Data Challenge II

Logo by Stefano Ciprini.

http://www-glast.slac.stanford.edu/software/DataChallenges/DC2/DC2Mail.htm

Data Challenges

- **A series of end-to-end studies:**
  - **Produce 1 day; one month; three months of simulated LAT data, release this to the collaboration for science analysis.**

- **Drives instrument performance studies, exercises detector simulation software.**

- **Science input – include in the simulation science/astrophysical features we expect to see in the GLAST gamma-ray sky, verify that the analysis tools can find them.**

- **Tests data servers, user level documentation and more…**

- **DC1. Modest goals. 1 simulated day.**
- **DC2, start beginning of CY06. More ambitious goals. Encourage further development, based on lessons from DC1. One simulated month.**
- **DC3, in CY07. Support for flight science production.**

DC Components

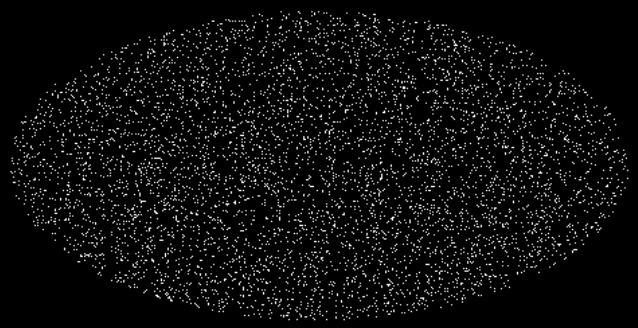
- **Focal point for many threads**
  - **Orbit, rocking, pointing history**
  - **Plausible model of the sky**
  - **Event Reconstruction**
  - **Background rejection and event selection**
  - **Instrument Response Functions**
  - **Data formats for input to high level tools**
  - **First look at major science tools – Likelihood, Observation Simulator**
  - **Generation of datasets**
  - **Populate and exercise data servers at GSSC & SLAC**
  - **Code distribution on windows and linux**

