ICRC
The Astroparticle Physics Conference
34th International Cosmic Ray Conference
July 30 - August 6, 2015
The Hague, The Netherlands

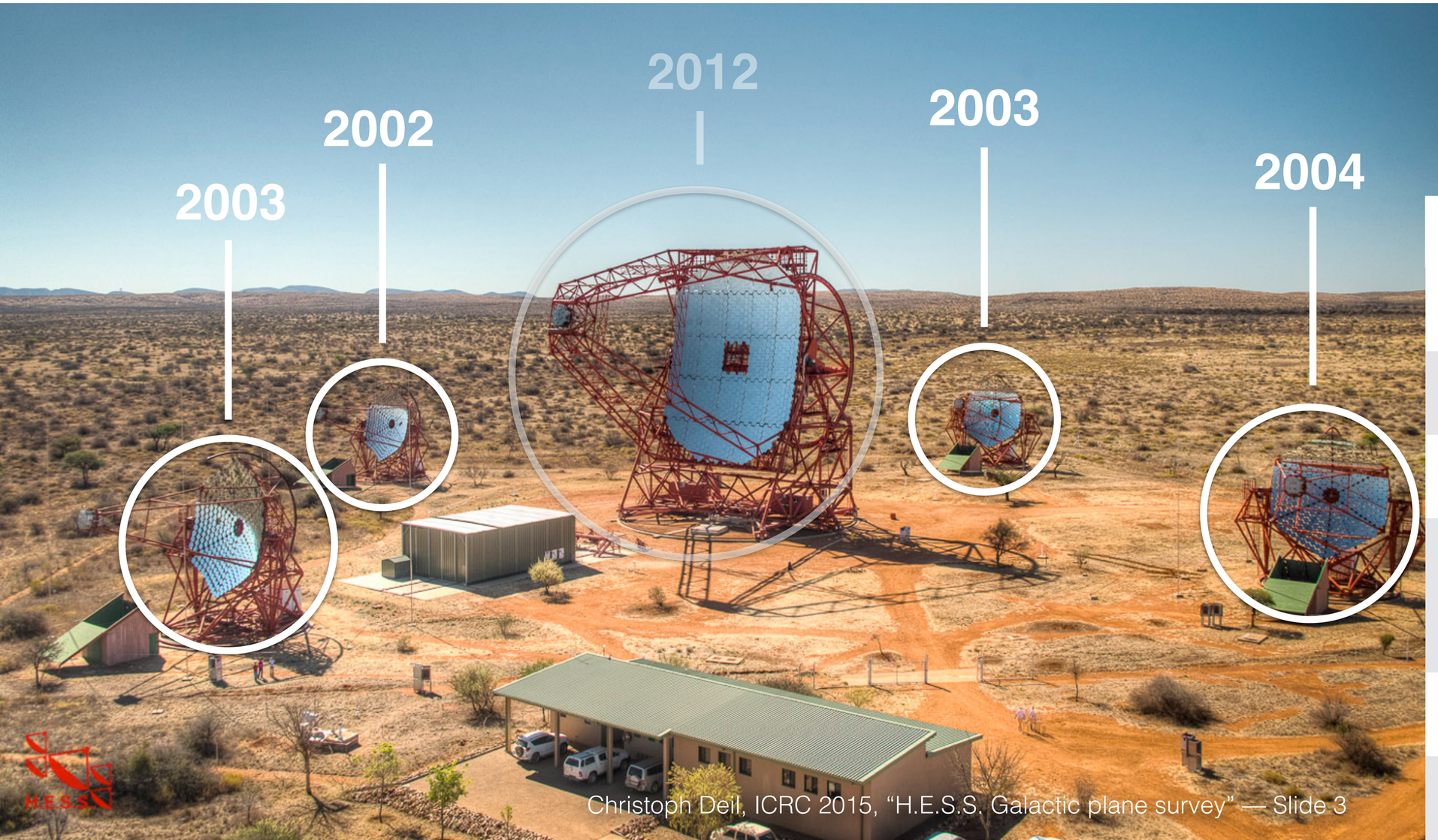
H.E.S.S. Galactic plane survey

Christoph Deil, Francois Brun, Svenja Carrigan, Ryan Chaves, Axel Donath, Henning Gast, Vincent Marandon, Regis Terrier for the H.E.S.S. collaboration

