The Third Catalog of Hard *Fermi*-LAT Sources (3FHL)

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On behalf of the *Fermi* LAT Collaboration
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Outline – Three Questions

- **Who did the work?**

- **How was it done?**

- **What are some of the results?**

Reference: Ajello, M. et al. 2017, ApJS 232, 18

https://fermi.gsfc.nasa.gov/ssc/data/access/lat/3FHL/

Who - Key Participants

Alberto Dominguez, team lead
Benoit Lott
Sara Cutini
Marco Ajello
Pascal Fortin
Jean Ballet
Seth Digel
Dario Gasparrini
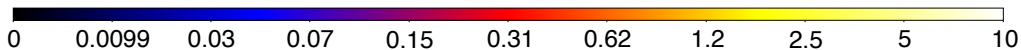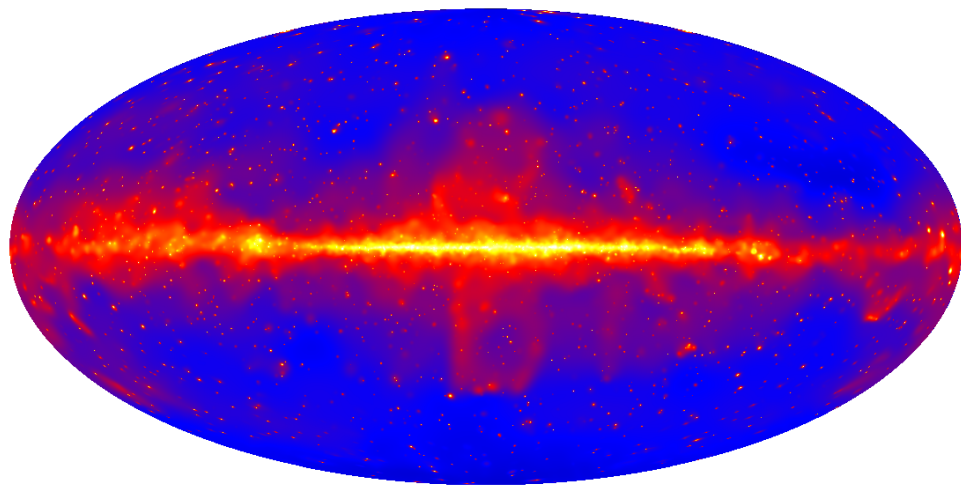David Paneque
Pablo Saz Parkinson
and others

Construction of 3FHL

0   0.0099   0.03   0.07   0.15   0.31   0.62   1.2   2.5   5   10

Adaptively smoothed counts map

Energy Range: 10 GeV -2 TeV
Duration: 7 years
Pass 8 data, Source-class
Unbinned likelihood using PSF types
Zenith angle < 105°
Minimum 4 photons/source

Median point source localization accuracy: 2.3 arcmin radius (95%)
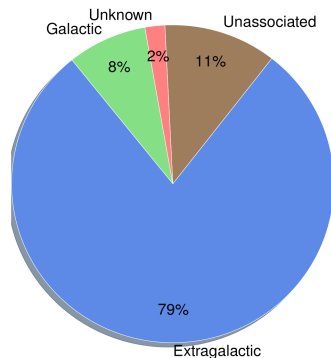48 spatially extended sources