- **Involve new users from across the collaboration**

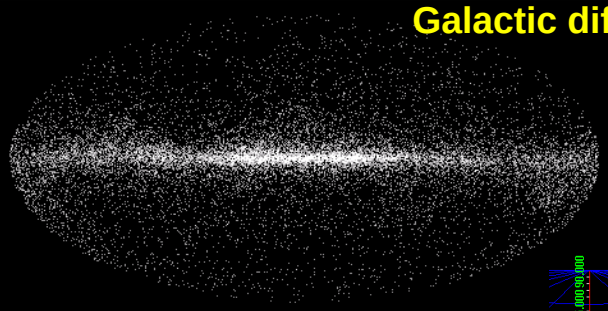
- **Teamwork!**

The Simulated DC1 Sky

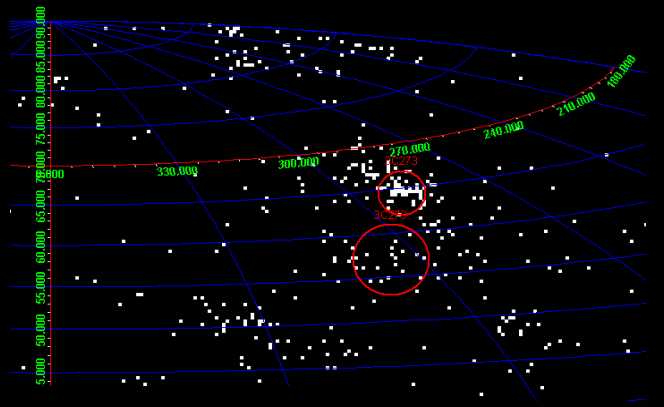
Extragalactic diffuse

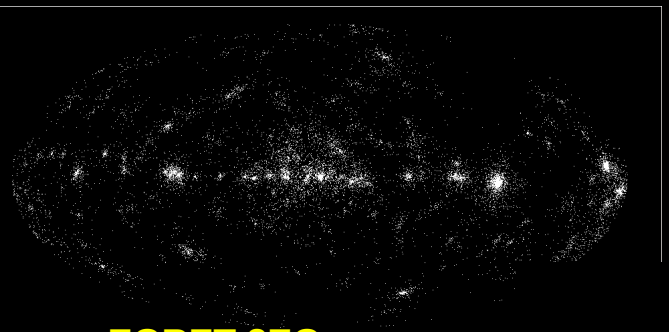


Galactic diffuse



Fiddling 3C273/279

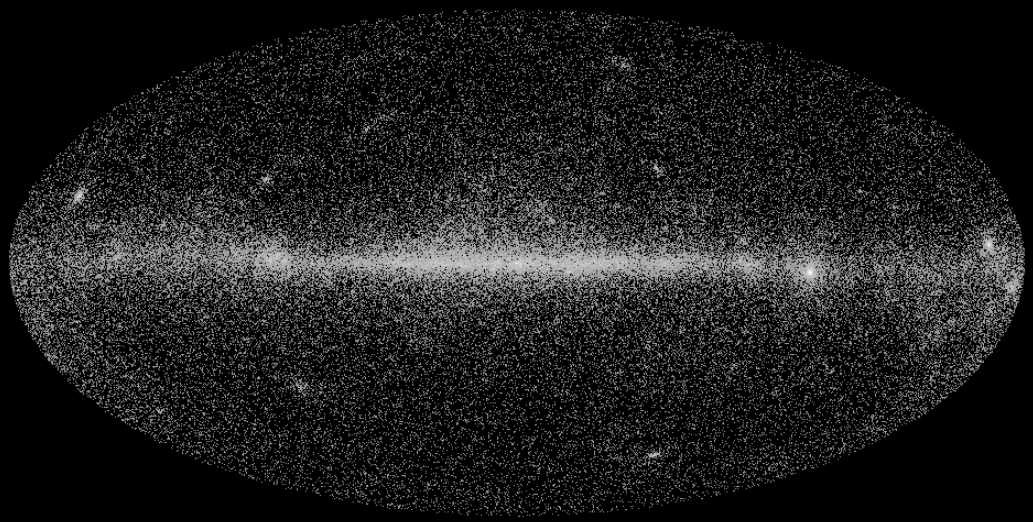




