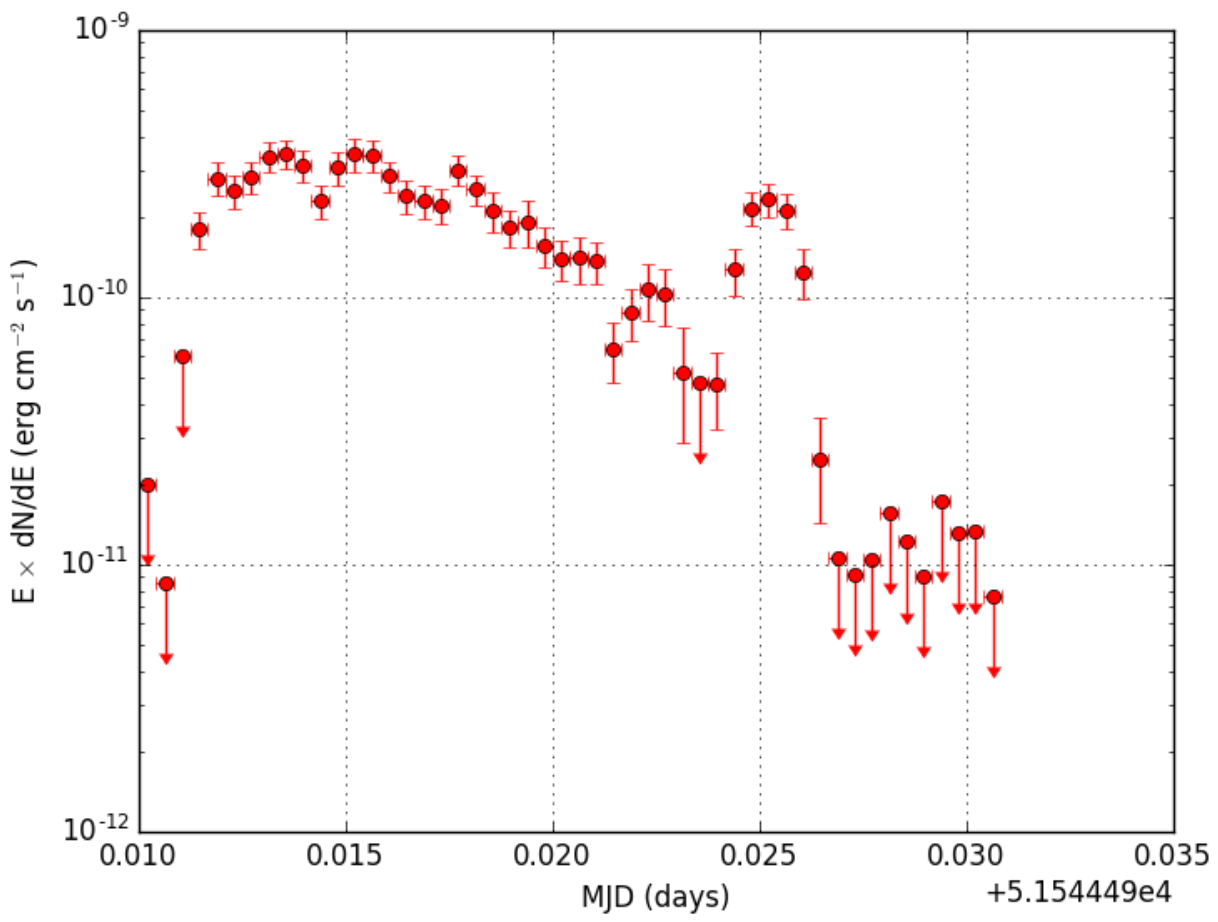
### History

#### #1 - 01/25/2017 05:24 PM - Knödlseider Jürgen

- File validate1.png added
- File validate2.png added
- File validate3.png added
- File validate4.png added
- File validate5.png added
- File validate6.png added
- File test-filefunction.py added
- File temp\_filefunction.fits added
- Target version set to 1.2.0
- % Done changed from 0 to 90

The class has been implemented, a dedicated unit test has been added and the mc() and eval() methods have been tested using a dedicated test script (attached). The visual output of the test script is shown below, indicating that the mc() method works properly for various time intervals.