August 4th, 2015
ICRC 2015

Dataset

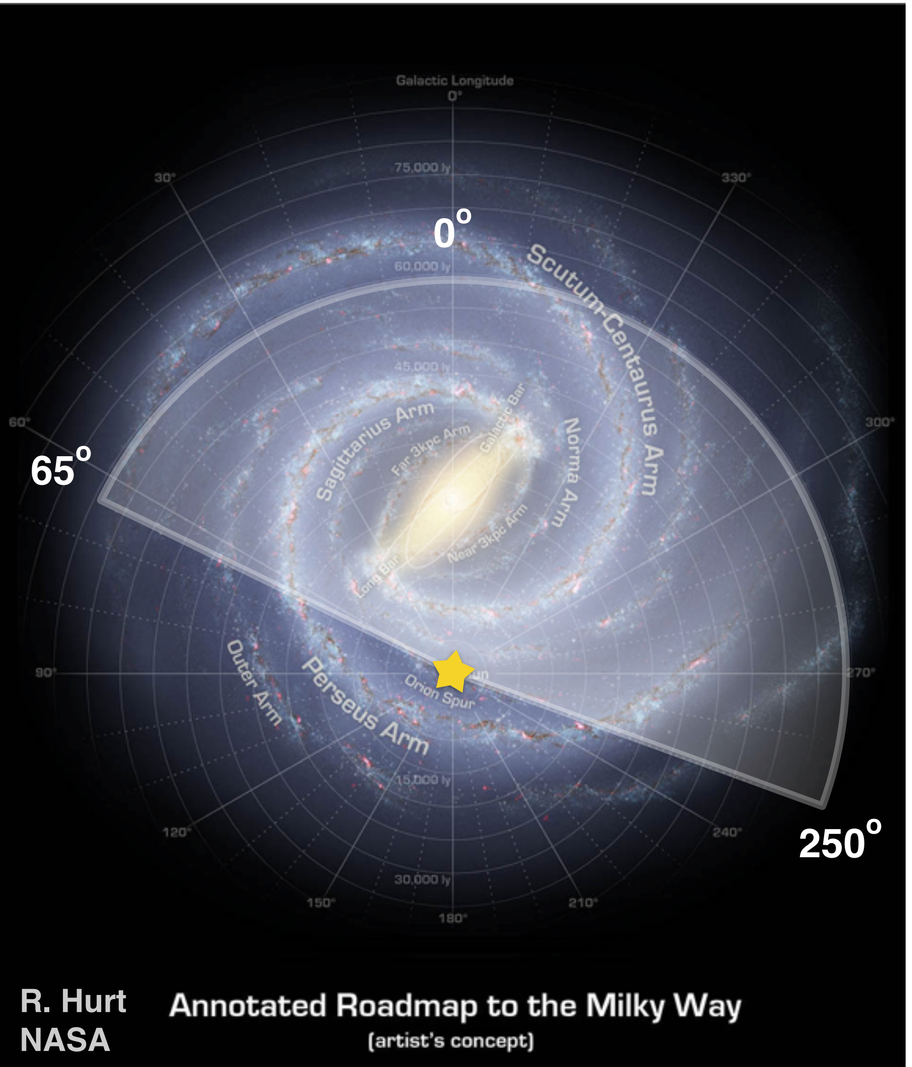
H.E.S.S. — HGPS



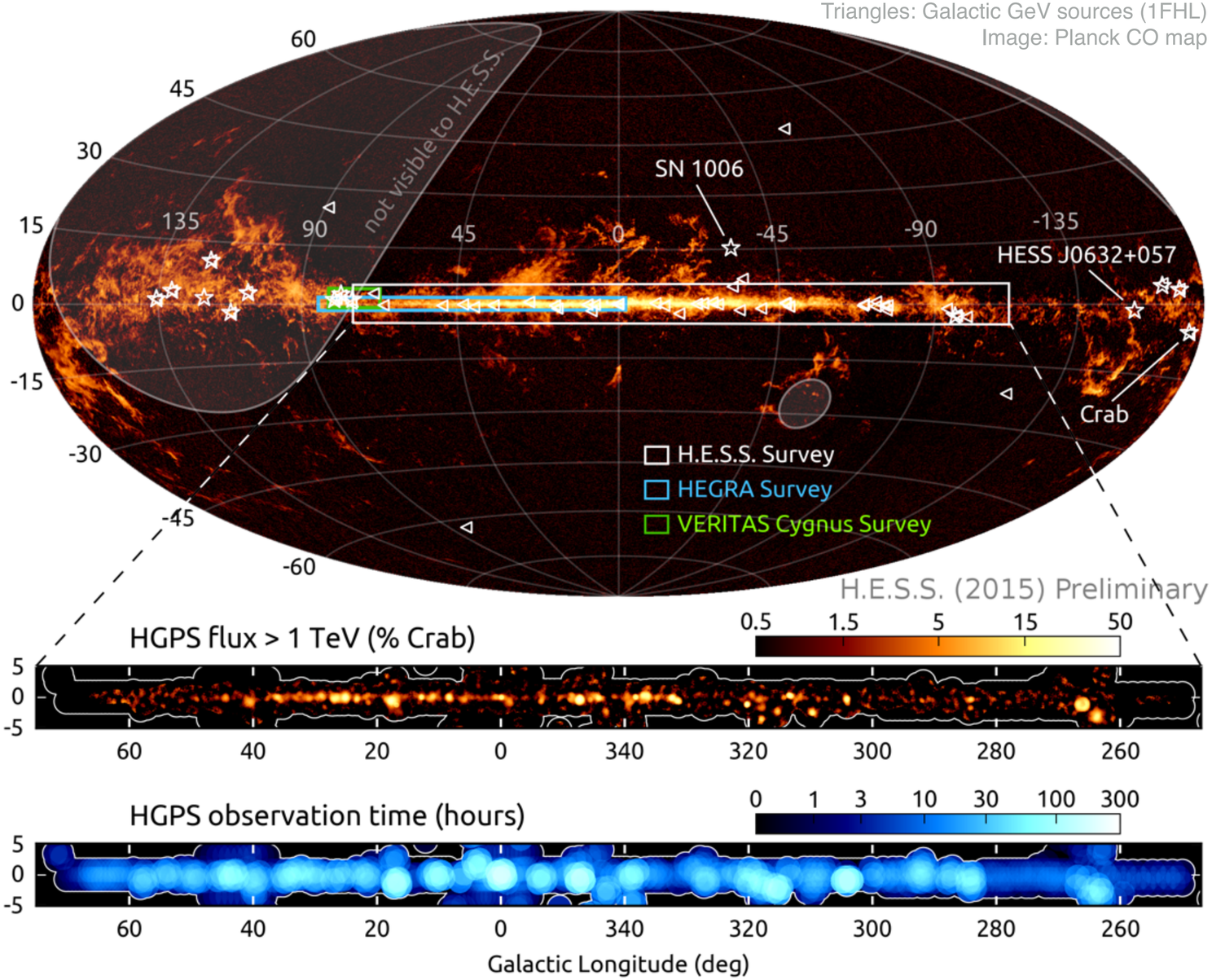
HGPS dataset

Telescopes	**H.E.S.S. I**
Observations	**2004 to 2013**
Total exposure	**3000 hours**
Sky region	**$250^\circ < l < 65^\circ$** **$-3.5^\circ < b < 3.5^\circ$**
Energy range	**0.2 – 100 TeV**
Resolution (R68)	**0.07 deg**

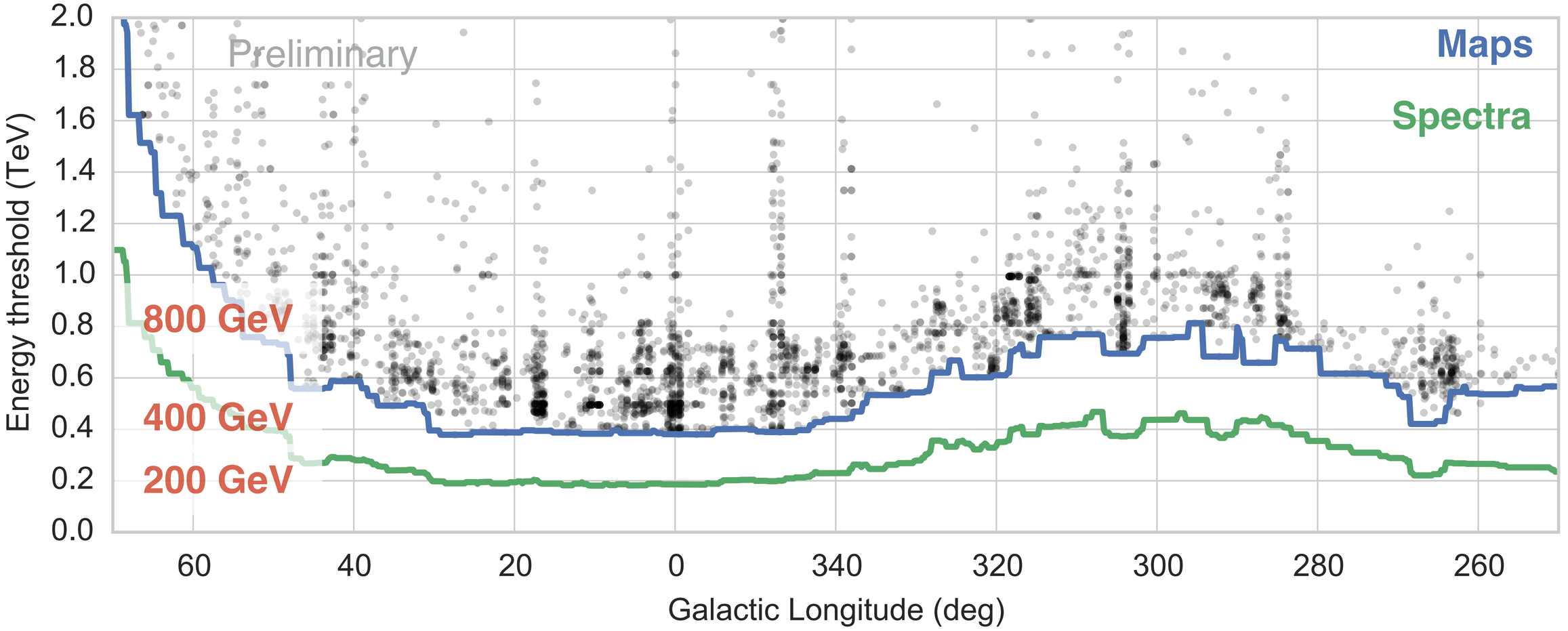
Survey region and exposure



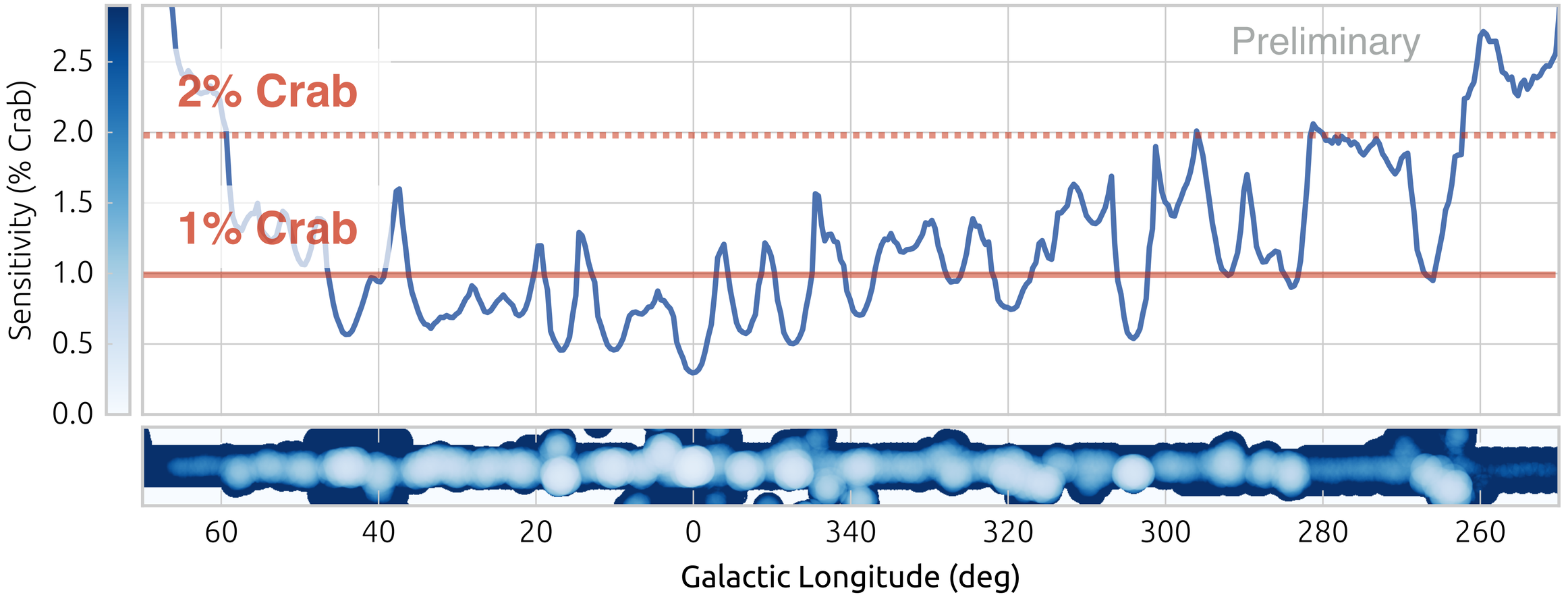
Stars: Galactic TeV sources outside HGPS region
Triangles: Galactic GeV sources (1FHL)
Image: Planck CO map