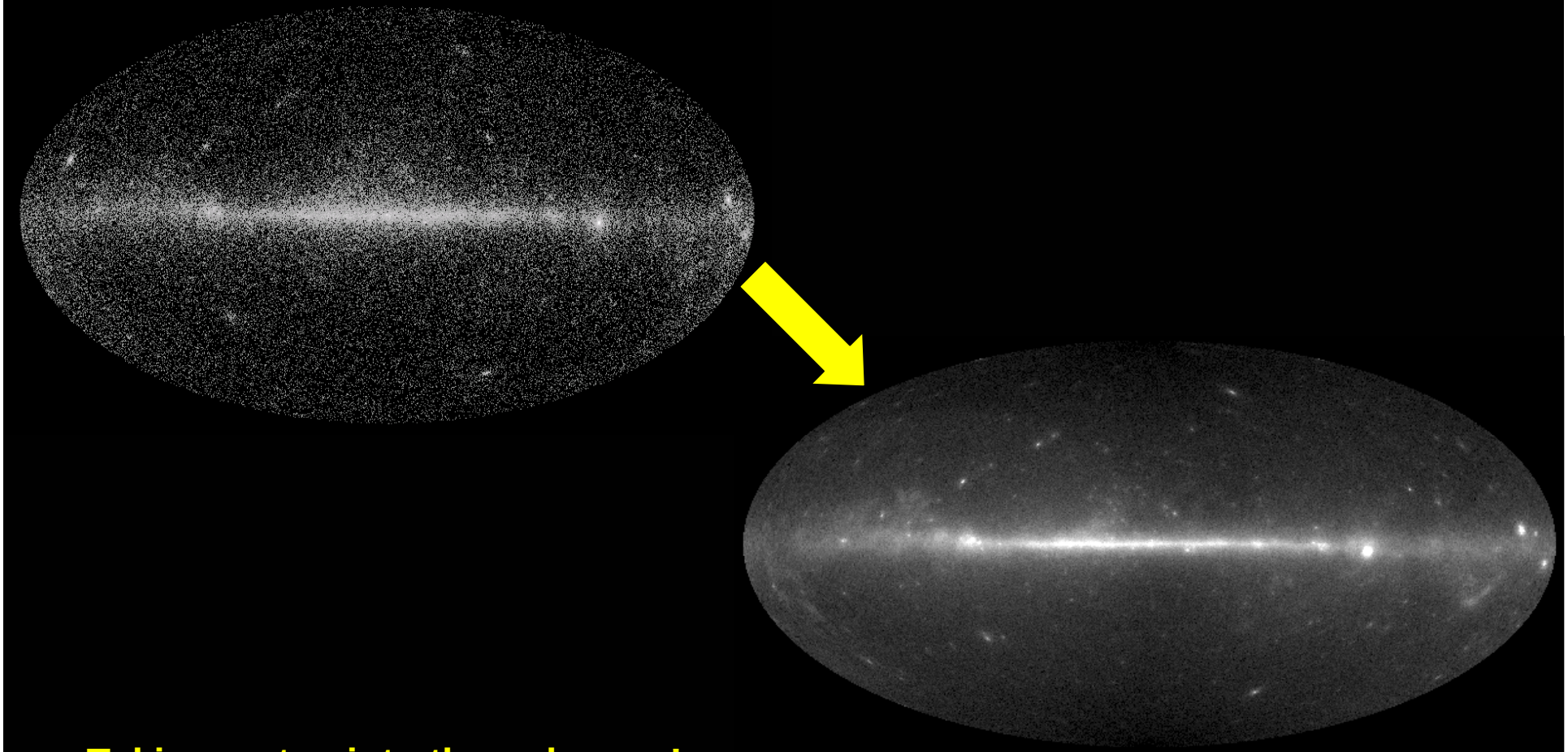
EGRET 3EG

No variability

Our Sky

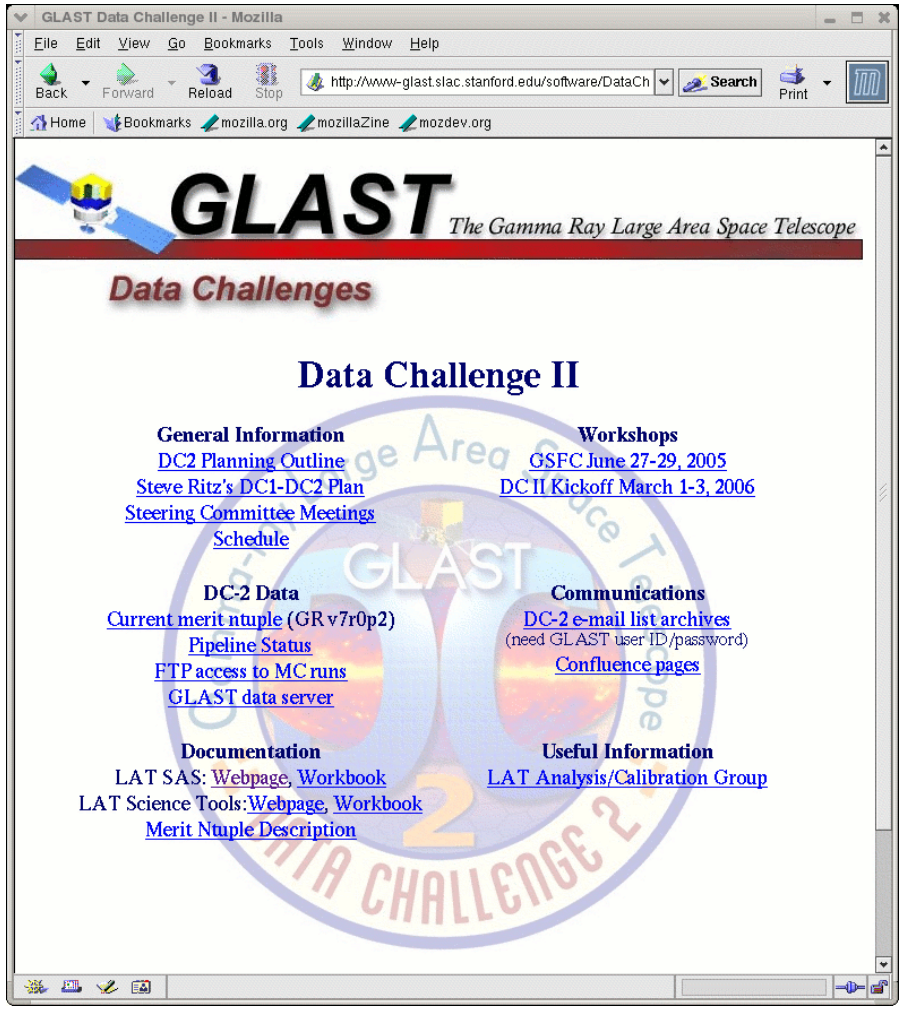


From DC1 to DC2



- Taking a step into the unknown!
- One month of LAT data will provide the deepest image of GeV sky ever seen.
- Science model of the sky needs to be more detailed (and imaginative) than for DC1