The 3FHL Catalog

1556 sources:
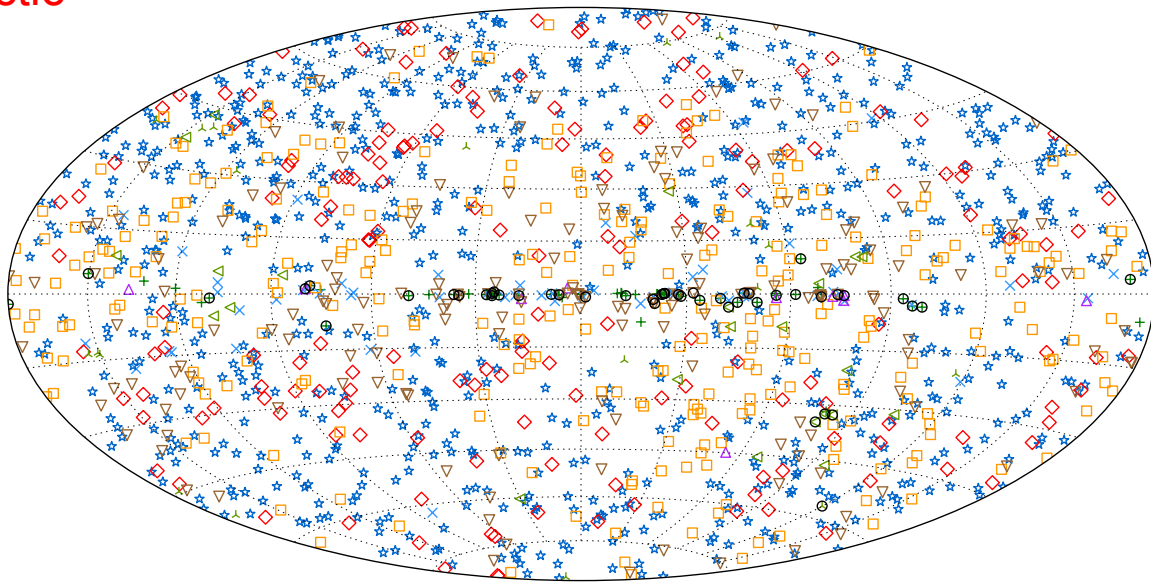
79% extragalactic, 8% Galactic