Energy threshold



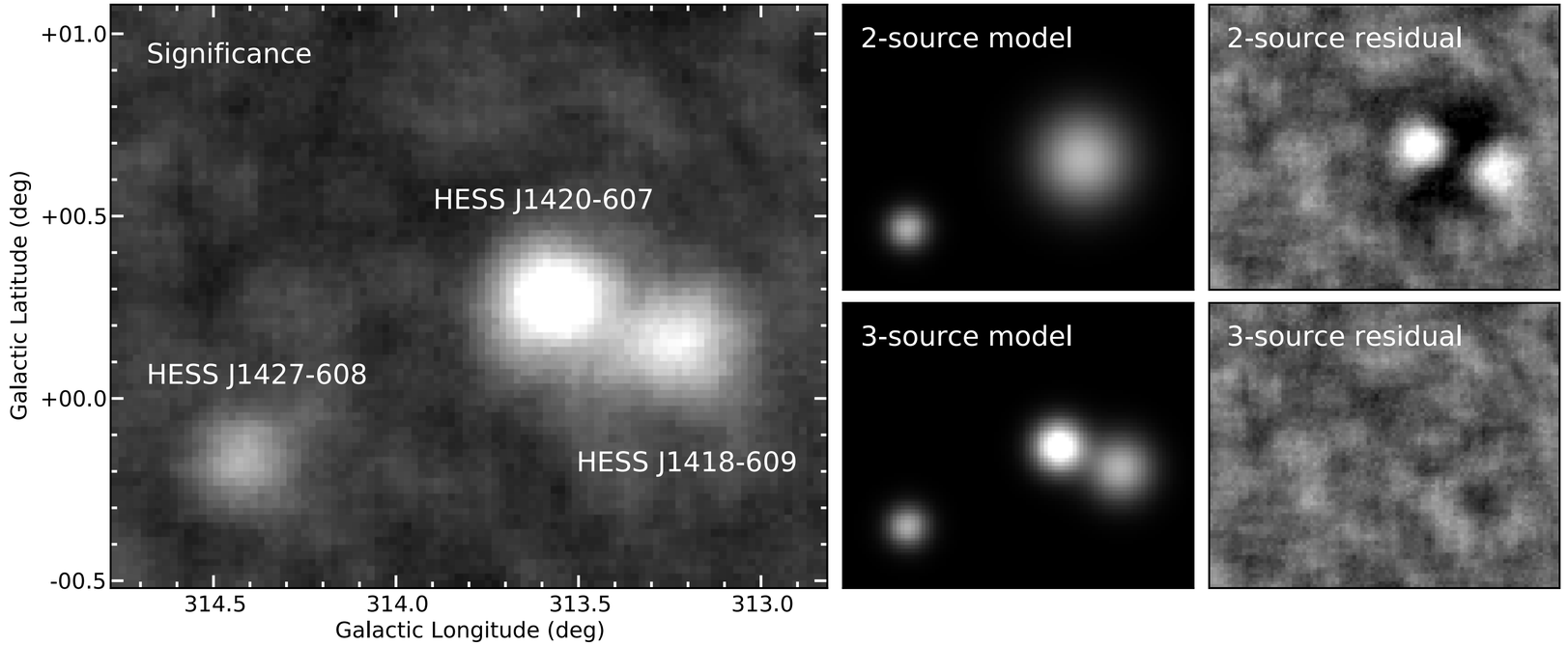
Point source sensitivity



Source catalog Construction

Morphology model (2013)