http://www-glast.slac.stanford.edu/software/DataChallenges/DC2/DC2Main.html



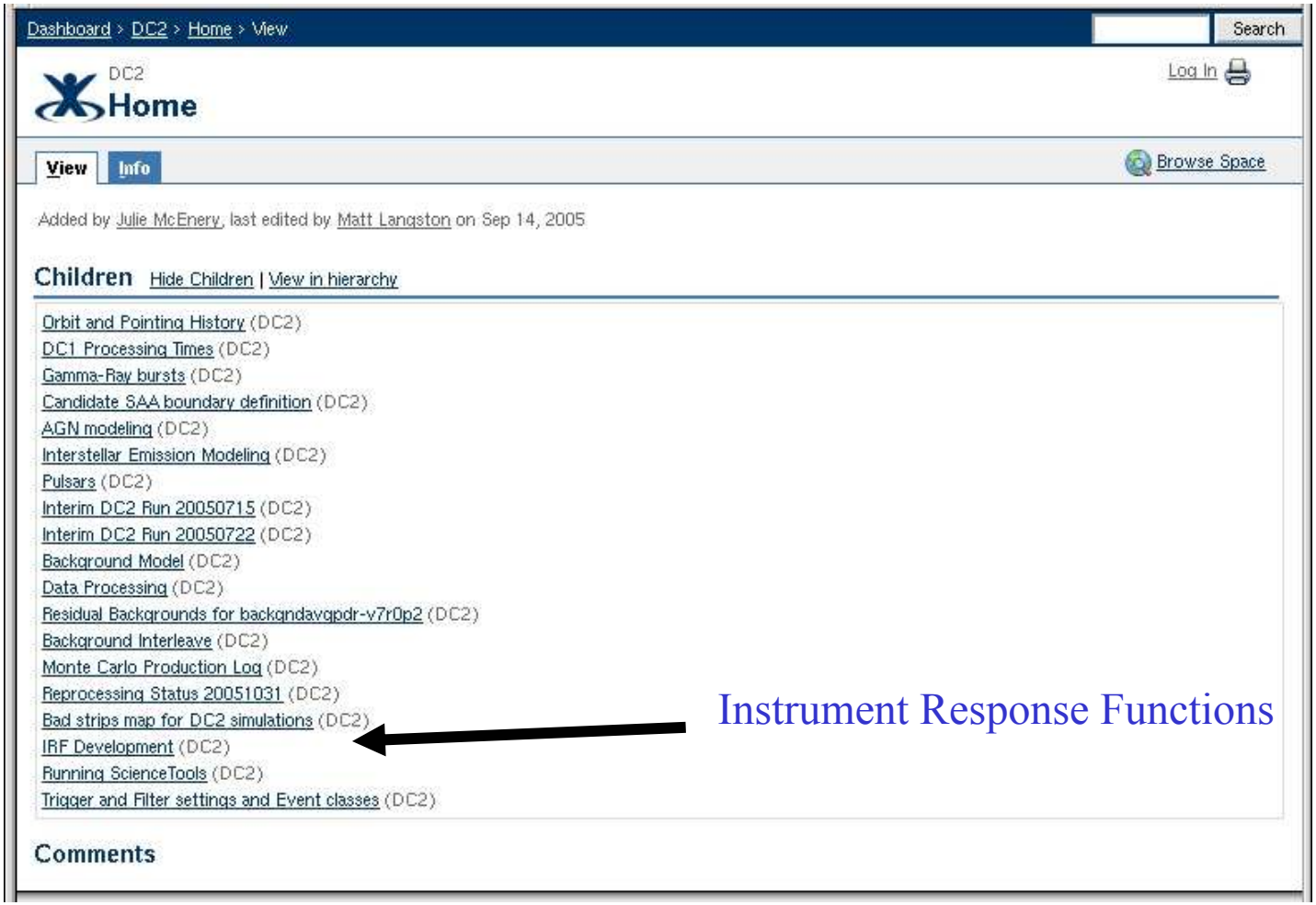
Date of the kickoff meeting:
March 1-3 (please register).
F-to-F meeting: March 4

