



The Fermi Gamma-ray Space Telescope Bright Source List

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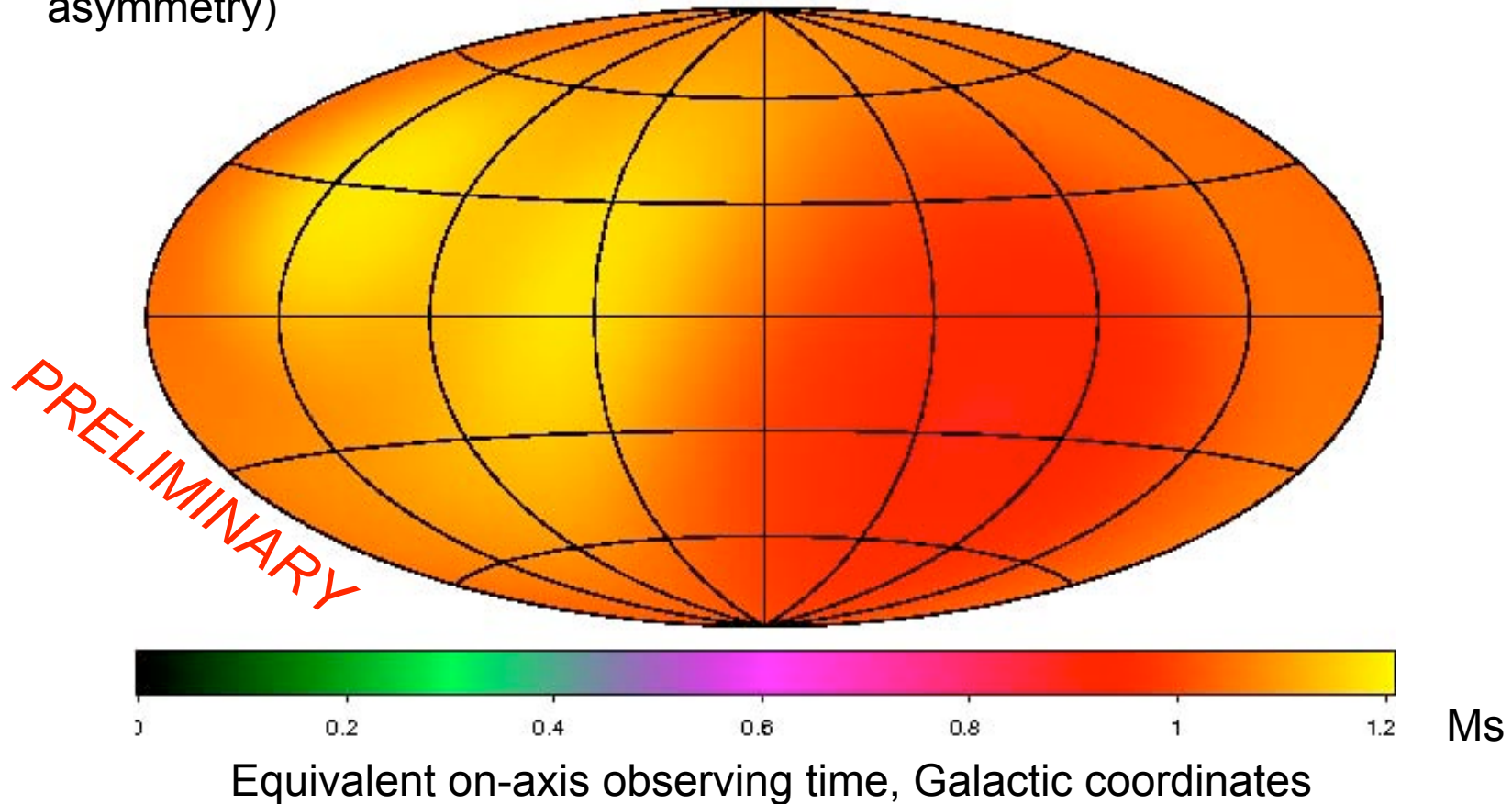
**On behalf of the
Fermi Large Area Telescope (LAT)
Collaboration**

The LAT Bright Source List

- During the early part of the Fermi mission, the Large Area Telescope (LAT) team is optimizing calibrations, analysis methods, and background subtraction techniques.
- The brightest sources seen by LAT are less influenced by these ongoing improvements than are weaker sources.
- Releasing information about the brightest sources early has two principal goals:
 1. Provide opportunities for multiwavelength studies of these sources;
 2. Facilitate proposals for the second cycle of Fermi Guest Investigator proposals, due on March 6.
- The release date for the bright source list is February 6.
- This list is a first step toward the first LAT catalog, due in the Fall of this year.