13% unassociated

1286 in 3FGL

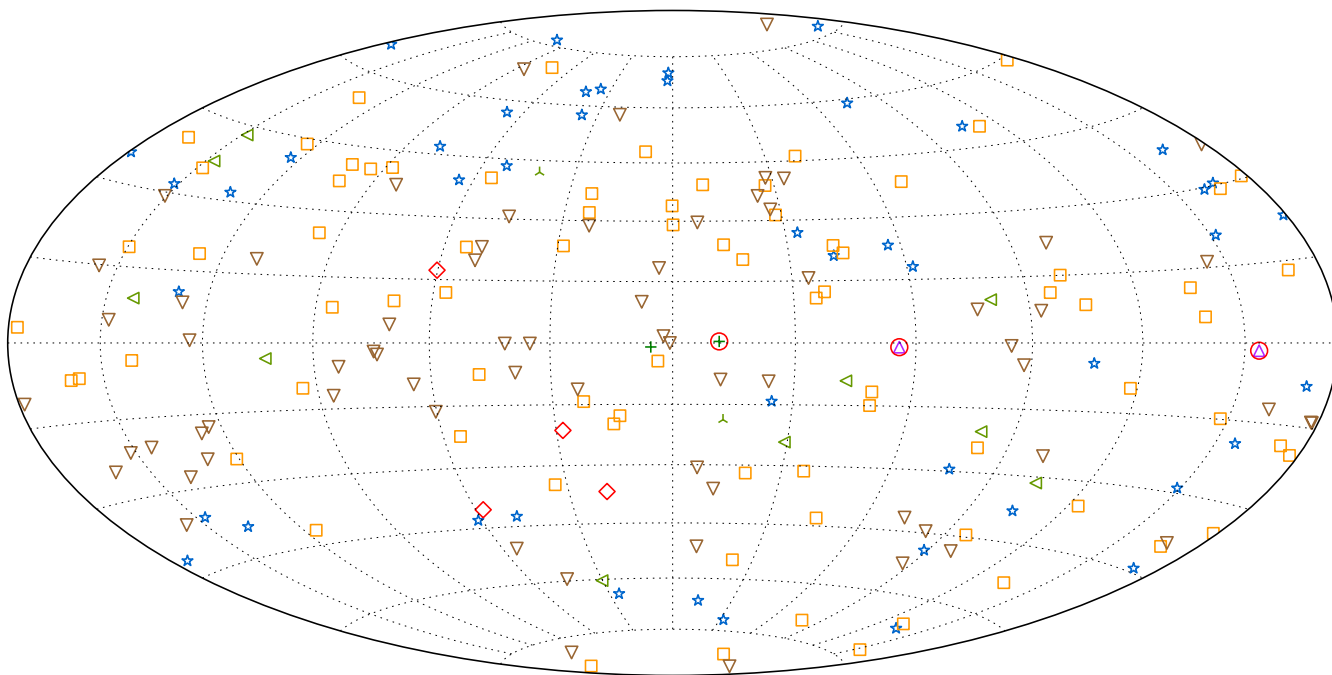133 in TeVCat

211 new sources (not in 1FHL/2FHL/3FGL/TeVCat)

16 with redshift > 2