Date of closeout meeting:
Not defined
(between April 26 and May 17)

Size of the data set
Requirement: 30 days
Goal: 55 days

Some background will be included.

http://confluence.slac.stanford.edu/display/DC2/Home



Documentation

http://glast-ground.slac.stanford.edu/workbook/science-tools/sciTools_Home.htm

Participants in DC2 looking at Blazars

- SLAC: R. Cameron, J. Carson, J. Chiang, E. do Couto e Silva, G. Madejski, B. Lott
- Perugia: G. Tosti, P. Lubrano, S. Ciprini, A. Cucchiara, L. Furhmann
- ASI: P. Giommi, S. Cutini, D. Gasparrini
- GSFC: L. Reyes, J. Scargle
- Stockholm Observatory: S. Larsson, F. Ryde
- CENBG: Th. Reposeur, D. Smith

At the kickoff meeting, the catalog group will provide a list of candidate sources,with (approximate) position, flux and spectral index for each.
This list will then be refined during DC2.
Establishing the first list requires about 2 weeks on a farm of 8 processors.

This means that:

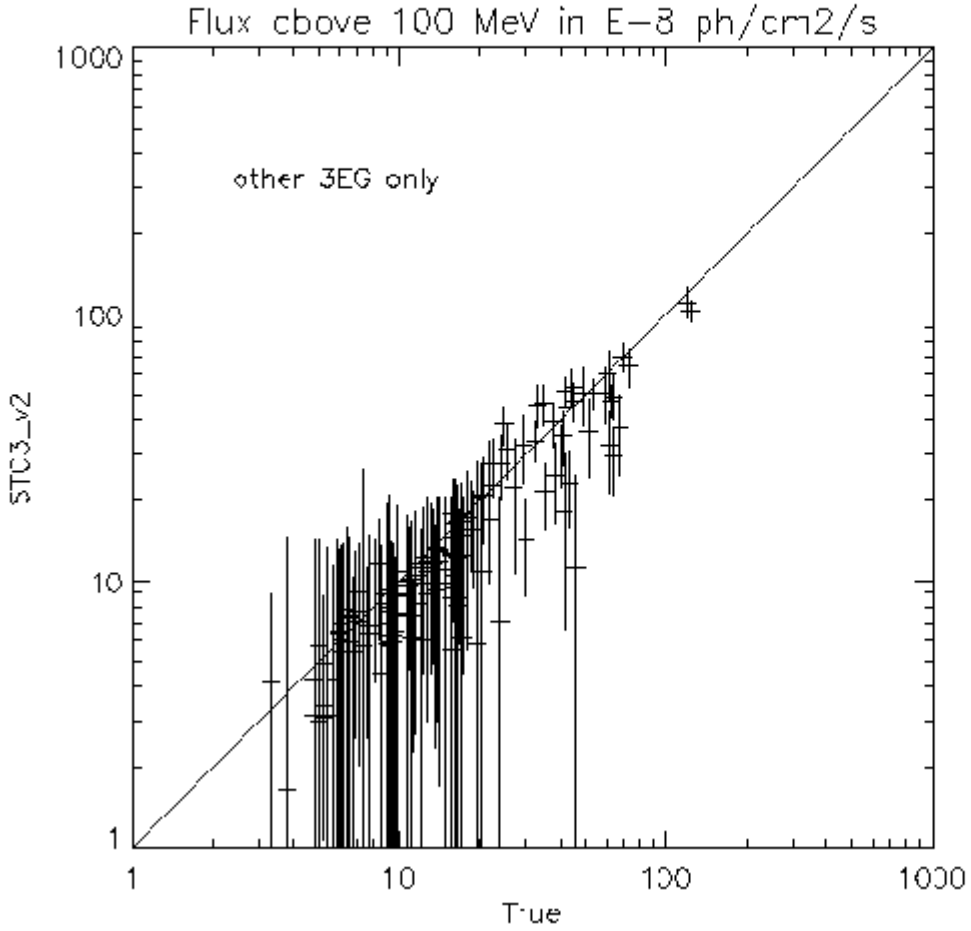
- the identification of blazars in the sample is left to us;
- no variability information will be provided.

