Things that can bite you: DIY cuts

- For Science Tools analysis, getting accurate fluxes, fluences, etc. requires exact correspondence between the data selections and the IRFs
- It is entirely possible to apply a selection (e.g., in the FITS skimmer) that the Science Tools are not aware of or cannot be accommodated by the IRFs and the *tools will run anyway* and (after listening to this talk) *you will get what you deserve*
- Basically, all of the selections that the Science Tools understand are applied by gtselect leaves a record of the selections that it applied in the header of an FT1 file
  - gtvcuts will show you what cuts have been applied

Things that you can do instead of cuts

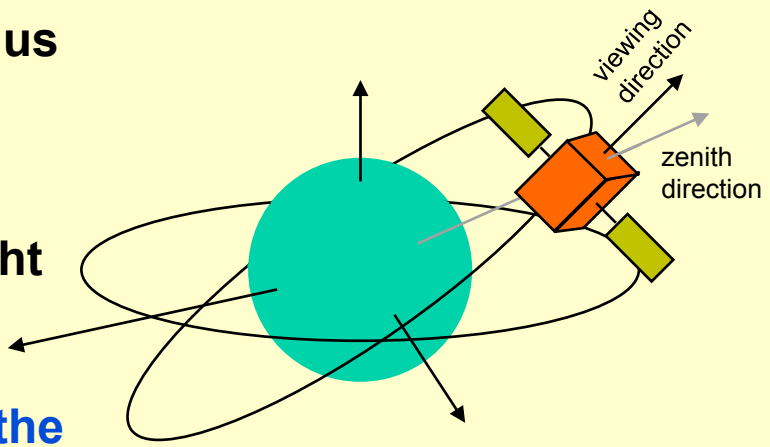
- FT1 files are event lists (ntuples) WITH a 'Good Time Interval' extension
  - GTIs define the time ranges (lists of START and STOP times in MET) that are considered good data

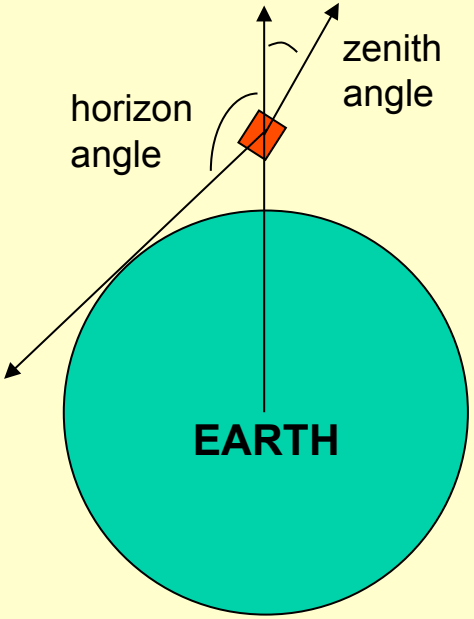
- For us it is all good but the power is using the GTI to make selections that are attitude, location, time or geomagnetic environment dependent

- gtmktime lets you define selections based on the FT2 files (which are time histories of attitude, location, geomagnetic quantities… and live time)

More things that can bite you: albedo γs

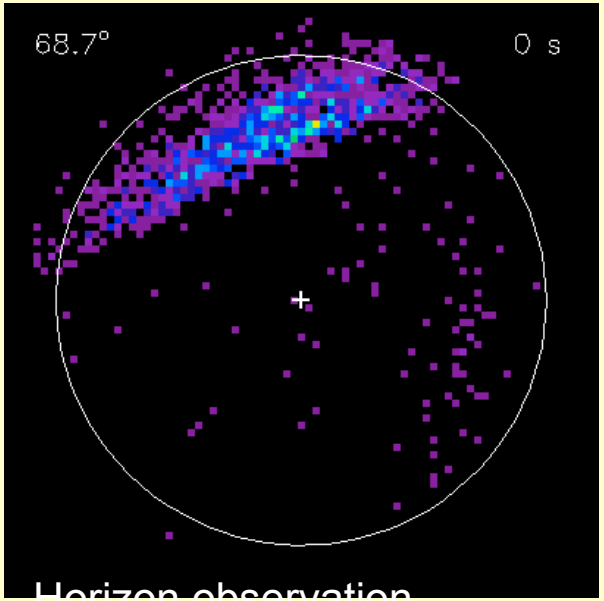
- Earth in the FOV: Albedo gamma rays plus loss of exposure due to blockage by the earth
- The location of the earth is defined by zenith angle (the angle away from 'straight up'.
  - This is independent of the viewing direction of the LAT (obviously) and the region of the sky blocked by the earth is continually changing
- In survey mode, we typically don't care about where the earth is because it is kept out of the FOV
  - This is good because the blockage by the earth (which again is time variable) is not accommodated by likelihood analysis (see later slide for how we deal with this)