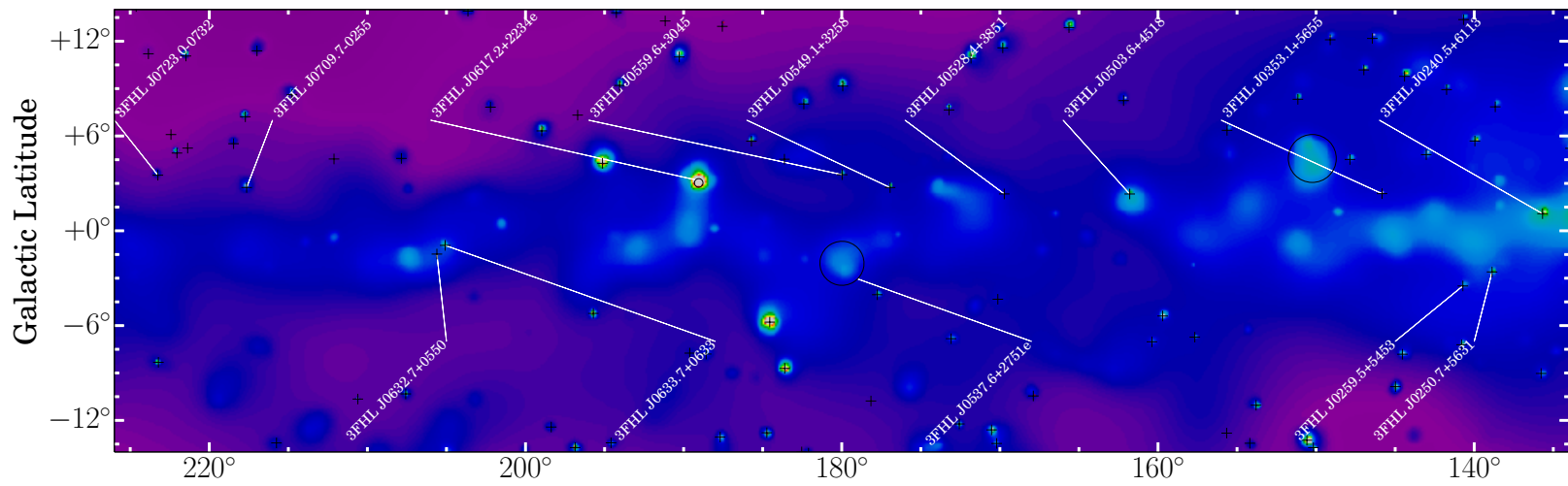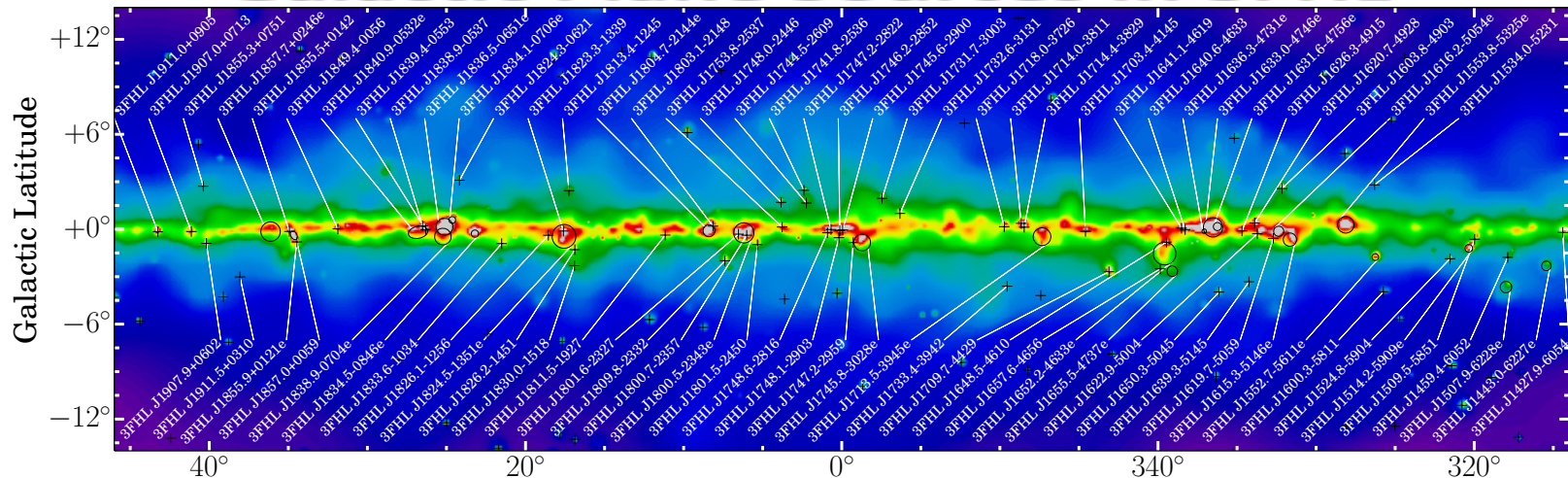|		
+ SNRs and PWNe	✶ BL Lacs	☐ Unc. Blazars	△ Other GAL	▽ Unassociated
✕ Pulsars	◇ FSRQs	⅄ Other EGAL	◁ Unknown	○ Extended