We will need to repeat the Likelihood analysis over a large number of sources, which is computing intensive. We need to be prepared.

Use of binned analysis ? Jennifer Carson is looking into this issue.

Optimal filter results

The run found 553 sources (versus 510 with the wrong exposure) with Test Statistic above 10: all 105 bright blazars, all 14 pulsars, 142 other 3EG sources (among 148), 291 faint blazars (among 514) and 1 γ-ray burst. The FITS file can be found here. The figures shown in the previous report are qualitatively identical, except the flux which is now approximately correct (see below).



Jean Ballet
(catalog group)

Goals for DC2

1. Blazar catalog, sample definition
   Source Identification in collaboration with the Catalog Group (Jürgen Knödlseder)

2. Gamma-ray statistical properties of the samples
   - LogN-LogS, redshift distributions, luminosity function
   - population studies: BL Lacs and FSRQs, bright radio galaxies, radio_quiet galaxies

3. General properties of GLAST-detected blazars
   - spectral index
   - spectral cutoffs
   - luminosity and spectral variability
   - duty cycle…

4. Specific Properties of Individual Source
   For the brightest sources: spectral evolution with time, flux
   detailed spectra (cutoff, curvature)
   non-simultaneous SEDs

5. Extragalactic Background Light
   Rough estimate of EBL density (if enough bright, high-redshift, high-energy sources…)

Variability

Variability studies

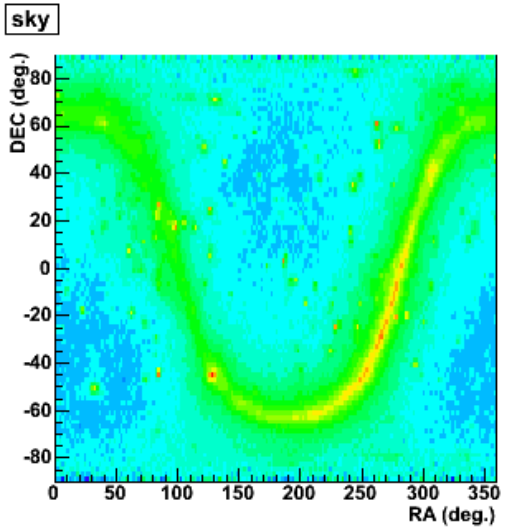
Impractical to run the Likelihood package on all sources as a function of time.

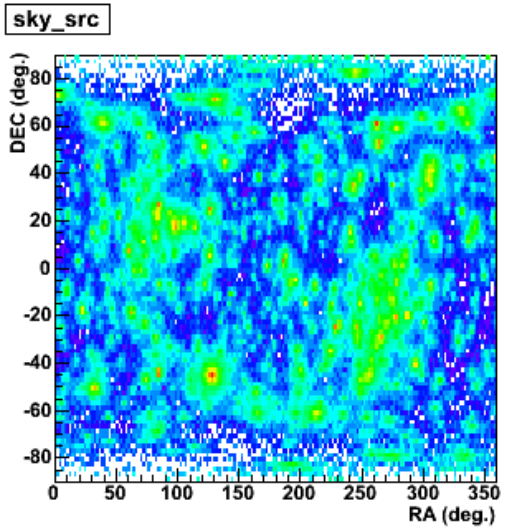
Possibility:

- create flux maps (count maps normalized with respect to exposure) for different time bins
- subtract Galactic + Extragalactic Diffuse Emission components,
- investigate if the measured variations of flux is consistent with a steady flux, for instance by computing the variability index (McLaughlin,Torres,…)