#3 - 01/26/2017 02:54 PM - Knödseder Jürgen

Finally, I also checked that the fitting of the temporal file function works. See the output below. I still need to generate pull distributions to see whether they are also okay.

```
2017-01-26T08:28:49: +=====+
2017-01-26T08:28:49: | Maximum likelihood optimisation |
2017-01-26T08:28:49: +=====+
2017-01-26T08:28:49: >Iteration 0: -logL=147599.390, Lambda=1.0e-03
2017-01-26T08:28:50: >Iteration 1: -logL=147595.361, Lambda=1.0e-03, delta=4.030, max(|grad|)=7.453374 [Index:3]
2017-01-26T08:28:50: >Iteration 2: -logL=147595.348, Lambda=1.0e-04, delta=0.012, max(|grad|)=0.022177 [Index:3]
2017-01-26T08:28:51: >Iteration 3: -logL=147595.348, Lambda=1.0e-05, delta=0.000, max(|grad|)=0.000017 [Index:3]
2017-01-26T08:28:51:
2017-01-26T08:28:51: +=====+
2017-01-26T08:28:51: | Maximum likelihood optimisation results |
2017-01-26T08:28:51: +=====+
2017-01-26T08:28:51: === GOptimizerLM ===
2017-01-26T08:28:51: Optimized function value ...: 147595.348
2017-01-26T08:28:51: Absolute precision .....: 0.005
2017-01-26T08:28:51: Acceptable value decrease ..: 2
2017-01-26T08:28:51: Optimization status .....: converged
2017-01-26T08:28:51: Number of parameters .....: 10
2017-01-26T08:28:51: Number of free parameters ..: 4
2017-01-26T08:28:51: Number of iterations .....: 3
2017-01-26T08:28:51: Lambda .....: 1e-06
2017-01-26T08:28:51: Maximum log likelihood ....: -147595.348
2017-01-26T08:28:51: Observed events (Nobs) ...: 21022.000
2017-01-26T08:28:51: Predicted events (Npred) ..: 21022.000 (Nobs - Npred = 1.61784555530176e-07)
2017-01-26T08:28:51: === GModels ===
2017-01-26T08:28:51: Number of models .....: 2
2017-01-26T08:28:51: Number of parameters .....: 10
2017-01-26T08:28:51: === GModelSky ===
2017-01-26T08:28:51: Name .....: Crab
2017-01-26T08:28:51: Instruments .....: all
2017-01-26T08:28:51: Instrument scale factors ...: unity
2017-01-26T08:28:51: Observation identifiers ...: all
2017-01-26T08:28:51: Model type .....: PointSource
2017-01-26T08:28:51: Model components .....: "PointSource" * "PowerLaw" * "FileFunction"
2017-01-26T08:28:51: Number of parameters .....: 6
2017-01-26T08:28:51: Number of spatial par's ...: 2
2017-01-26T08:28:51: RA .....: 83.6331 [-360,360] deg (fixed,scale=1)
2017-01-26T08:28:51: DEC .....: 22.0145 [-90,90] deg (fixed,scale=1)
2017-01-26T08:28:51: Number of spectral par's ...: 3
2017-01-26T08:28:51: Prefactor .....: 5.64109934986393e-16 +/- 1.44694059813623e-17 [1e-23,1e-13] ph/cm2/s/MeV
(free,scale=1e-16,gradient)
2017-01-26T08:28:51: Index .....: -2.42121810308988 +/- 0.020974164555023 [-0,-5] (free,scale=-1,gradient)
2017-01-26T08:28:51: PivotEnergy .....: 300000 [10000,1000000000] MeV (fixed,scale=1000000,gradient)
2017-01-26T08:28:51: Number of temporal par's ...: 1
2017-01-26T08:28:51: Normalization .....: 1 [0,1000] (relative value) (fixed,scale=1,gradient)
2017-01-26T08:28:51: === GCTAModellrfBackground ===
2017-01-26T08:28:51: Name .....: CTABackgroundModel
2017-01-26T08:28:51: Instruments .....: CTA
2017-01-26T08:28:51: Instrument scale factors ...: unity
2017-01-26T08:28:51: Observation identifiers ...: all
2017-01-26T08:28:51: Model type .....: "PowerLaw" * "Constant"
2017-01-26T08:28:51: Number of parameters .....: 4
2017-01-26T08:28:51: Number of spectral par's ...: 3
2017-01-26T08:28:51: Prefactor .....: 0.996001391554557 +/- 0.0118927869244997 [0.001,1000] ph/cm2/s/MeV (free,scale=1,gradient)
2017-01-26T08:28:51: Index .....: -0.00066143101849483 +/- 0.0073650960488301 [-5,5] (free,scale=1,gradient)
2017-01-26T08:28:51: PivotEnergy .....: 1000000 [10000,1000000000] MeV (fixed,scale=1000000,gradient)
2017-01-26T08:28:51: Number of temporal par's ...: 1
2017-01-26T08:28:51: Normalization .....: 1 (relative value) (fixed,scale=1,gradient)
```

#4 - 01/26/2017 03:51 PM - Knödseder Jürgen

- File pull\_prefactor.png added
- File pull\_index.png added
- File pull\_bgd\_prefactor.png added
- File pull\_bgd\_index.png added
- Status changed from New to Closed
- % Done changed from 90 to 100

Also the pull distributions look good. Consider that this model is now validated. Close the issue.