New Sources in the 3FHL Catalog

214 sources not included in previous LAT catalogs. 3 of these have been seen by IACTs.
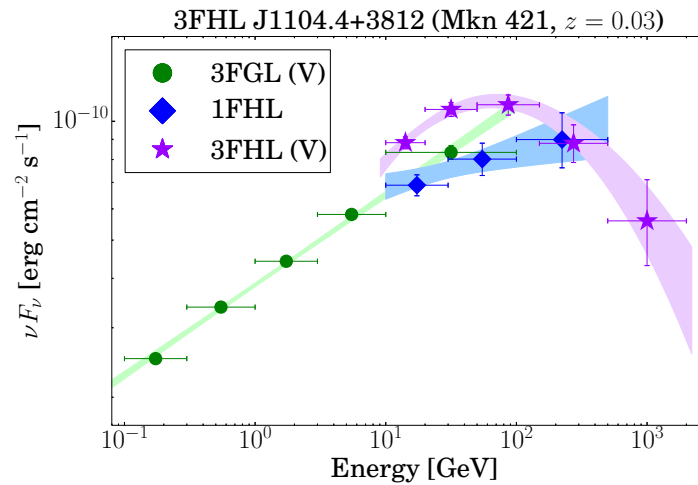

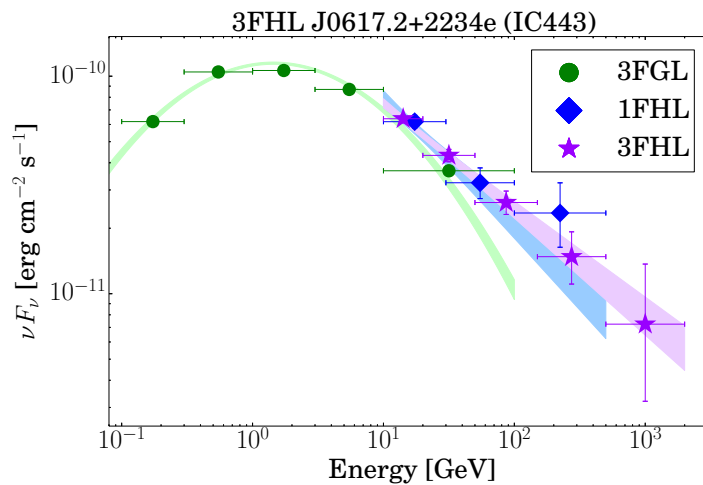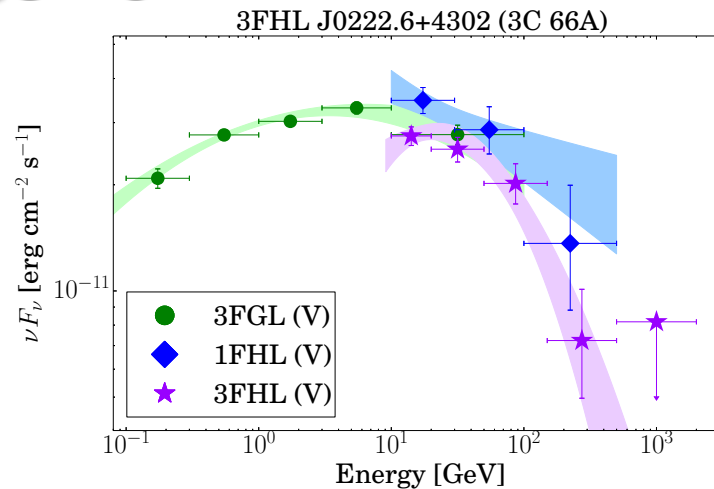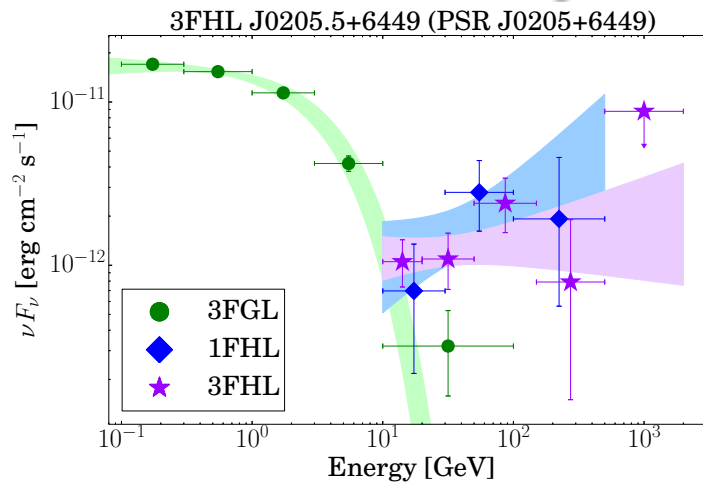