Exposure map

- Data used are the first three months of all-sky scanning data, Aug. - Oct. 2008. Total live time is 7.53 Ms
- Scanning scheme makes exposure map very uniform (SAA creates North-South asymmetry)

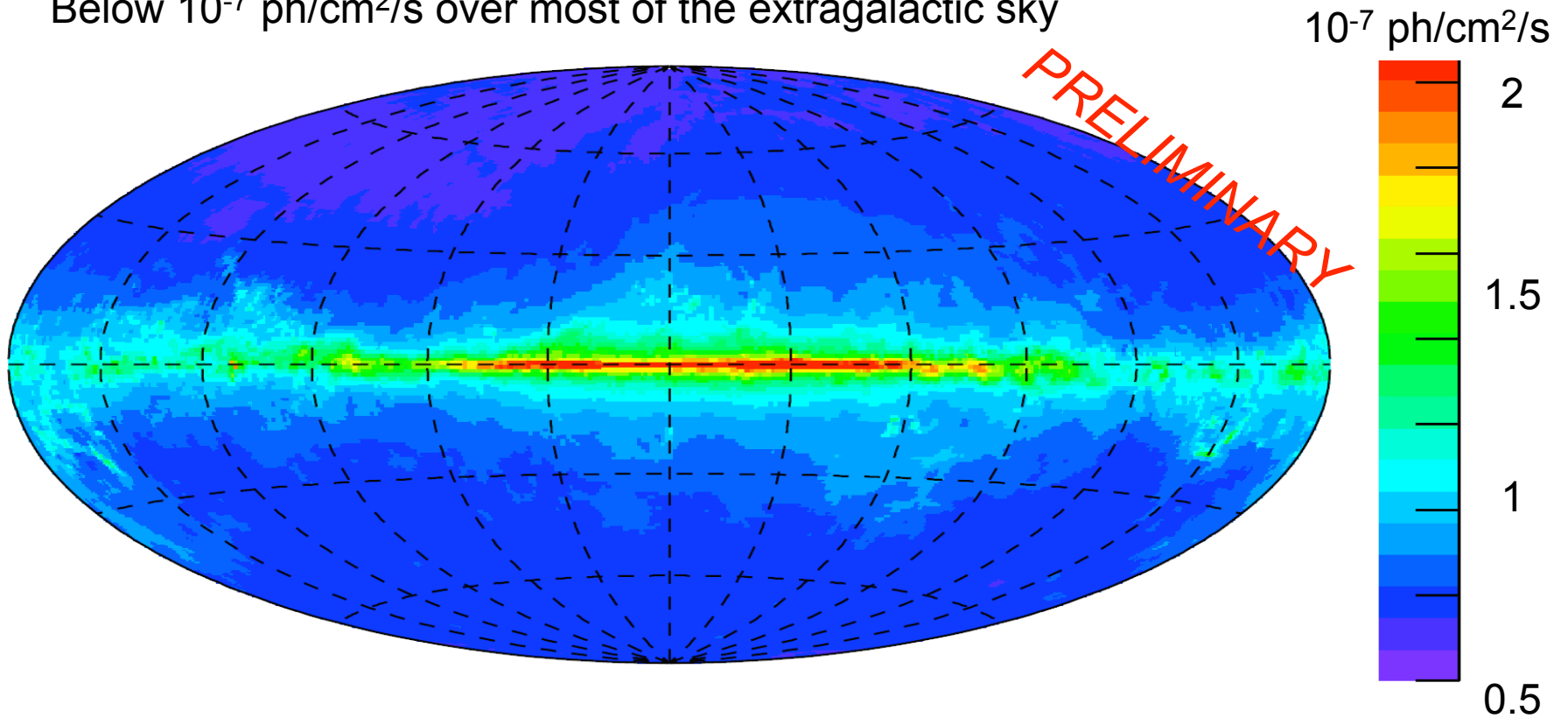


Constructing the LAT Bright Source List

- 2.8 M events above 100 MeV with current cuts
- Maximum likelihood analysis was used to determine source significance, fluxes in two energy bands, locations, and variability information, all of which is included in the list.
- Only sources with confidence level greater than **10 σ** over 3 months were retained for the bright source list.
- The resulting bright source list is not a full catalog:
 - **Not complete - many more sources at lower significance**
 - **Not flux limited - cut is on confidence level**
 - **Not uniform - sources near the Galactic plane must be brighter because of the strong diffuse background.**
 - **No detailed energy spectral information.**

