SEARCH FOR
SPATIALLY
EXTENDED
Fermi-LAT
SOURCES USING
TWO YEARS OF
FLIGHT DATA

Joshua Lande
SLAC/Stanford
joshualande@gmail.com

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OVERVIEW

- Category II Paper
- Contact Authors: J. Lande, M. Ackermann, S. Funk
- Full author list being finalized
- Internal Referees: Marianne Lemoine-Goumard and Johann Cohen-Tanugi
- Target Journal: ApJ
- Status (something about being submitted to internal referees XXXX)

Paper Outline

- Description of a new method (`pointlike`) for analyzing extended sources.
- Monte Carlo calculation of false detection rate for extended sources.
- Calculation of the LAT's sensitivity to spatially extended sources
- Presentation of a new search for spatially extended sources:
  - reanalyzing the extension of the 12 extended sources in 2FGL
  - testing AGN from 2LAC for extension to validate the analysis
  - presenting on the discovery/interpretation of several new extended sources not in 2FGL.

- I am leaving out information about each extended source
- Not including their sky maps
- Not including their physical interpretation
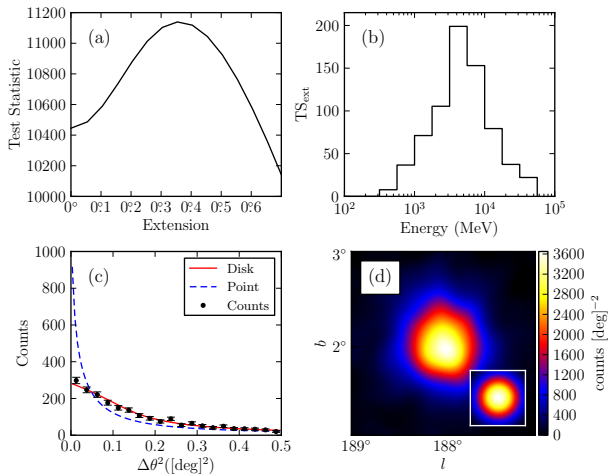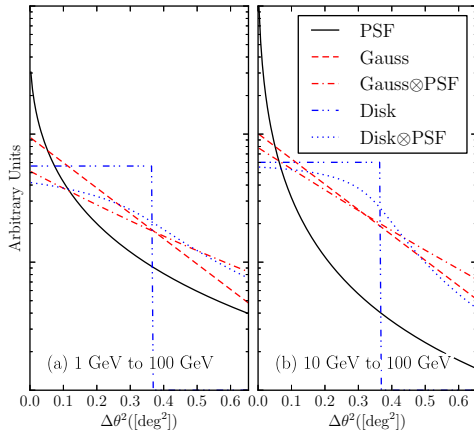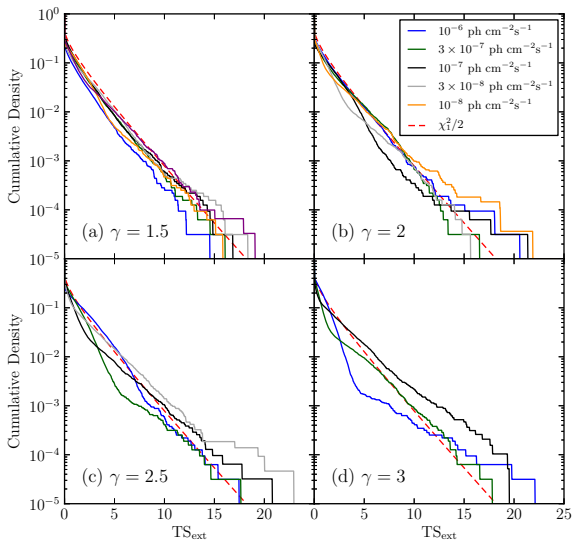- (See presentation at Galactic splinter)