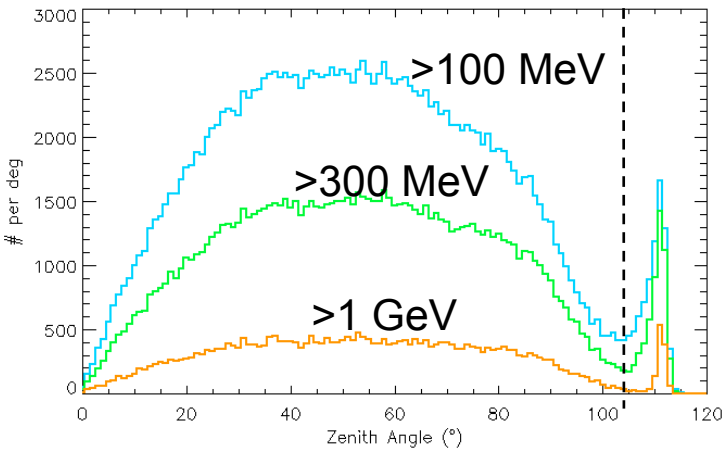


Albedo gamma rays

- And albedo gamma rays are not celestial (not in Galactic diffuse model, for example) and albedo emission is very bright
  - The horizon (ZA ~ 113°) is bright and the earth also shines at larger zenith angles
- There's no perfect way to deal with the albedo emission and finite angular resolution. We make a practical compromise
- Typically we apply a cut on zenith angle at 100° or 105° depending on the analysis



Horizon observation



Diffuse class

Aside

- **NB: The pollution from the horizon albedo gamma rays is not all over the sky**
  - **A tighter cut on zenith angle, will start reducing exposure around the orbital pole**
  - **The poles also get brightened somewhat (energies <300 MeV) by misreconstructed gamma rays immune to zenith angle cuts. Hint: If you are making an analysis of diffuse signals at low energies you may want to stay below some declination limit |Dec| < 50°**

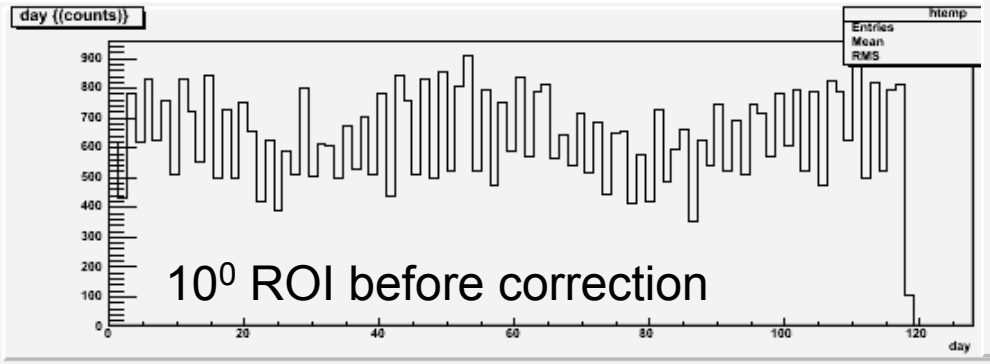
Pointed observations

- We have not had to deal with these since L&EO except for ARRs
- During a pointed observation Fermi will track a target until rocking angle ~92°, by which time the earth is well into the FOV and albedo gamma rays are brightening your sky
- The limited number of ARRs suggests that most analyses are better off just omitting these time intervals (see later)
- Alternatively, for a specific ROI you can analyze time ranges when your ROI did not cross some zenith angle limit