Maps

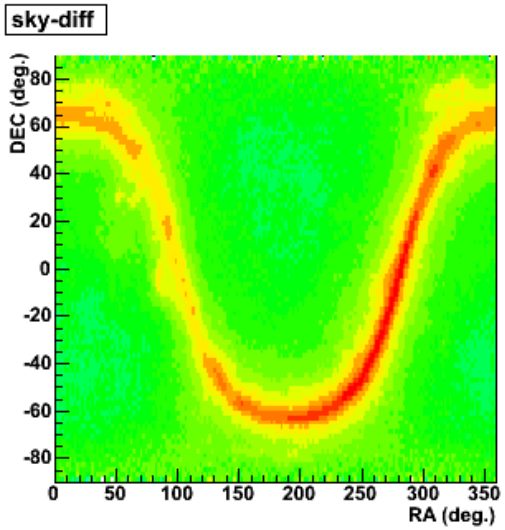
all

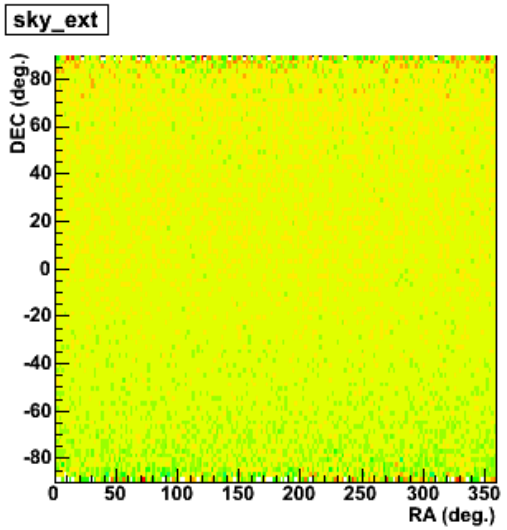




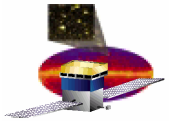
Point sources

Galactic

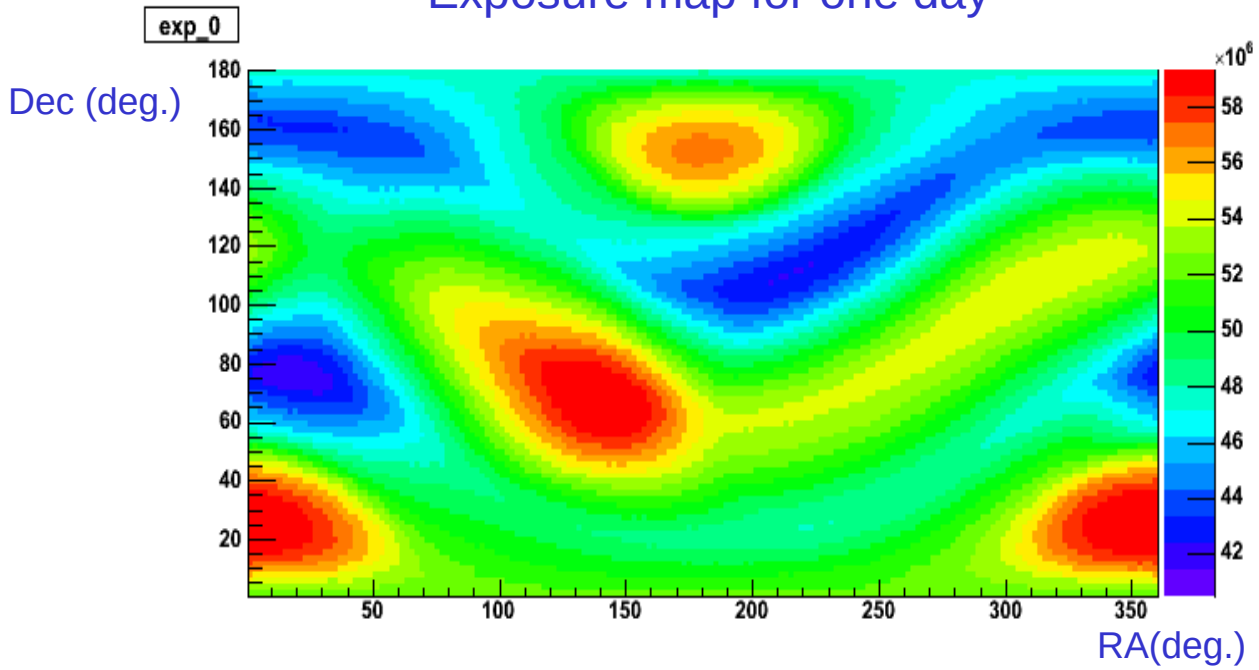


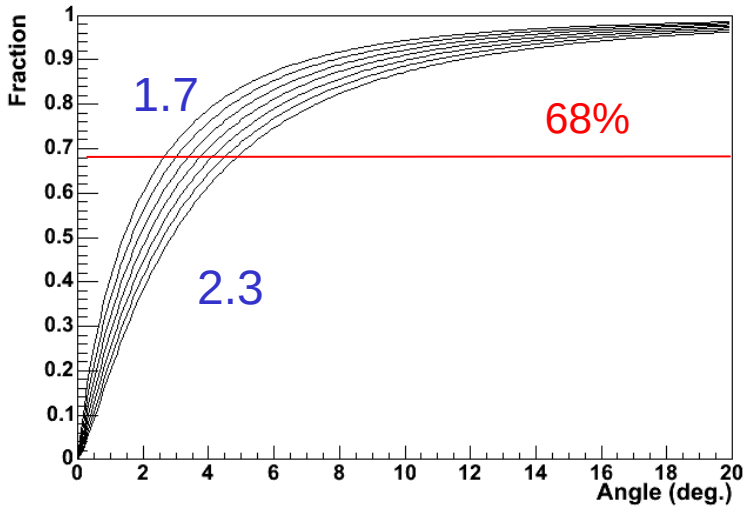


Extragalactic

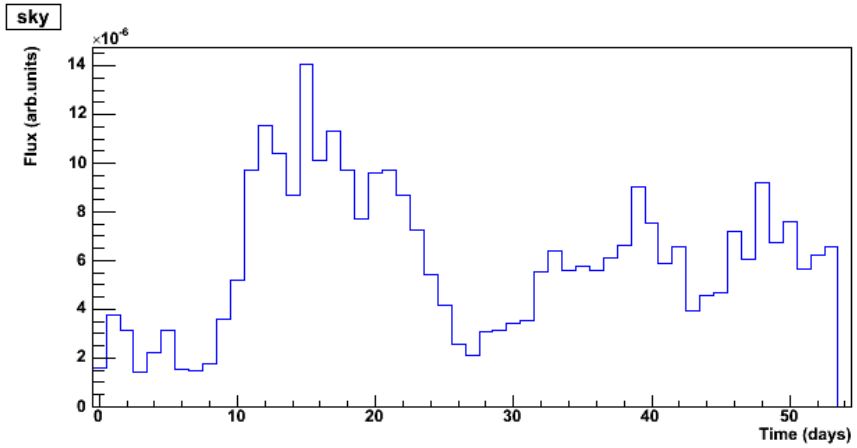