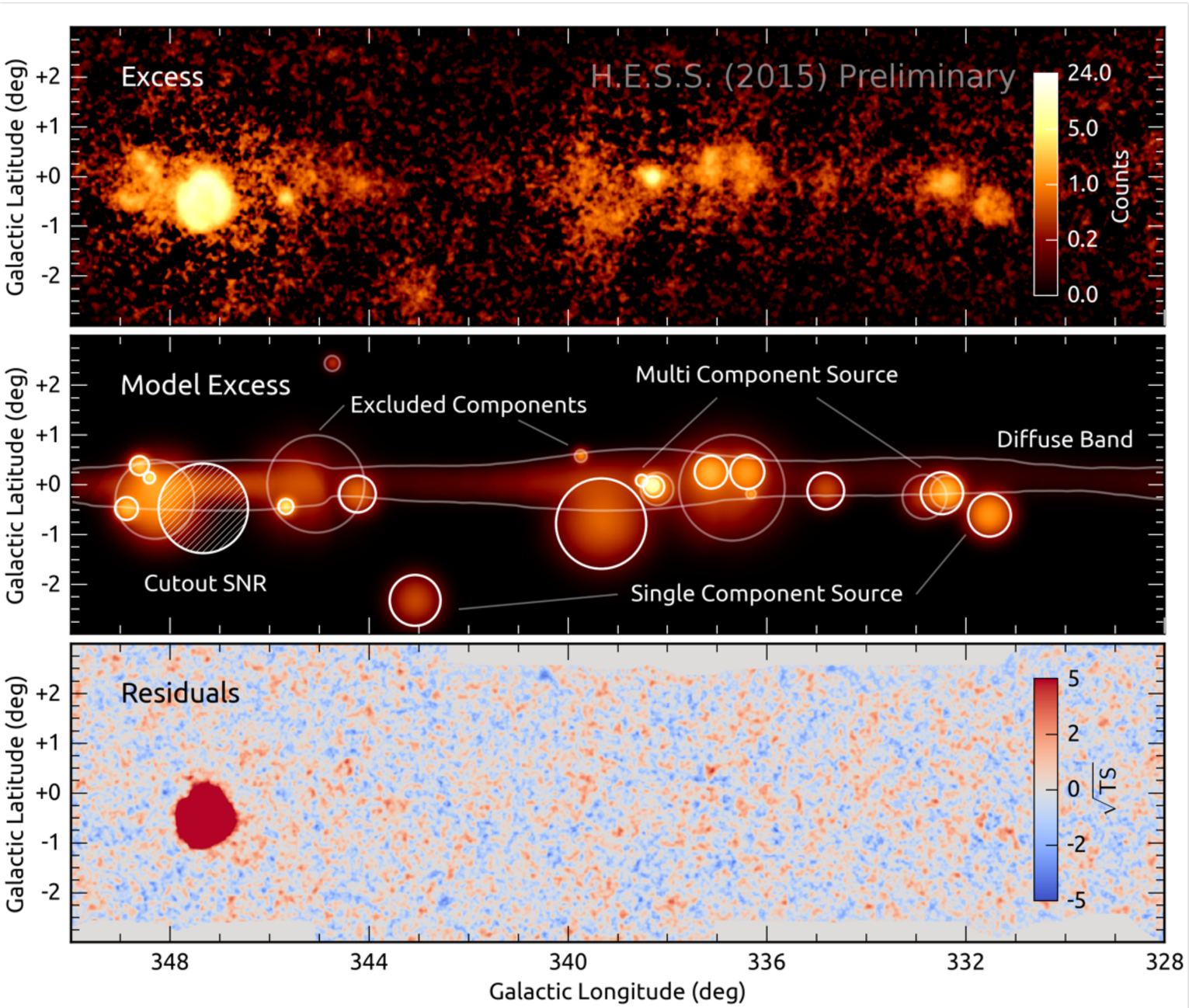
ICRC 2013 Figure – Gaussian sources …



… it's not really that simple …

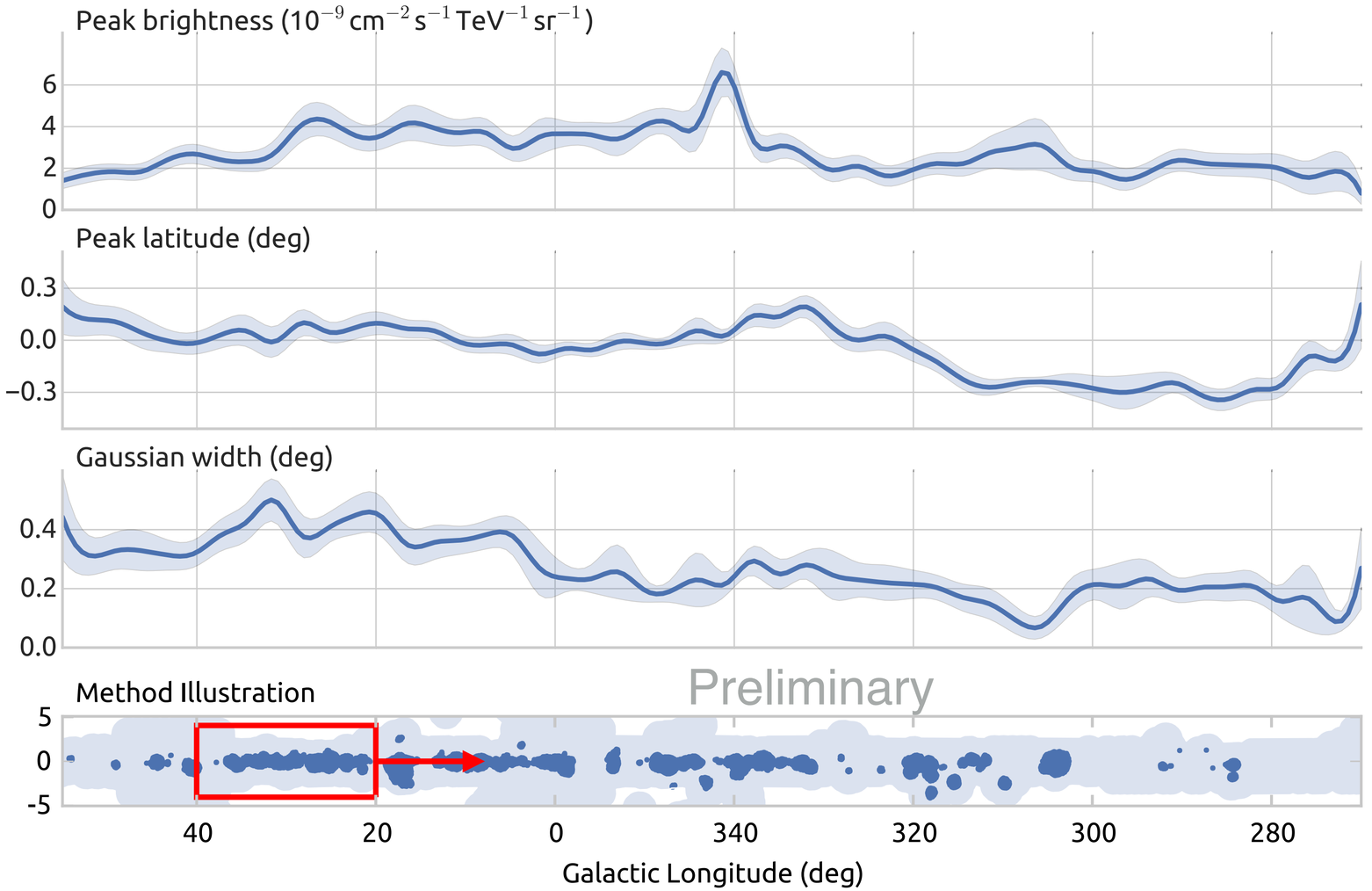
Morphology model (2015)

- Cut out SNRs and Galactic centre region (**13** sources)
- Large-scale diffuse Gaussian band model
- **100** significant Gaussian components with Poisson likelihood test statistic **TS > 30**
- **64** sources (re-)analysed
- HGPS catalog sources: **77** = 64 + 13

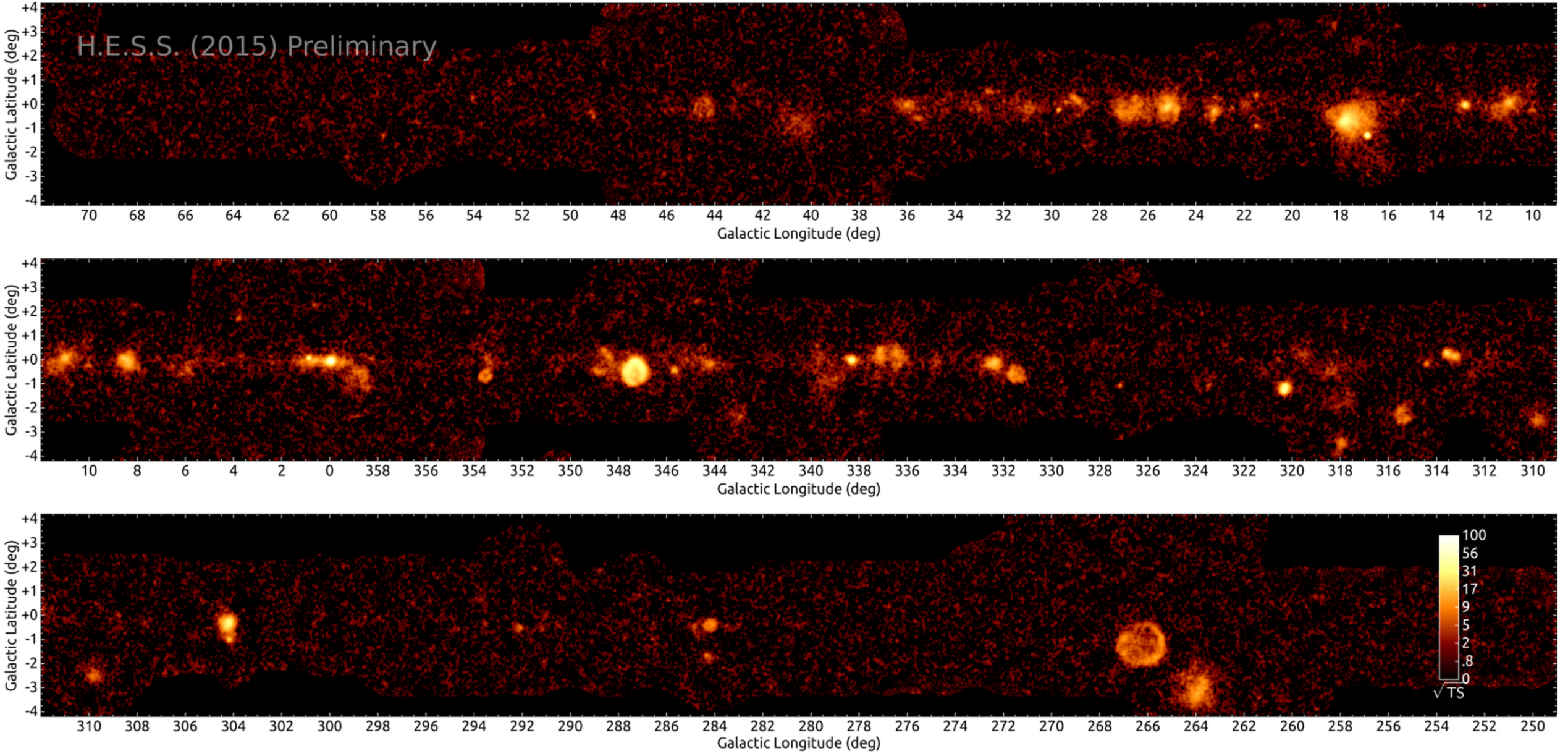


Gaussian band large-scale emission model

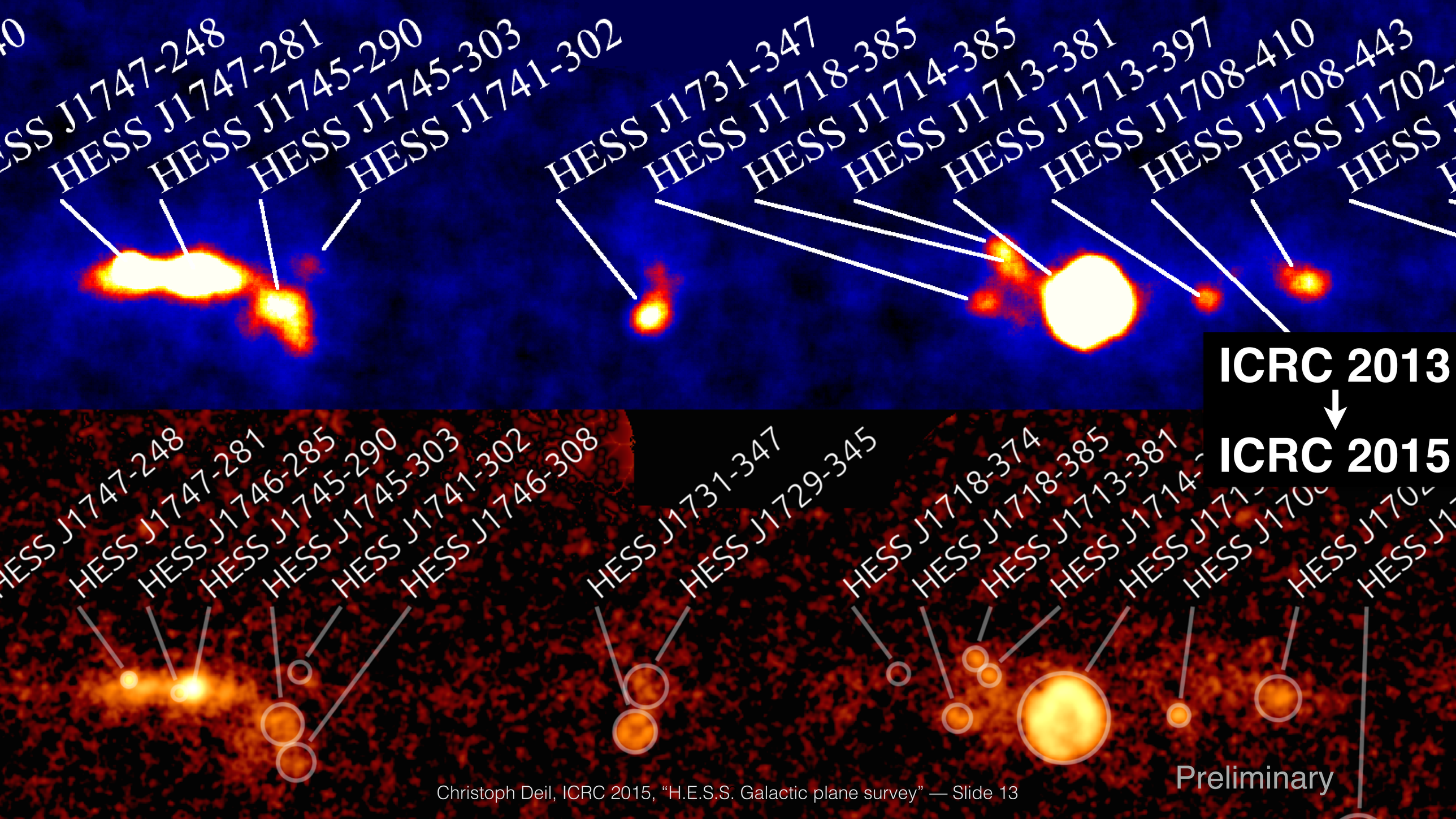
- Gaussian shape in GLAT
- Parameters vary with GLON:
  - Peak Brightness
  - Peak latitude
  - Gaussian width
- Fitted outside exclusion regions, using sliding window with 20 deg width.