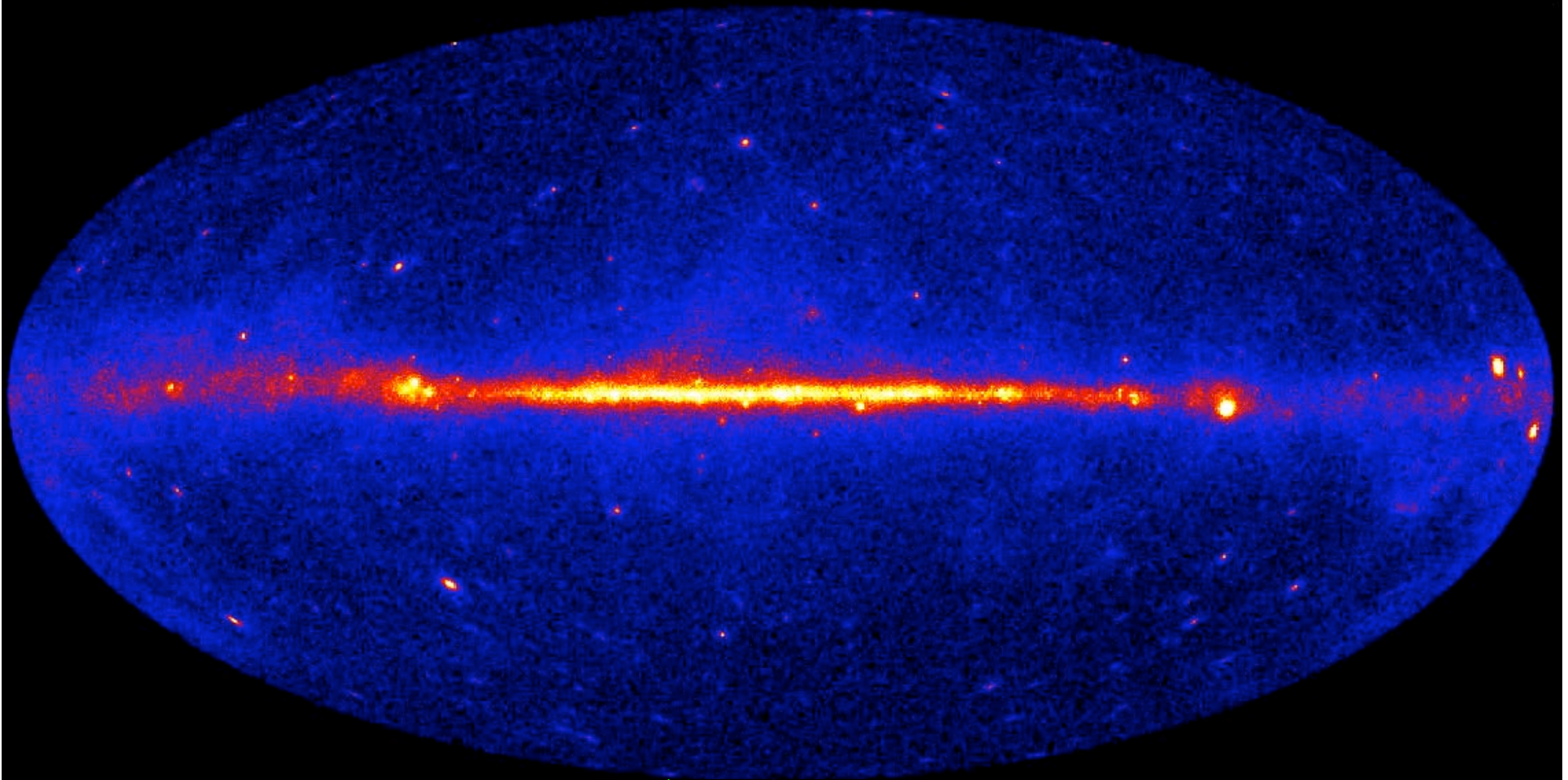
Sensitivity map

- Structure is mostly that of the interstellar medium
- Below 10^{-7} ph/cm²/s over most of the extragalactic sky