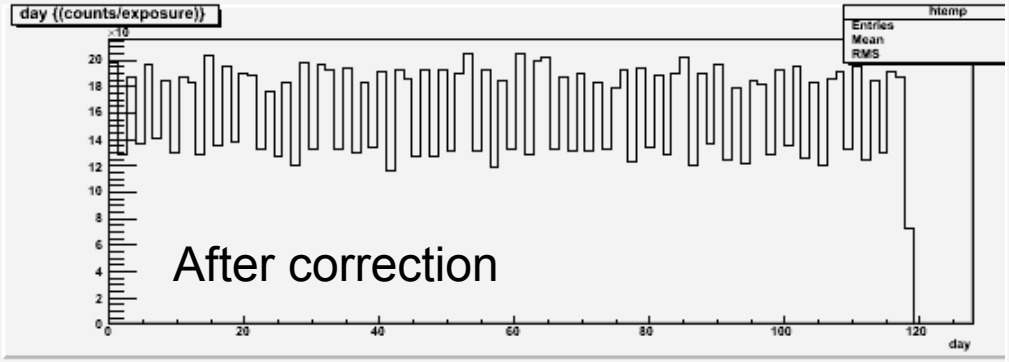
Calculating Exposure: LS I +61 303

- **gtexposure & gtexpmap**

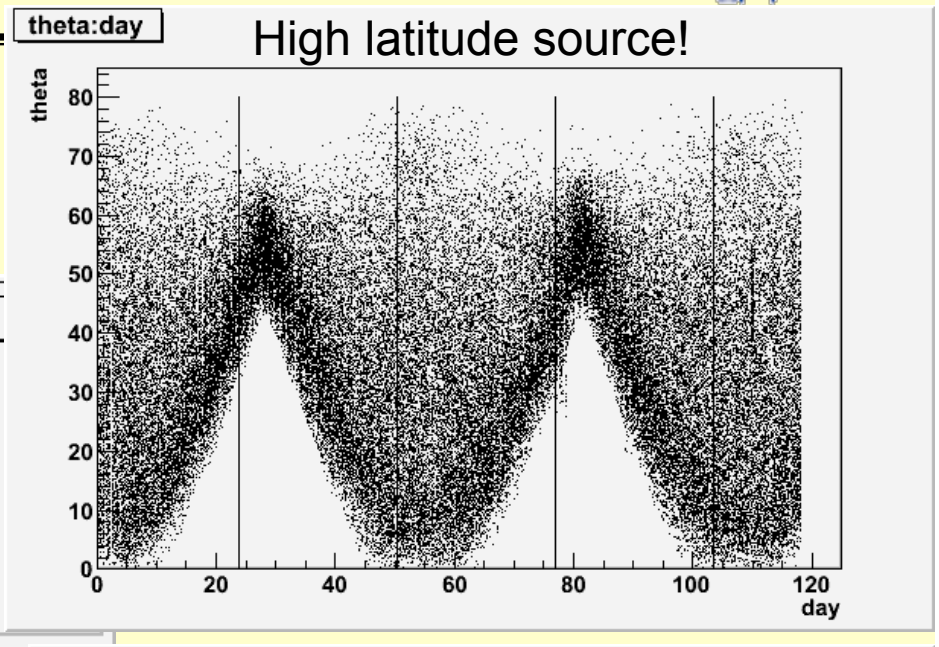
  gtbin gtlike



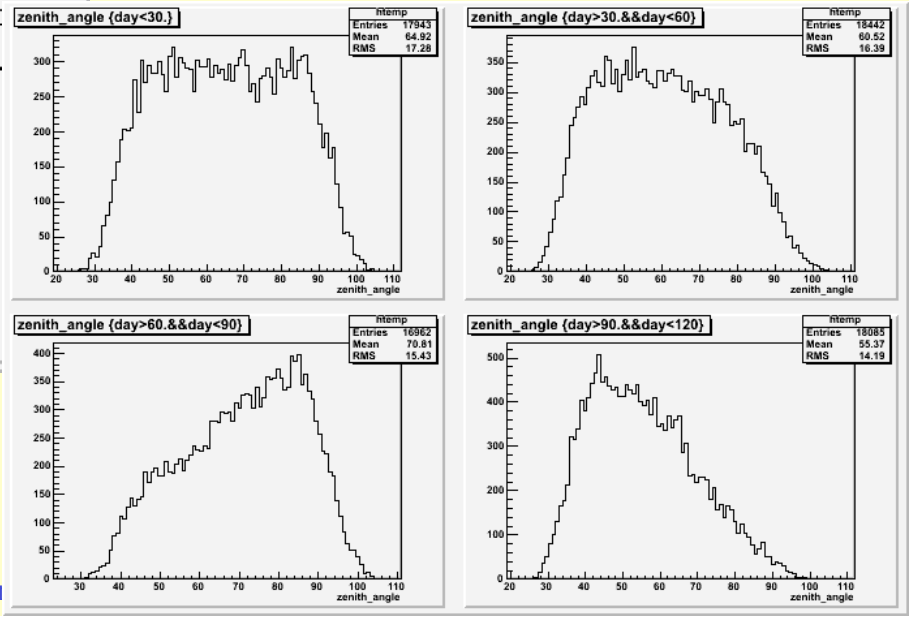
10^0 ROI before correction



After correction



High latitude source!



Uniformity of Exposure