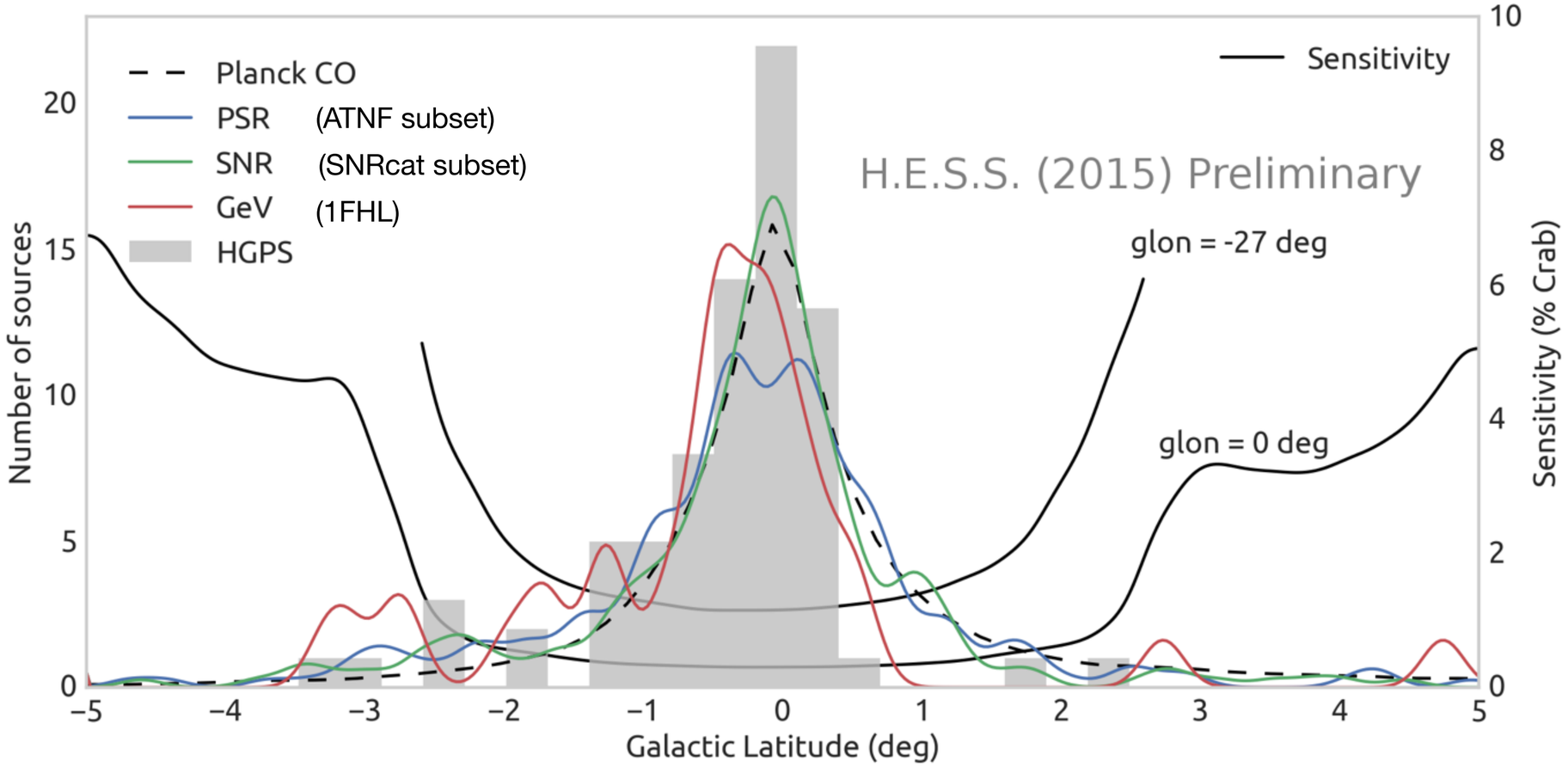
Results



For the first time shown in full detail! Will be released as FITS with the paper.
Come see the poster — Session: Poster 3 GA, Track: GA-EX Board #: 54


HESS J1747-248
HESS J1747-281
HESS J1745-290
HESS J1745-303
HESS J1741-302
HESS J1731-347
HESS J1718-385
HESS J1714-385
HESS J1713-381
HESS J1713-397
HESS J1708-410
HESS J1708-443
ICRC 2013
ICRC 2015
HESS J1747-248
HESS J1747-281
HESS J1746-285
HESS J1745-290
HESS J1745-303
HESS J1741-302
HESS J1746-308
HESS J1731-347
HESS J1729-345
HESS J1718-374
HESS J1718-385
HESS J1713-381
Preliminary

Source and sensitivity
Galactic latitude distribution

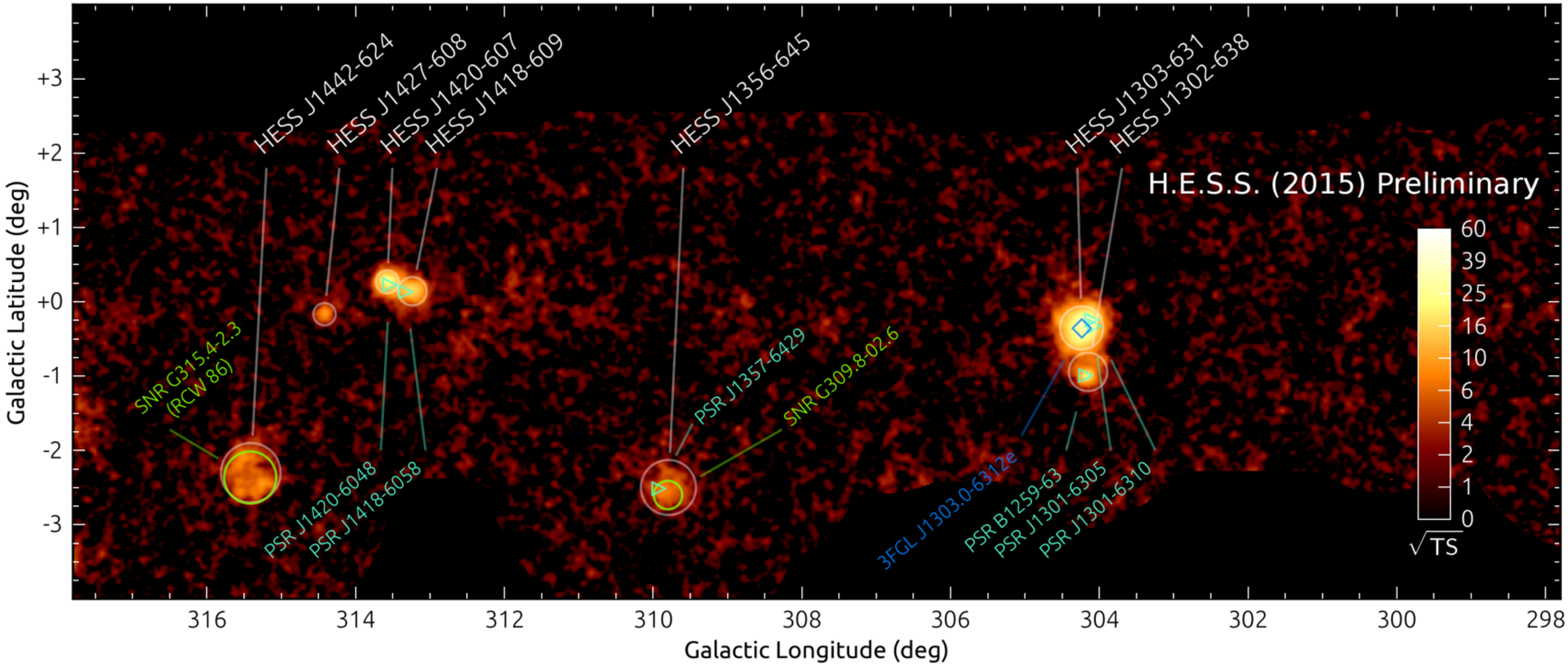


Caveat: these are observed distributions, not taking survey coverage and selection effects into account!

