

Sources for the Data Challenge

Toby Burnett, Theodore Hierath, Sean Robinson

SLAC Workshop

15 July 2003

The background mixture from PDR

	Protons	Electrons	Gammas
Average	cremeavg albedo_proton_avg	electronavg albedo_electronpositronavg_total	albedo_gamma
Maximum	chimemax albedo_proton_max	electronmax albedo_electronpositronmag_total	albedo_gamma

- electronavg, electronmax: from scaled CHIME at representative lat,lon
- chimemax: CHIME at =-28.5,110 (empirical maximum)
- cremeavg: from a table of the “average” CRÈME spectrum
- albedo_gamma: narrow band at horizon
- albedo_electronpositronavg[avg,mag]_total: empirical broken power-law spectrum, eye-ball fit to AMS data—implemented as e+ only.

Validation by David Wren

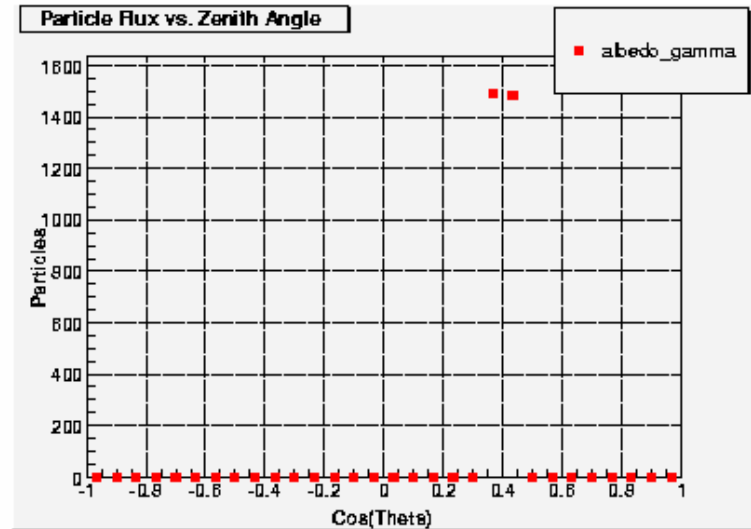
- Important changes since CDR
 - Gismo → Geant4
 - FluxSvc code reorganization (“refactoring”)
- Careful comparison by David Wren:

http://www-glast.slac.stanford.edu/software/AnaGroup/wren_fluxes4.pdf

Flux Type	Integrated Flux (kHz/m ²) in <i>GlastRelease/Gleam</i>	Integrated Flux (kHz/m ²) in <i>pdrApp</i>
backgndmaxpdr	9.9	9.9
chimemax	4.2	4.2
albedo_proton_max	2.6	2.6
albedo_gamma	0.92	0.92
electronmax	0.043	0.043
albedo_electron_positron_total	2.2	2.2

Deficiencies

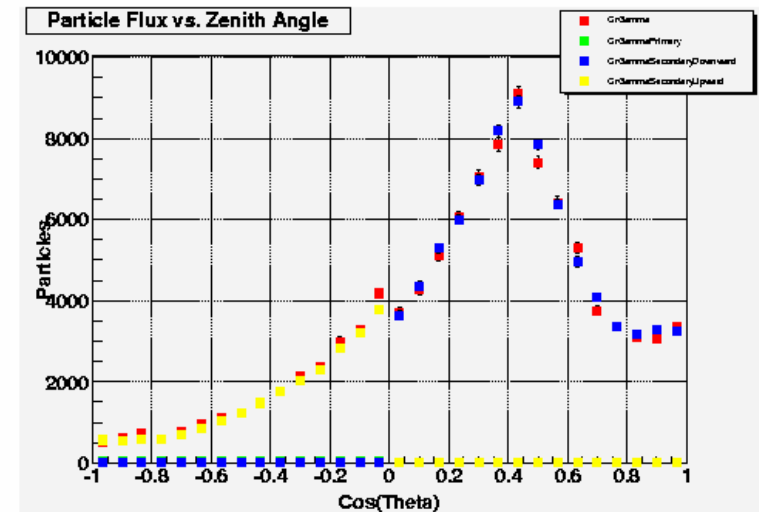
- The albedo gamma has only the limb
- The electron albedo sources do not have dependence on geomagnetic latitude
- We need a full position-dependent source, since we will be simulating orbits (more later)



albedo_gamma angular
dependence

The new CRflux package

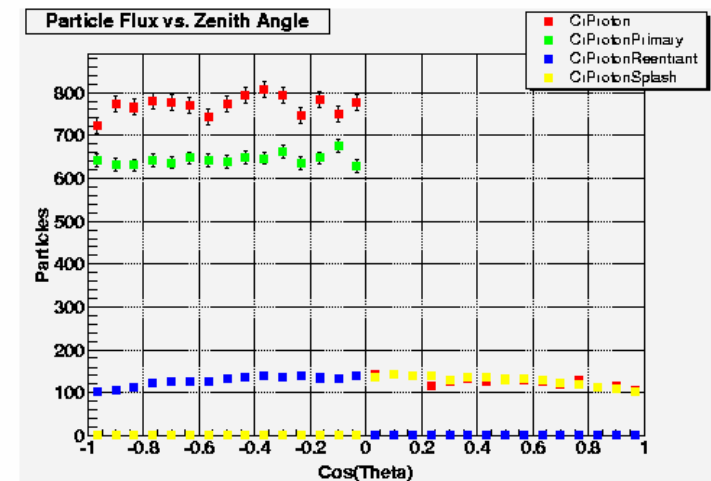
- Primary author: Tsunefumi Mizuno
- Based on AMS data, evolved from balloon data (Palestine)
- Careful descriptions of proton, electron/positron, gamma fluxes
- Some flaws to be fixed, clear that lat/lon is correct