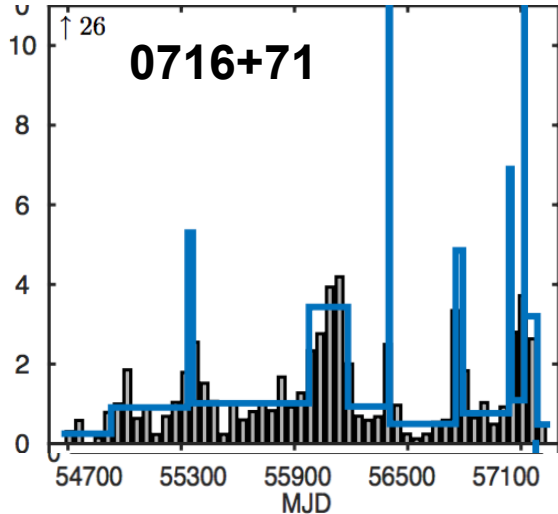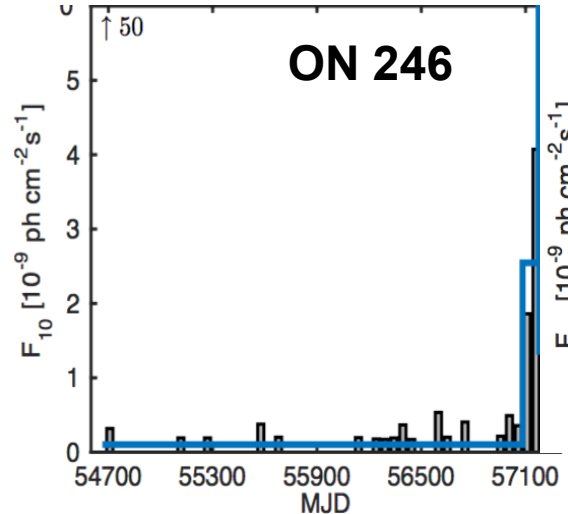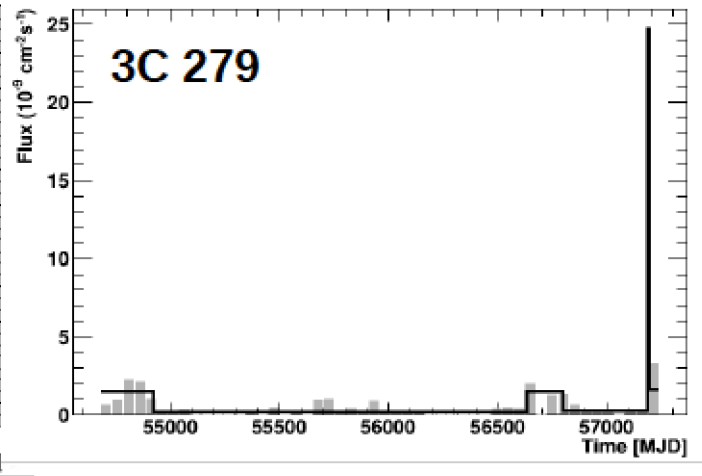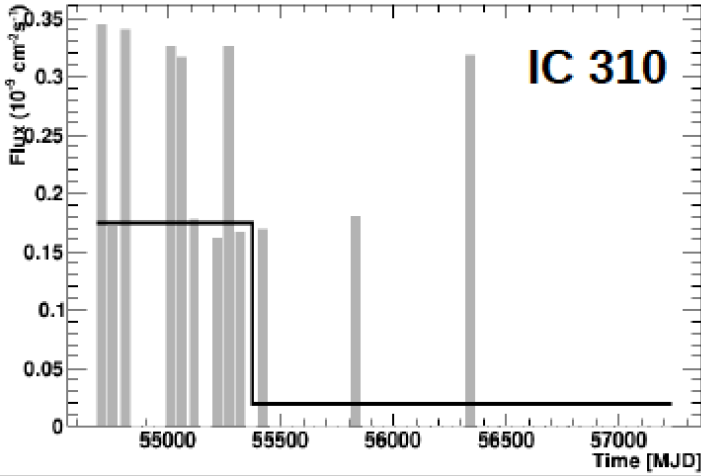|					
+ SNRs and PWNe	★ BL Lacs	□ Unc. Blazars	△ Other GAL	▽ Unassociated	○ TeVCat
✕ Pulsars	◇ FSRQs	⋏ Other EGAL	◁ Unknown	○ Extended	