See H.E.S.S. PWN and SNR population studies.
PWN – Klepser et al. GA03 ID=635
SNR – Hahn et al. GA17 ID= 556

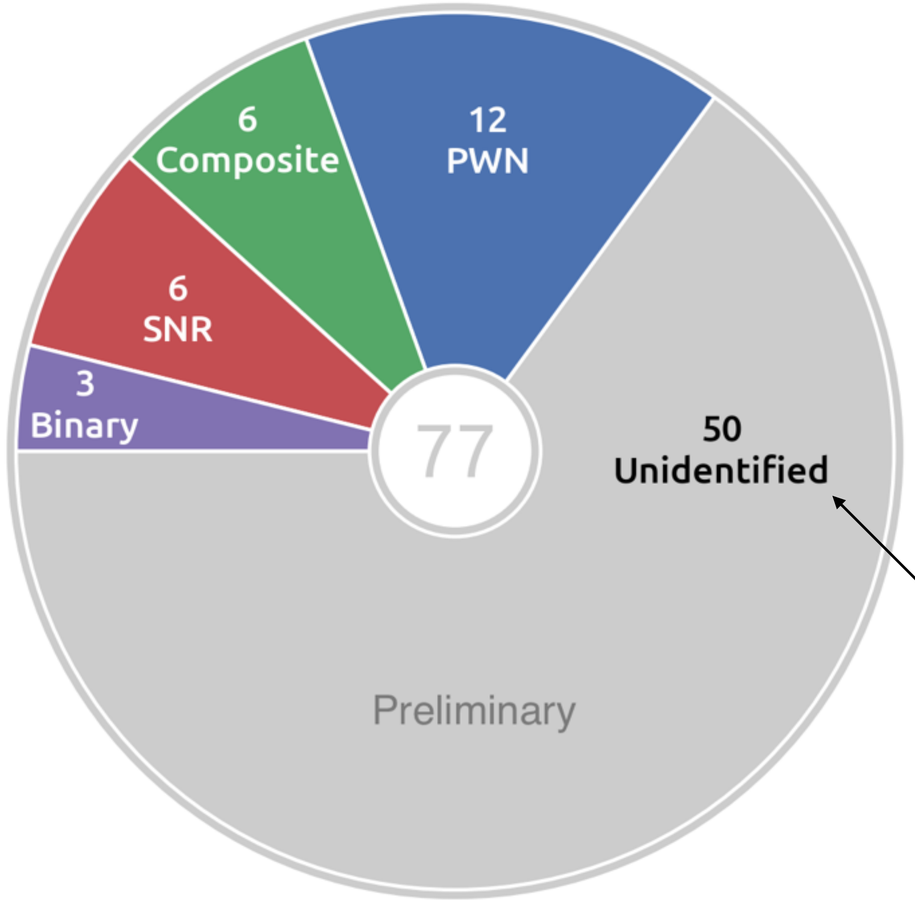
Associations

Systematic association of HGPS sources with nearby PSR, SNR, PWN, GeV sources (3FGL and 1FHL)
Not a population study!



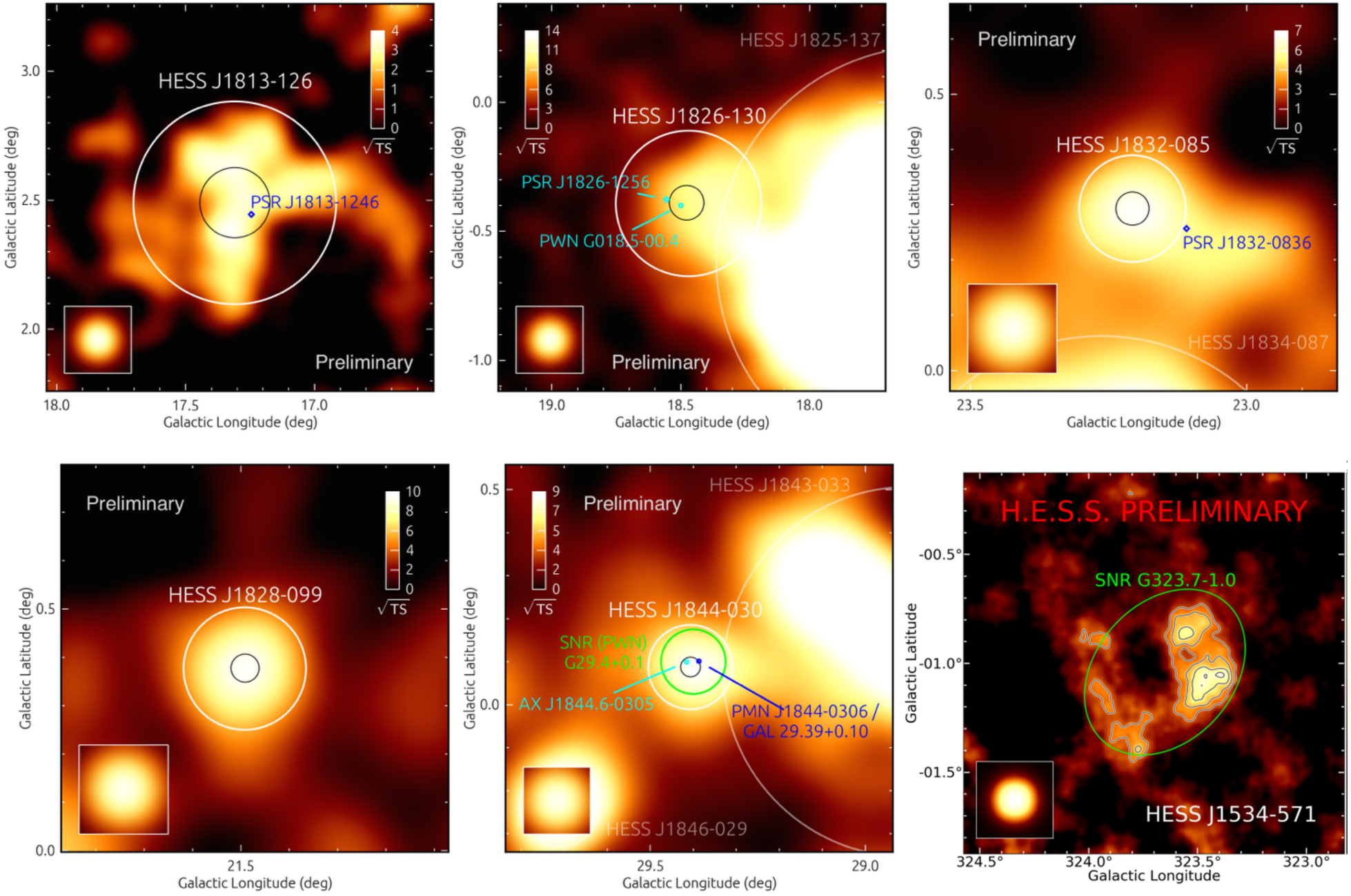
Thanks to Samar Safi-Harb and Gilles Ferrand for SNRcat!
http://www.physics.umanitoba.ca/snr/SNRcat/

