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
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 gamma-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/\(\gamma\)-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) cm$^{-2}$ 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
- (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