Galactic Plane Sources in 3FHL

Sample Energy Spectra
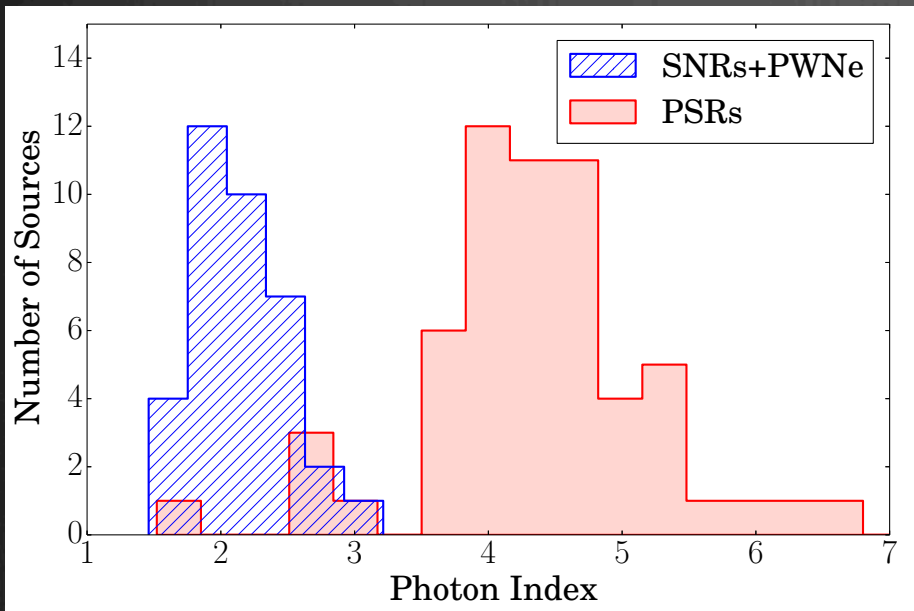
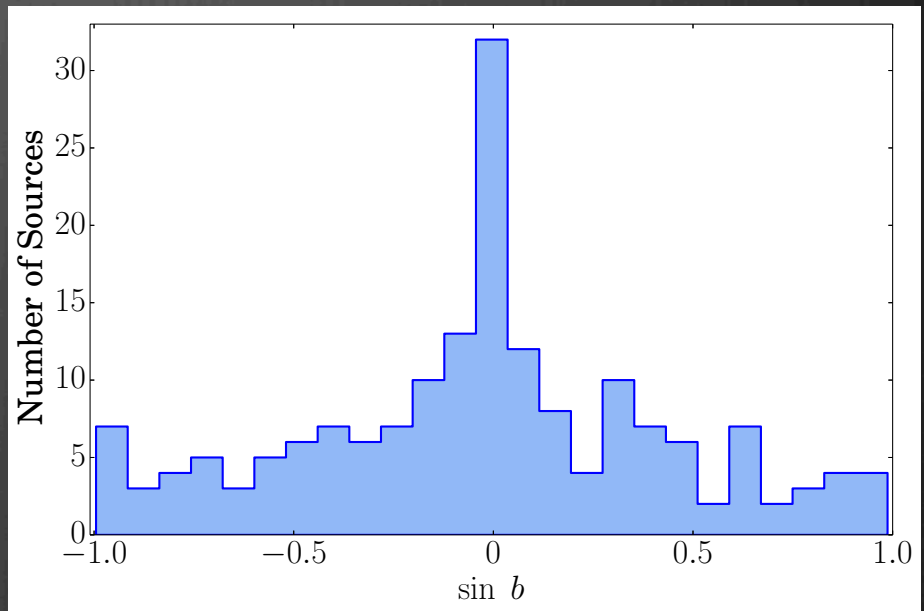# Variability Samples