Firm identifications



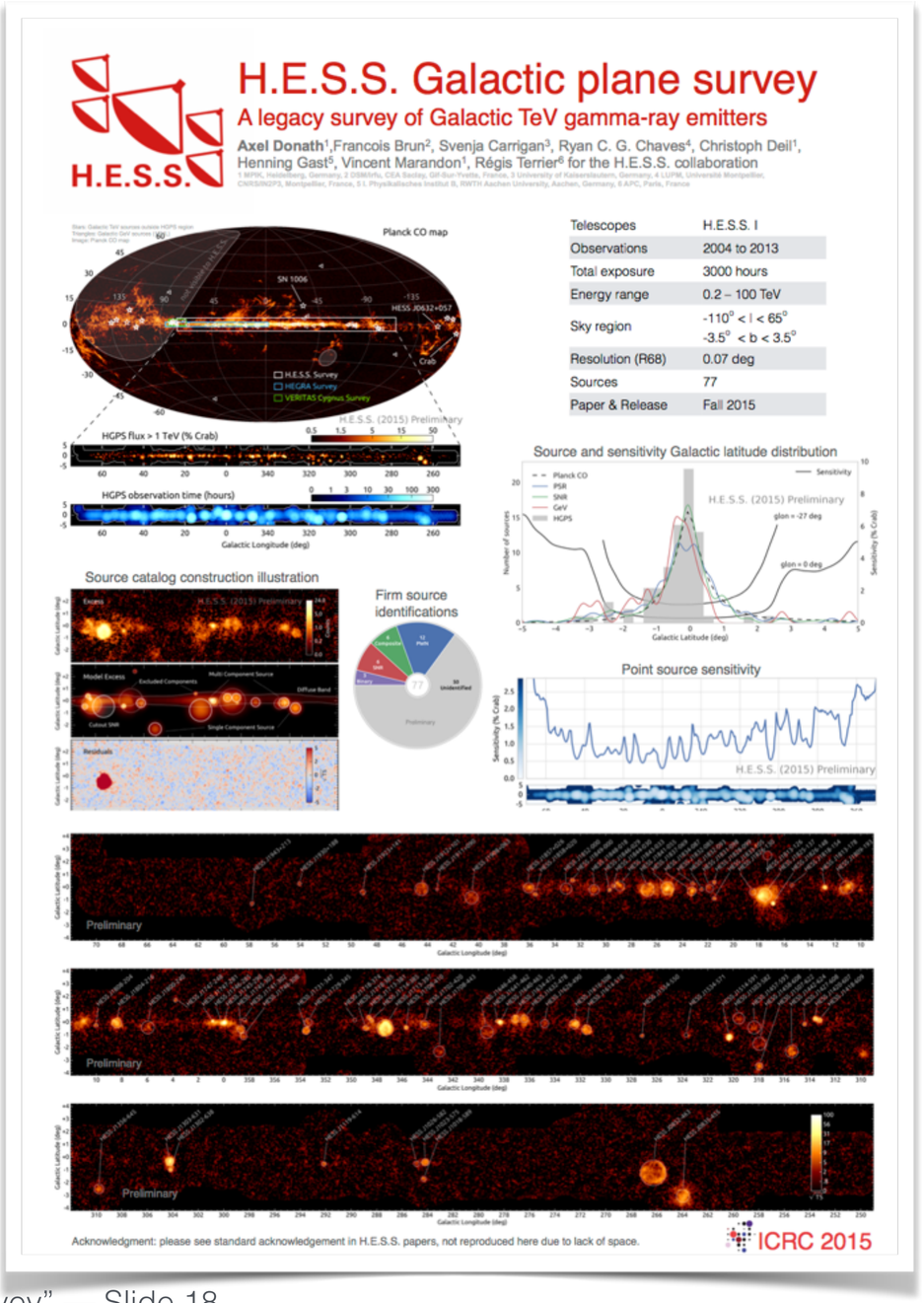
Mostly sources with multiple associations

New H.E.S.S. sources!



Summary

- H.E.S.S. Galactic plane survey (HGPS) is completed
- Can be the basis for new studies, e.g. by H.E.S.S.
  - PWN population study (Stefan Klepser et al.)
  - SNR population study (Joachim Hahn et al.)
- Several new sources discovered
- Paper and legacy data release coming soon (fall 2015)
- FITS maps and source catalog (morphology & spectra)
- Come see the HGPS poster (Axel Donath et al.) and talk to us!



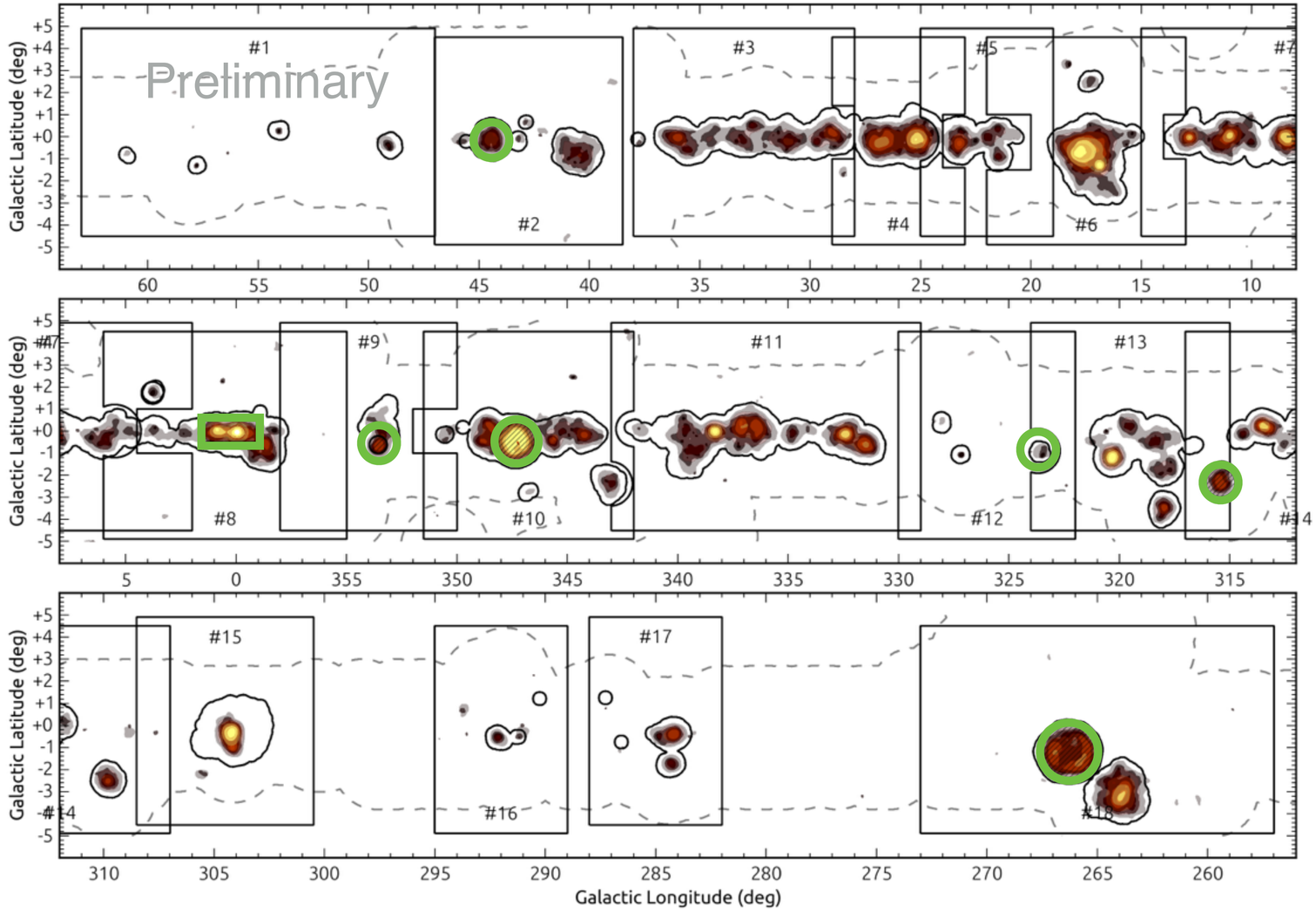
Backup slides

HGPS firm identifications

(see pie chart on slide 17)