CrGamma angular dependence

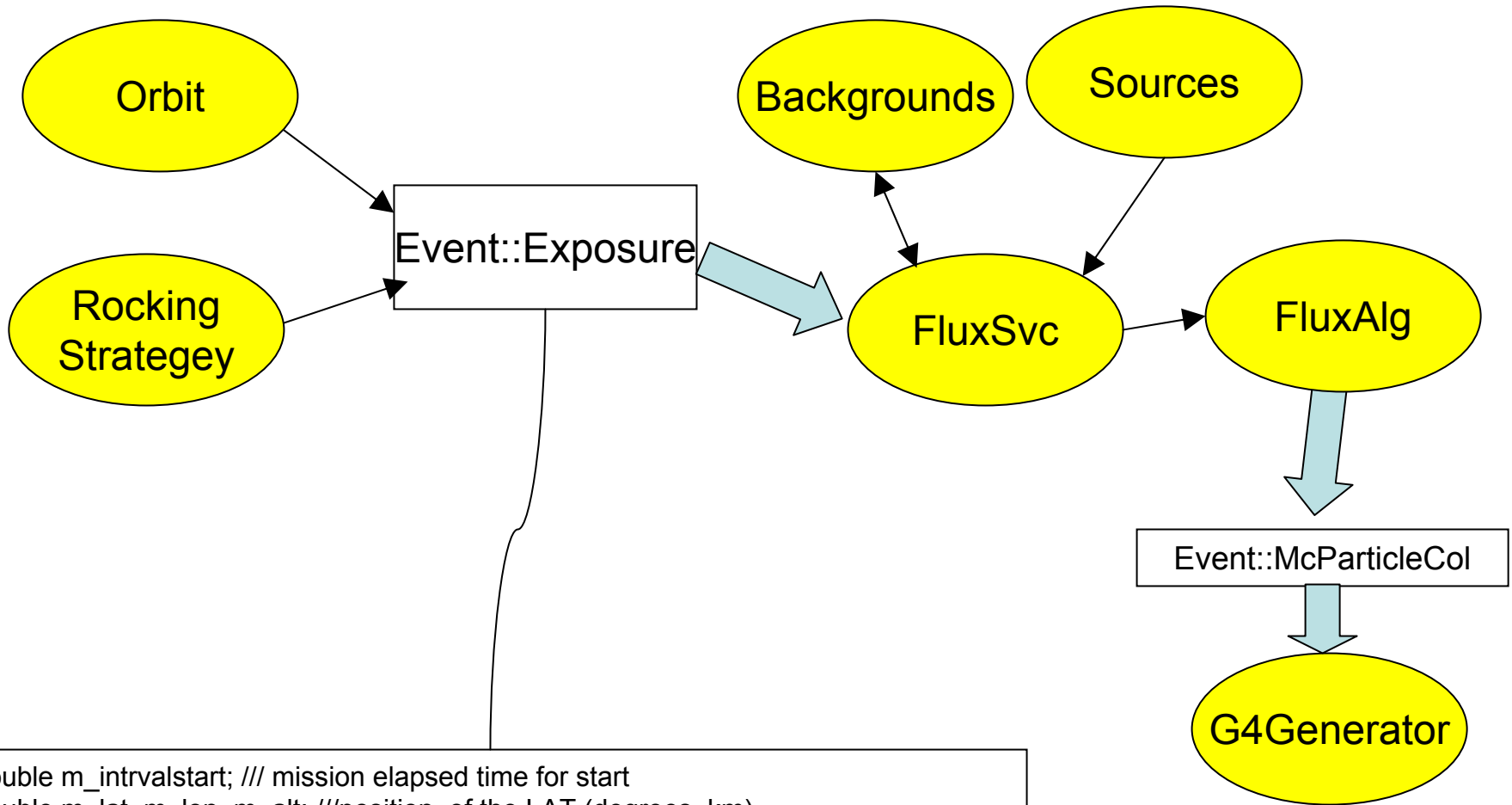
Fluxes (particles/m²/sr/sec)

Source	Palestine	Min	Max
CrProton	330.292	190.568	346.333
CrProtonPrimary	236.336	47.5487	203.313
CrProtonReentrant	46.7033	71.5096	71.5096
CrProtonSplash	47.2525	71.5096	71.5096
chime	180.732	28.227	331.584



CrProton angular dependence

Orbits, rocking and all that



```
double m_intrvalstart; /// mission elapsed time for start
double m_lat, m_lon, m_alt; ///position of the LAT (degrees, km)
double m_posX,m_posY,m_posZ; /// position (in inertial celestial cartesian coords)
double m_RAX, m_DECX; /// direction of LAT x-axis
double m_RAZ, m_DECZ; /// direction of LAT z-axis
```

Some Issues

- Time as an event key:
 - Internal format : double (mission elapsed time, or two long ints)?
 - Mission start: let's choose it. (JD 2006.5?)
- Launch date for the simulation
- Orbit model: plan to use Perugia's astro::EarthOrbit
- Three stages:
 1. Exposure database, 30 sec intervals
 2. Incoming particles record
 3. Full simulation
- Determine the random seed from the event key