Bayesian Block Analysis

163 variable sources

Almost entirely AGN

9

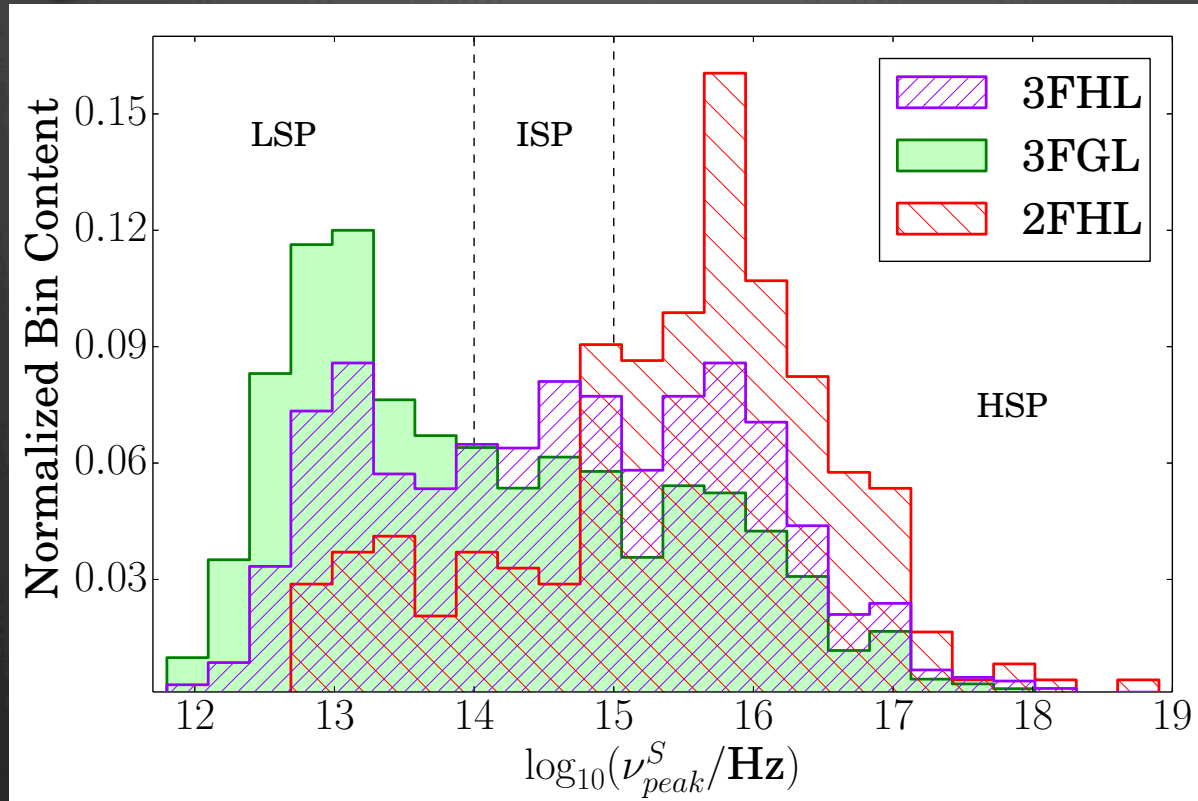# Some Source Characteristics

PSRs tend to be softer than SNRs+PWNe

Latitude distribution of unassociated sources.

Extragalactic sources - multiwavelength

Distribution of AGN synchrotron peak frequencies

Extragalactic Background Light (EBL)

3FHL sources provide valuable information about the EBL

Talks on this topic by Marco Ajello, Justin Finke, and Alberto Dominguez on Thursday

Summary

- The 3FHL catalog contains 1556 sources above 10 GeV, a factor of 3 more than the previous LAT survey at these same energies (1FHL). 211 of these have not been seen before.

- About 79% of the sources are extragalactic sources with a rich variety of AGNs.

- At these energies, pulsars have steeper spectra than SNRs/PWNe. Unassociated sources are a mixture of Galactic and isotropic.