Flux > 100 MeV required to reach 10σ for average $E^{-2.2}$ spectrum

205 Preliminary LAT Bright Sources

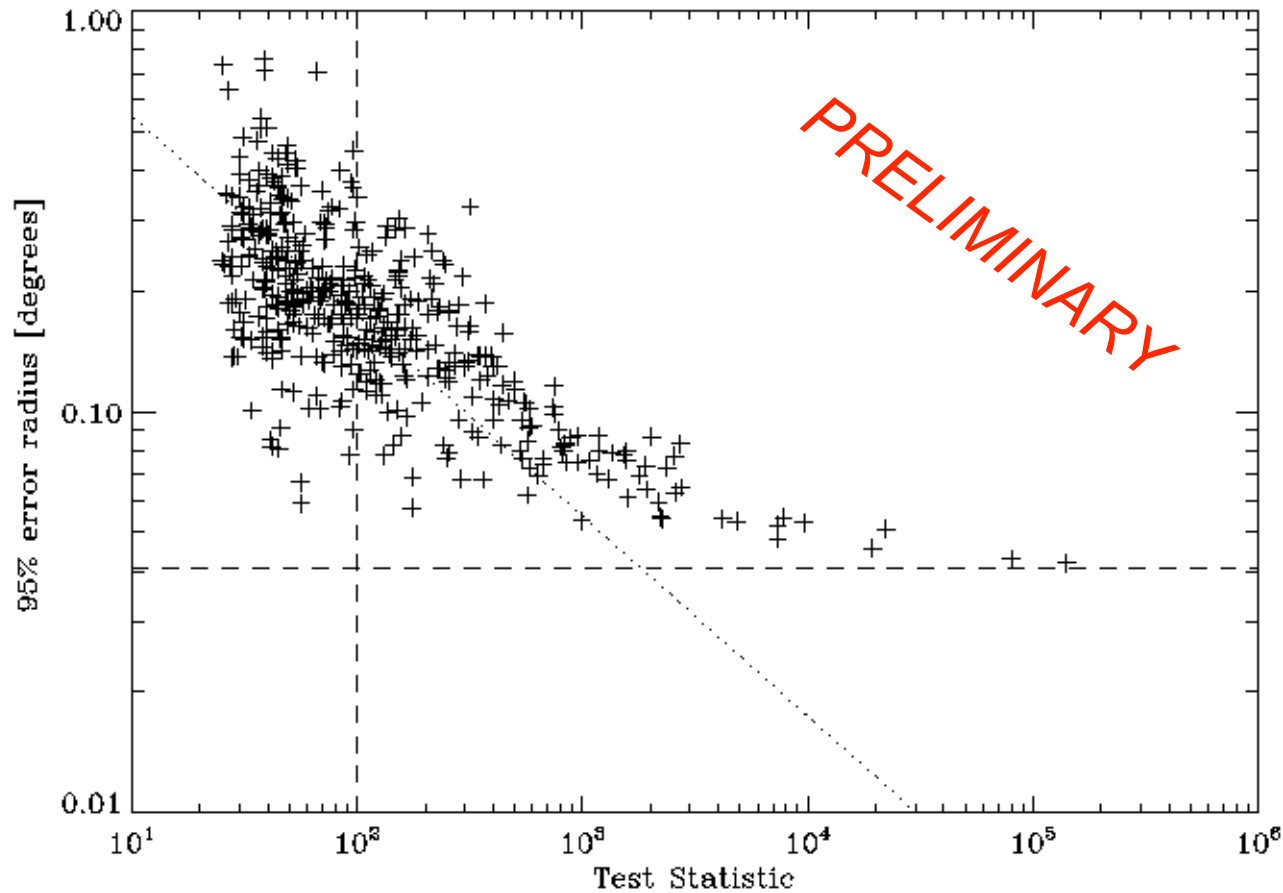


Map above 300 MeV

Crosses mark source locations, in Galactic coordinates