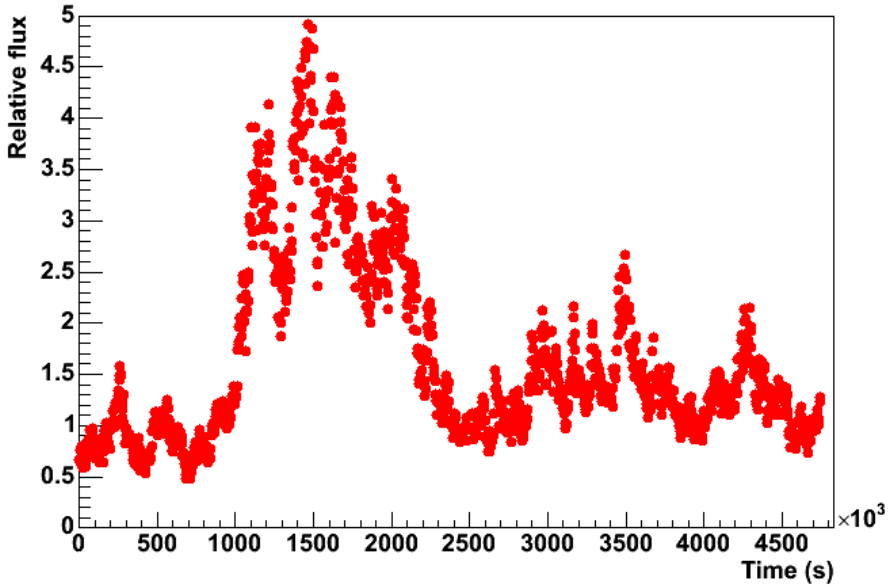
Exposure map for one day





Fraction of contained photons as a function of the opening angle
(1.7 <index <2.3)





Light curve obtained

The distributions look similar but are not identical: pb with the exposure normalization.

Seed light curve (Gino Tosti's 34)