

GLAST Science Working Group III on Extragalactic Sources

Organizers: **C. Dermer, K. Wood, R. Hartman, T. Kamae , R. Johnson**

Science Topics:

- 3. Extragalactic Diffuse Radiation and Log N-log S of Extragalactic Sources*
- 9. Gamma-ray Emission from Blazar AGNs: Emission Mechanisms,
Multiwavelength Spectral Studies and Time Variability*
- 10. Luminosity Evolution of AGN Blazars and Spectral Cutoffs: Population
and Extragalactic Background Light Studies*
- 11. High-Energy Gamma-ray Emission from Seyfert and Radio Galaxies*

Charge: Mock data challenge to provide source simulators for LAT all-sky survey

- Generate simulated data set of γ -ray sky
- Test data analysis tools
- Determine expected rates of transients
- Optimal strategy for follow-up (lead-up) monitoring

Blazar/ Extragalactic Science

Greg Madejski (SLAC) *Emission Mechanisms in Blazars*

How are the radiating particles accelerated?

Particle jets or Poynting flux-dominated jets?

Correlating with SOFIA

Jun Kataoka (Tokyo Institute of Technology) *X-ray and Gamma-ray Observations of Blazars; Recent Progress and Future Perspectives*

Internal vs. External Shocks; long term variability

Correlation of X-ray/ γ -ray results

Structure function analysis

Correlated observations with MAXI (mCrab; 0.5-30 keV) on ISS (2007)

Pasquale Blasi (Arcetri) *Merging Clusters of Galaxies as Gamma Ray Sources*

Prospects of detecting merging clusters

New calculations of diffuse background from cluster mergers

Sensitivity to unknown mean magnetic field in cluster environment

Blazar Variability

Massimo Fiorucci (Perugia) *Statistical Analysis of Variability in a Sample of Intensively Observed Blazars*

Various types of noise: White noise, $1/f$, $1/f^2$, $1/f^3$

Analyses of noise: Structure function; Autocorrelation; Fourier Analyses; PDS

Why? Classify variability/sources

Search for periodic sources

Non-parametric characterization

John Mattox (Francis Marion U) *The Variability of the EGRET Blazars, an Analysis based on the Final EGRET Blazar Catalog*

Frequency of occurrence of sources at different flux levels:

~ 5 blazars $> 10^{-6}$ ph (> 100 MeV) $\text{cm}^{-2} \text{s}^{-1}$ on any scan of the orbit

Drivers for variability aspects of mock data challenge

Diffuse Background

Martin Pohl (Bochum) *BL Lac Evolution and the Contribution of Blazars to the Diffuse Gamma-ray Background*

Blazar contribution to diffuse Xgal BG

Differences between Salamon/Stecker approach

Inputs: log N/log S, z-distribution of blazars

AGN contribute 20-40% to Xgal BG

Olaf Reimer (Bochum) *Log N-log S Analysis of Extragalactic EGRET Sources*

Diagnosis of known source populations

Spatial Distribution/completeness

Assessment of unidentified and unresolved sources

Cosmological evolution Studies

Different populations for GLAST simulation model

Igor Moskalenko (GSFC) *Current Status of GALPROP Model*

Effects of Galactic diffuse on Xgal diffuse BG

Optical Monitoring

John Mattox (Francis Marion U) *An Update on Preparations for Optical Monitoring of Blazars during the GLAST Mission*

Robotically Controlled Telescope (50 inch on Kitt Peak)

RCT will be fully function for remote observations in ~2003

Studies of optical variability of blazars

Dedicated to imaging: blazars, GRBs, extra-solar planet occultation search,
narrow line studies of galactic diffuse features, binary stars.

RCT Consortium also includes SDSU, WKU, PSI, Villanova University

www.psi.edu/rct/ ATN



Optical Monitoring (cont.)

Gino Tosti (Perugia) *The Whole Year Blazar Telescope: Preliminary Results*

~ 13 telescopes, started Nov. 15th, 2001; source list

Each WYBT member contributes 20% of time to WYBT

Member owns their own data, but share data to archive

Example: 0716+714

Amplitude of variability

Search for 11 year variability

WYBT: flaring blazar alarm system

Recognize long timescales of flaring blazars

Remotely operated telescope (REM) in development (JHK)

Gordon Spear (SSU) *GLAST Telescope Network*

Series of small amateur college telescopes

Joining with AAVSO

Follow-up observations for mock-data challenge

GLAST Observation Simulators

Gino Tosti (Perugia) / **Andrea Tramecere** (Perugia) ***Blazar Emission Simulation Code***

Blazar Emission Simulation Code

Inputs: SSC, ERC, Temporal evolution light curve

Simulated fluxes using SSC model

Cellular Automata model for accretion and variability

Claudia Cecchi (Perugia) ***The Perugia GLAST Observation Simulator***

Inputs: Maps of Xgal diffuse BG; Photon energy range; region of the sky; orbit or time

3rd EGRET catalog of sources

Output: Map of the gamma-ray sky; simulation of photon flux

(Gaussian PSF)

To do: add faint sources from log N/log S model

Include source variability

Graphical interface

GLAST Observation Simulators (cont.)

Jim Chiang (SLAC) *Observation Simulator and Likelihood Calculation for GLAST*

Inputs: 3EG catalog, Gal +Xgal diffuse BG

Likelihood calculation; Time scales: Orbital, SAA, Orbit precession

Flares: triangle and step functions; Test for Periodic Signals

<http://giants.stanford.edu/~pln/glastlikepaper.pdf>

(Procedure for likelihood source existence, spectral feature, timing on GLAST data)

Sean Robinson (U Washington) *Current Work on Simulation of the Extragalactic Diffuse Emission*

”GLEAM” Simulating diffuse BG as well as source contributions

Declare log N/log S characteristics

Catalog of discrete sources

Simulates calculates total background flux

Varies background as discrete sources are identified

Future: Energy spectra; flaring and quiescent sources

Goal: produce data sets that mimic Xgal radiation, truly diffuse emission