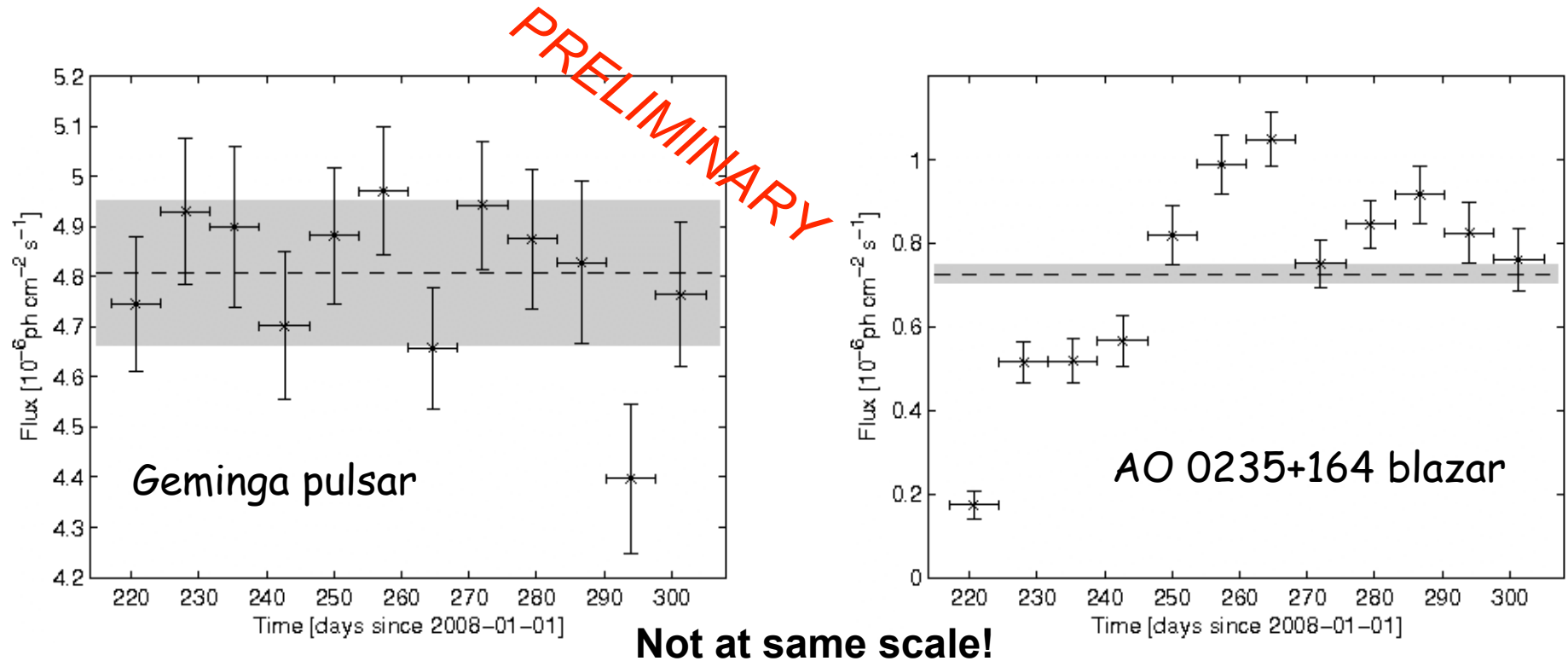
Source localization

- Conservative error radii adjusted on known associations
- Conservative 0.04° absolute limit based on bright pulsars