Fig. 1

FIG. 2

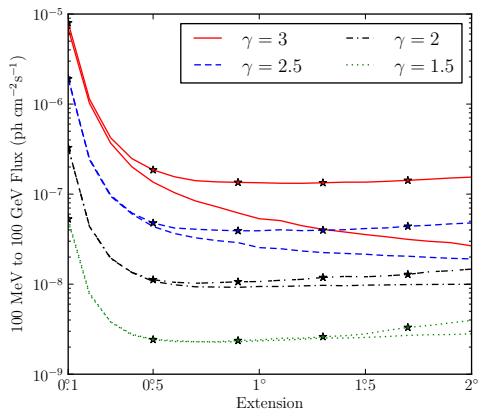(a) 1 GeV to 100 GeV

(b) 10 GeV to 100 GeV

FIG. 3

FIG. 4

FIG. 5
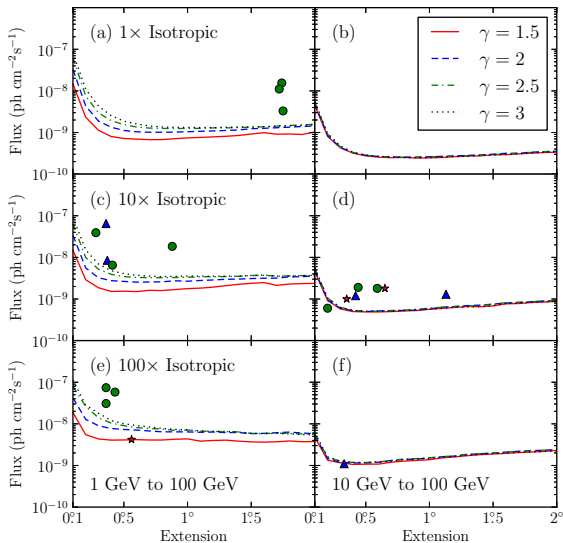
FIG. 6
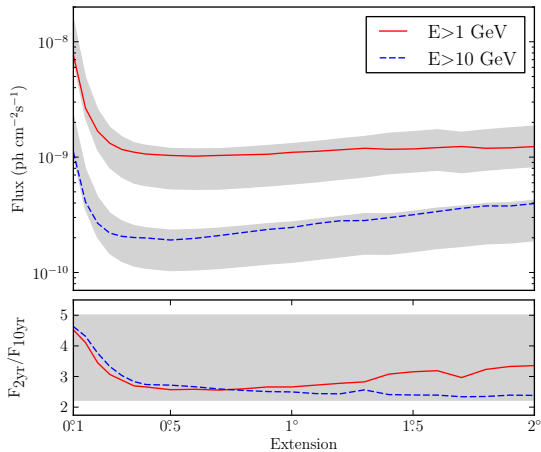
FIG. 6
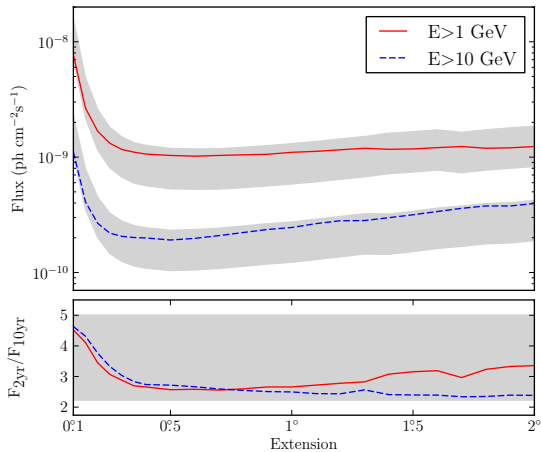
TABLE. 3

Name	GLON (deg.)	GLAT (deg.)	σ (deg.)	TS	TS_{ext}	Pos Err (deg.)	Flux[a] (ph cm^{-2} s^{-1})	Index
			E>1 GeV					
SMC	302.68	-44.81	$1.75 \pm 0.07 \pm 0.02$	94.8	67.4	0.12	3.3 ± 0.4	2.41 ± 0.17
LMC	279.10	-32.61	$1.74 \pm 0.05 \pm 0.13$	1101.3	860.5	0.05	15.5 ± 0.6	2.48 ± 0.06
IC443	189.05	3.04	$0.36 \pm 0.01 \pm 0.04$	10719.8	510.4	0.01	64.8 ± 1.2	2.23 ± 0.02
Vela X	263.34	-3.11	0.88					
Centarus A	309.52	19.42	~ 10					
W28	6.50	-0.27	$0.43 \pm 0.02 \pm 0.03$	1324.8	177.4	0.01	58.0 ± 1.8	2.63 ± 0.03
W30	8.61	-0.20	$0.36 \pm 0.02 \pm 0.02$	465.4	73.3	0.02	30.7 ± 1.6	2.59 ± 0.04
W44	34.69	-0.38	$0.36 \pm 0.01 \pm 0.02$	1903.3	217.7	0.01	73.6 ± 1.8	2.68 ± 0.02
W51C	49.13	-0.45	$0.28 \pm 0.02 \pm 0.05$	1819.5	115.7	0.01	39.3 ± 1.3	2.35 ± 0.03
Cygnus Loop	74.22	-8.46	$1.72 \pm 0.05 \pm 0.07$	356.5	356.5	0.06	11.1 ± 0.7	2.53 ± 0.11
			E>10 GeV					
MSH 15−52	320.38	-1.22	$0.20 \pm 0.04 \pm 0.03$	76.2	6.5	0.03	0.6 ± 0.7	2.27 ± 0.73
HESS J1825−137	17.56	-0.46	$0.65 \pm 0.03 \pm 0.01$	83.6	55.9	0.05	1.8 ± 0.2	1.74 ± 0.19