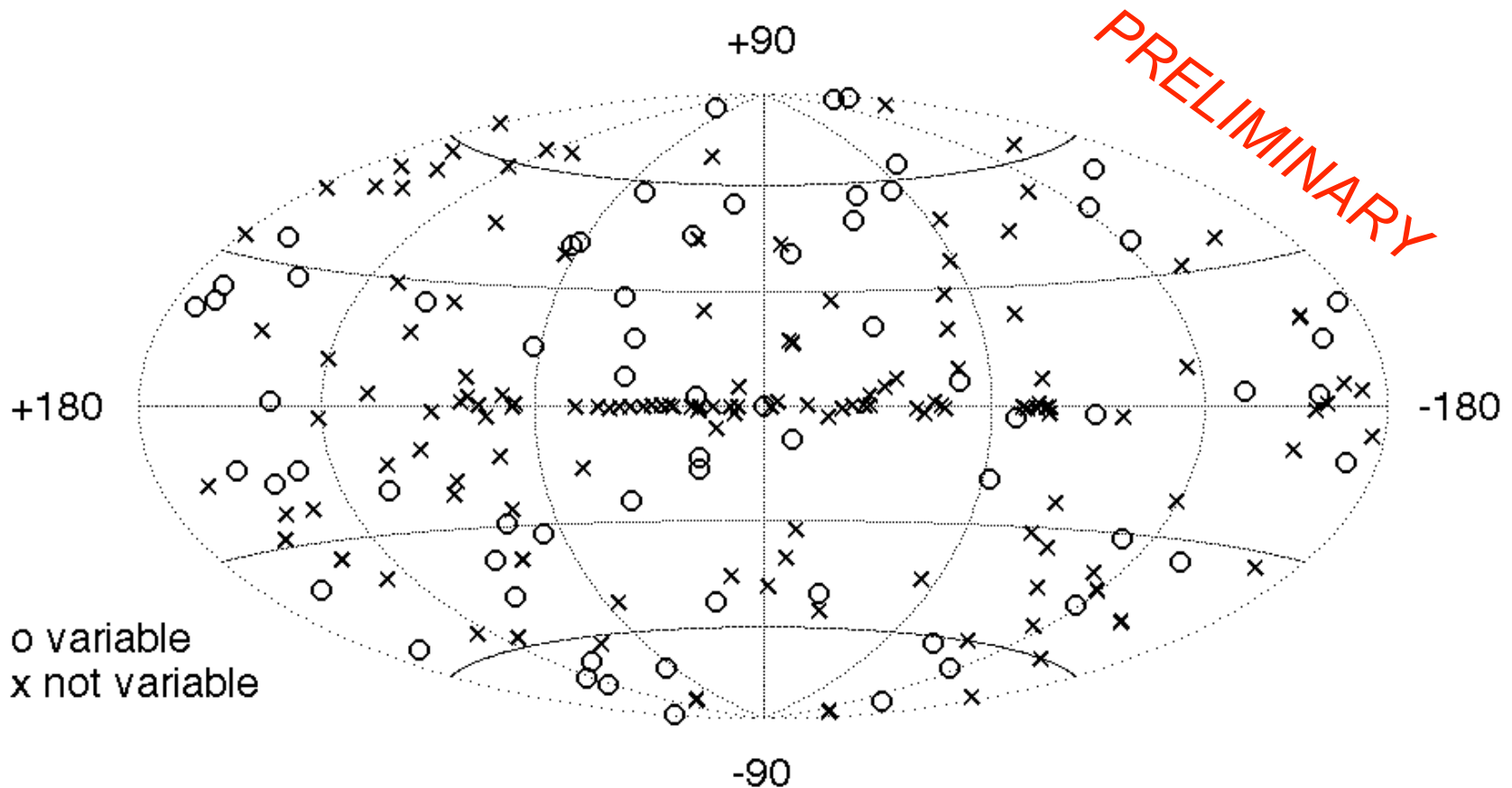
Source variability

- Build light curves of all sources on one-week time scale
- Pulsars are stable within 3%
- Bright blazars are very clearly variable



Source variability 2

- Many blazars are too faint (even at TS > 100) to be detected as variable even if they were
- Many fewer variable sources in the plane



205 Preliminary LAT Bright Sources

Census of Associations (not Identifications)

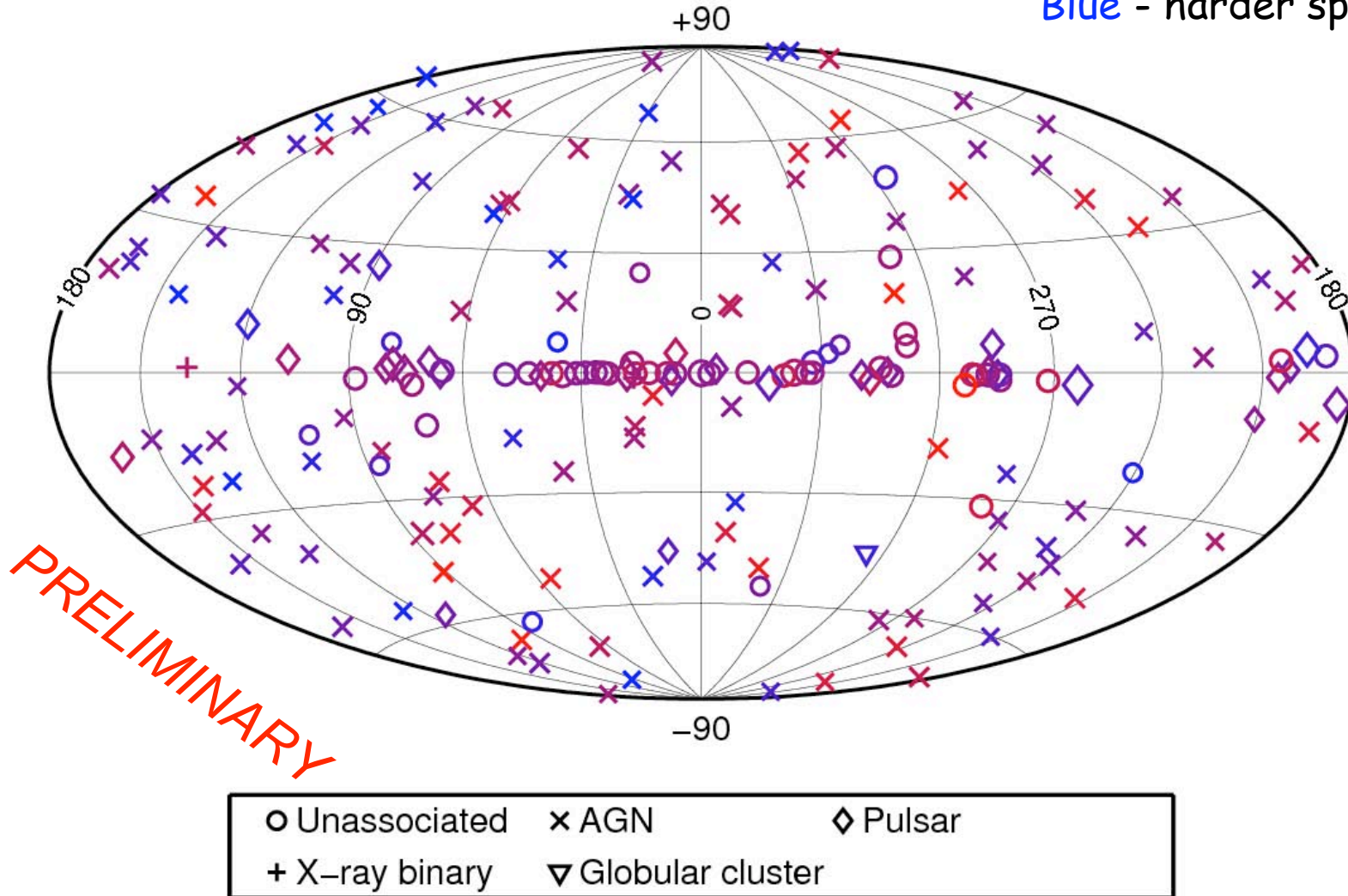
Class	Number
Radio/X-ray pulsar	15
LAT pulsar	14
Globular cluster (pulsars?)	1
HMXB	2
LMC	1
Flat Spectrum Radio Quasars	62
Bl Lac Objects	46
Blazar, uncertain type	11
Radio galaxies	2
Special cases (under study)	14
Unassociated	37