TABLE. 4

Name	GLON (deg.)	GLAT (deg.)	σ (deg.)	TS	TS_{ext}	Pos Err (deg.)	Flux$^{(a)}$ (ph cm^{-2} s^{-1})	Index	Counterpart
				E>1 GeV					
2FGL J0823.0−4246	260.32	-3.28	$0.37 \pm 0.03 \pm 0.02$	320.9	46.3	0.02	8.5 ± 0.7	2.20 ± 0.09	Puppis A
2FGL J1627.0−2425c	353.08	16.78	$0.41 \pm 0.05 \pm 0.02$	144.5	31.1	0.04	6.5 ± 0.6	2.49 ± 0.14	Ophiuchus
2FGL J1712.4−3941	347.25	-0.54	$0.56 \pm 0.04 \pm 0.01$	75.0	39.6	0.05	4.2 ± 0.9	1.47 ± 0.12	RX J1713.7−3946
				E>10 GeV					
2FGL J0851.7−4635	266.29	-1.43	$1.13 \pm 0.08 \pm 0.05$	116.1	87.2	0.07	1.3 ± 0.2	1.76 ± 0.21	Vela Jr.
2FGL J1615.0−5051	332.38	-0.14	$0.33 \pm 0.04 \pm 0.01$	53.4	16.3	0.04	1.1 ± 0.2	2.24 ± 0.28	HESS J1616−508
2FGL J1615.2−5138	331.66	-0.66	$0.42 \pm 0.03 \pm 0.01$	76.6	48.0	0.05	1.2 ± 0.2	1.77 ± 0.24	HESS J1614−518
2FGL J1632.4−4753c	336.41	0.22	$0.44 \pm 0.04 \pm 0.03$	127.8	64.5	0.04	1.9 ± 0.2	2.29 ± 0.21	HESS J1632−478
2FGL J1837.3−0700c	25.08	0.13	$0.35 \pm 0.08 \pm 0.03$	46.2	18.8	0.07	1.0 ± 0.2	1.63 ± 0.29	HESS J1837−069
2FGL J2021.5+4026	78.18	2.19	$0.59 \pm 0.03 \pm 0.02$	222.2	116.4	0.04	1.8 ± 0.2	2.31 ± 0.19	γ-Cygni

Name	$TS_{pointlike}$	TS_{gtlike}	$TS_{alt,diff}$	$TS_{ext_{pointlike}}$	$TS_{ext_{gtlike}}$	$TS_{ext_{alt,diff}}$	σ (deg.)	$\sigma_{alt,diff}$ (deg.)	$\sigma_{alt,psf}$ (deg.)	TS_{inc}
				E>1 GeV						
2FGL J0823.0−4246	350.9	320.9	352.5	66.0	46.3	53.6	0.37	0.39	0.38	22.1
2FGL J1627.0−2425c	170.2	144.5	112.6	43.9	31.1	23.9	0.41	0.40	0.39	20.0
2FGL J1712.4−3941	80.9	75.0	43.4	47.4	39.6	22.2	0.56	0.56	0.54	6.4
				E>10 GeV						
2FGL J0851.7−4635	116.7	116.1	122.3	87.1	87.2	90.4	1.13	1.16	1.17	16.1
2FGL J1615.0−5051	52.4	53.4	55.6	17.5	16.3	17.4	0.33	0.32	0.32	11.9
2FGL J1615.2−5138	76.3	76.6	86.3	44.0	48.0	52.6	0.42	0.43	0.43	37.0
2FGL J1632.4−4753c	126.6	127.8	120.7	63.9	64.5	64.1	0.44	0.44	0.47	40.6
2FGL J1837.3−0700c	45.4	46.2	39.0	18.5	18.8	16.6	0.35	0.34	0.38	12.6
2FGL J2021.5+4026	234.3	222.2	235.6	135.9	116.4	121.4	0.59	0.60	0.60	24.3