Source association

- Mostly AGN outside the Galactic plane
- Not that many unassociated outside the plane

Red - steeper spectra

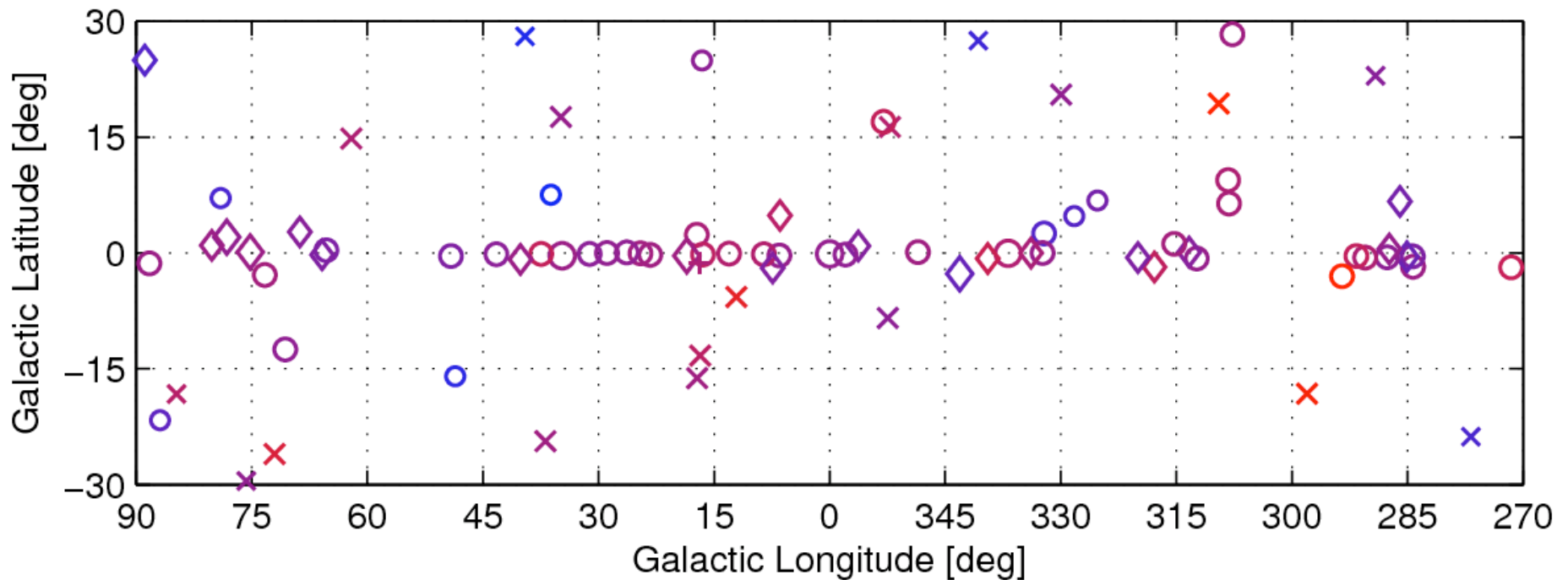
Blue - harder spectra



Source association 2

PRELIMINARY

- Most associated sources in the Galaxy are pulsars
- Many unassociated sources in the inner regions of the Galaxy



○ Unassociated	× AGN	◇ Pulsar
+ X-ray binary	▽ Globular cluster	

205 Preliminary LAT Bright Sources

Conclusions

- **EGRET on the Compton Observatory found only 31 sources above 10σ in its lifetime.**
- **Typical 95% error radius is less than 10 arcmin. For the brightest sources, it is less than 3 arcmin. Improvements are expected.**
- **About 1/3 of the sources show definite evidence of variability.**
- **29 pulsars in the list are identified by gamma-ray pulsations.**
- **Over half the sources are associated positionally with blazars. Some of these are firmly identified as blazars by correlated multiwavelength variability.**
- **37 sources have no obvious associations with known gamma-ray emitting types of astrophysical objects.**