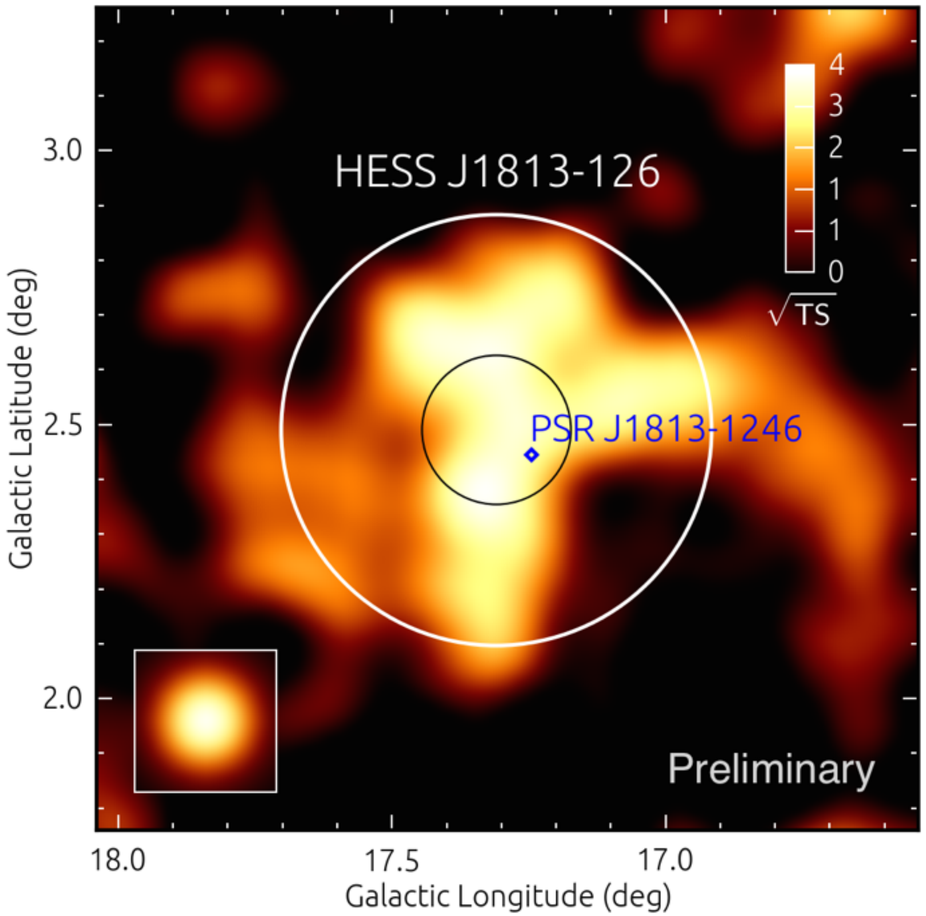
Source Name	Associated object	Class	Evidence	Reference
HESS J1018−589A	1FGL J1018.6−5856	Binary	Variability	H. E. S. S. Collaboration et al. (2015a)
HESS J1302−638	PSR B1259−63	Binary	Variability	Aharonian et al. (2005a)
HESS J1826−148	LS 5039	Binary	Variability	Aharonian et al. (2006c)
HESS J0852−463	Vela Junior	SNR	Morphology	Aharonian et al. (2005b)
HESS J1442−624	RCW 86	SNR	Morphology	Aharonian et al. (2009)
HESS J1534−571	G323.7-01.0	SNR	Morphology	HESS SNR shell paper (2015)
HESS J1713−397	RX J1713.7−3946	SNR	Morphology	Aharonian et al. (2004)
HESS J1731−347	G353.6−0.7	SNR	Morphology	H.E.S.S. Collaboration et al. (2011b)
HESS J1800−240	W 28	SNR	Position	Aharonian et al. (2008)
HESS J0835−455	Vela X	PWN	Morphology	Aharonian et al. (2006a)
HESS J1303−631	PSR J1301−6305	PWN	ED Morph.	H.E.S.S. Collaboration et al. (2012)
HESS J1514−591	MSH 15−52	PWN	Morphology	Aharonian et al. (2005a)
HESS J1825−137	PSR J1826−1334	PWN	ED Morph.	Aharonian et al. (2006d)
HESS J1356−645	PSR J1357-6429	PWN	Position	H.E.S.S. Collaboration et al. (2011a)
HESS J1418−609	PSR J1418-6058	PWN	Position	Aharonian et al. (2006b)
HESS J1420−607	PSR J1420-6048	PWN	Position	Aharonian et al. (2006b)
HESS J1554−550	G327.1-01.1	PWN	Morphology	Section 5.7.5
HESS J1747−281	G0.9+0.1	PWN	Morphology	Aharonian et al. (2005b)
HESS J1818−154	G015.4+00.1	PWN	Morphology	H. E. S. S. Collaboration et al. (2014)
HESS J1849−000	PSR J1849−0001	PWN	Position	Section 5.7.15
HESS J1837−069	PSR J1838−0655	PWN?	Morphology	Marandon et al. (2008)
HESS J1640−465	G338.3-0.0	Composite?	Position	Abramowski et al. (2014b), Gotthelf et al. (2014)
HESS J1119−614	PSR J1119-6127	Composite	Position	Section 5.7.1
HESS J1813−178	PSR J1813-1749	Composite	Position	Funk et al. (2007),Gotthelf & Halpern (2009)
HESS J1833−105	G21.5−0.9	Composite	Position	Section 5.7.10
HESS J1846−029	PSR J1846-0258	Composite	Position	Section 5.7.13
HESS J1930+186	G54.1+0.3	Composite	Position	Acciari et al. (2010), Section 5.5

Exclusion regions and regions of interest



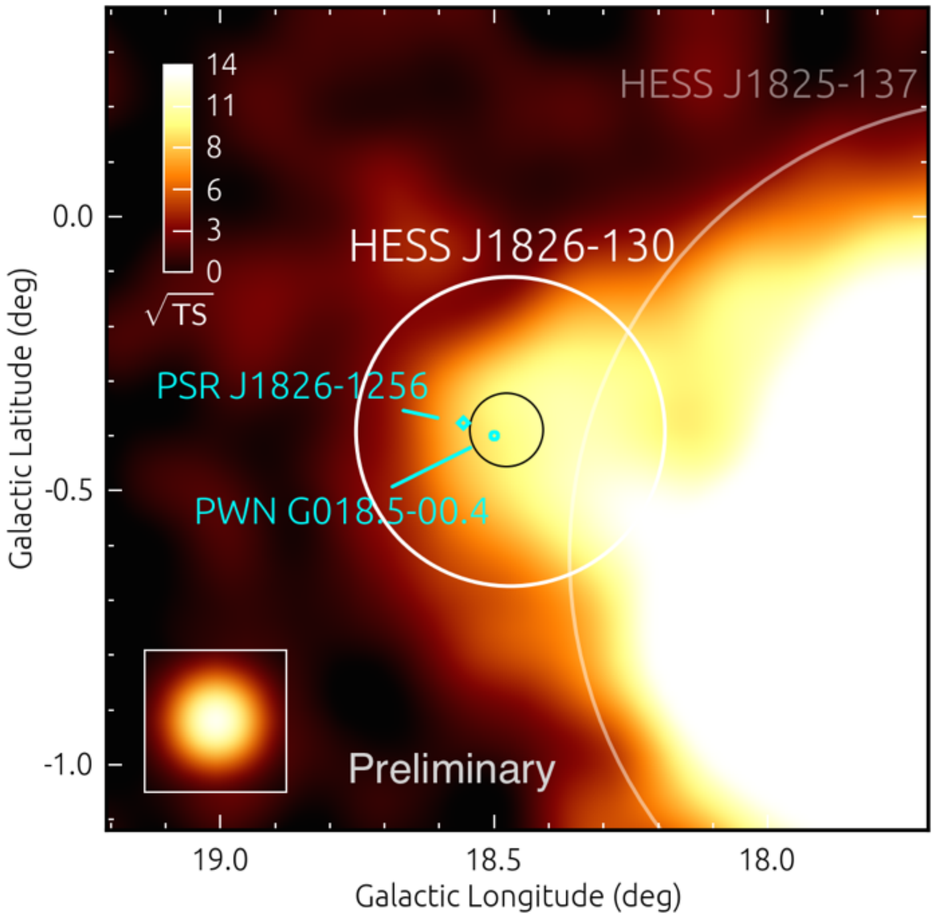
HESS J1813-126

- Position:
  (l, b) = (17.31, 2.49) deg
  (α, δ) = (273.34, -12.69) deg
- Extension: 0.21 deg
- Flux: 4.2% Crab



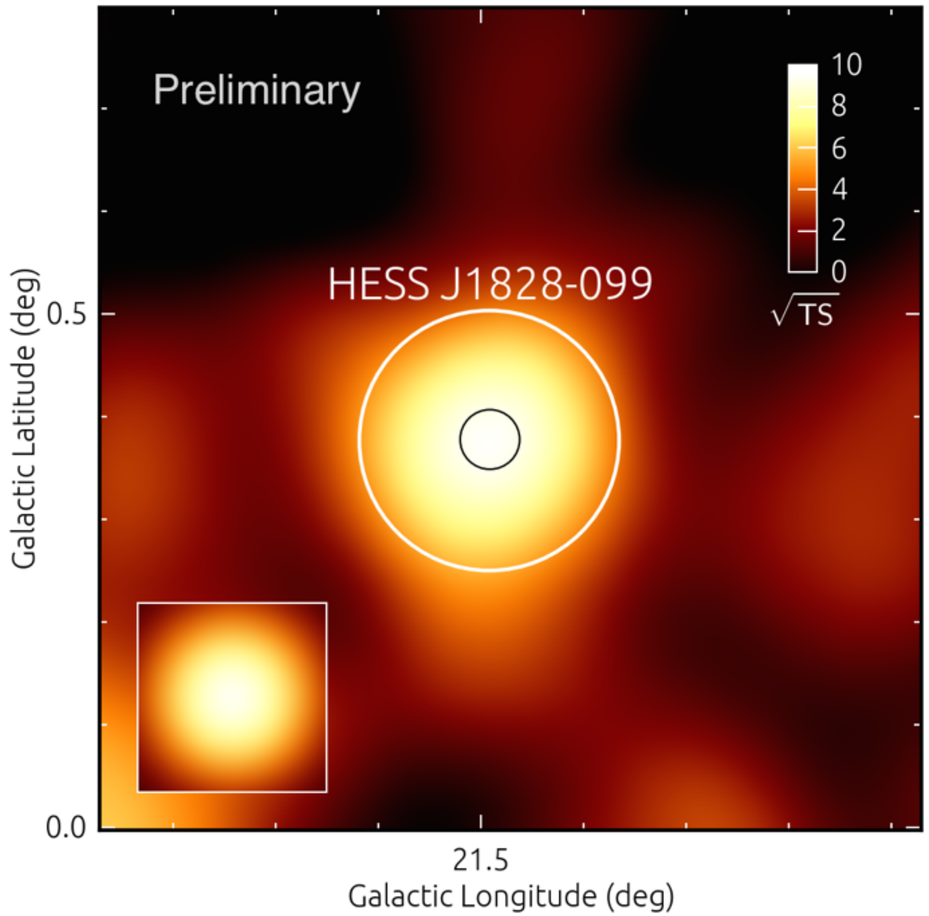
HESS J1826-130

- Position:
  (l, b) = (18.48, -0.39) deg
  (α, δ) = (276.51, -13.02) deg
- Extension: 0.15 deg
- Flux: 3.3% Crab



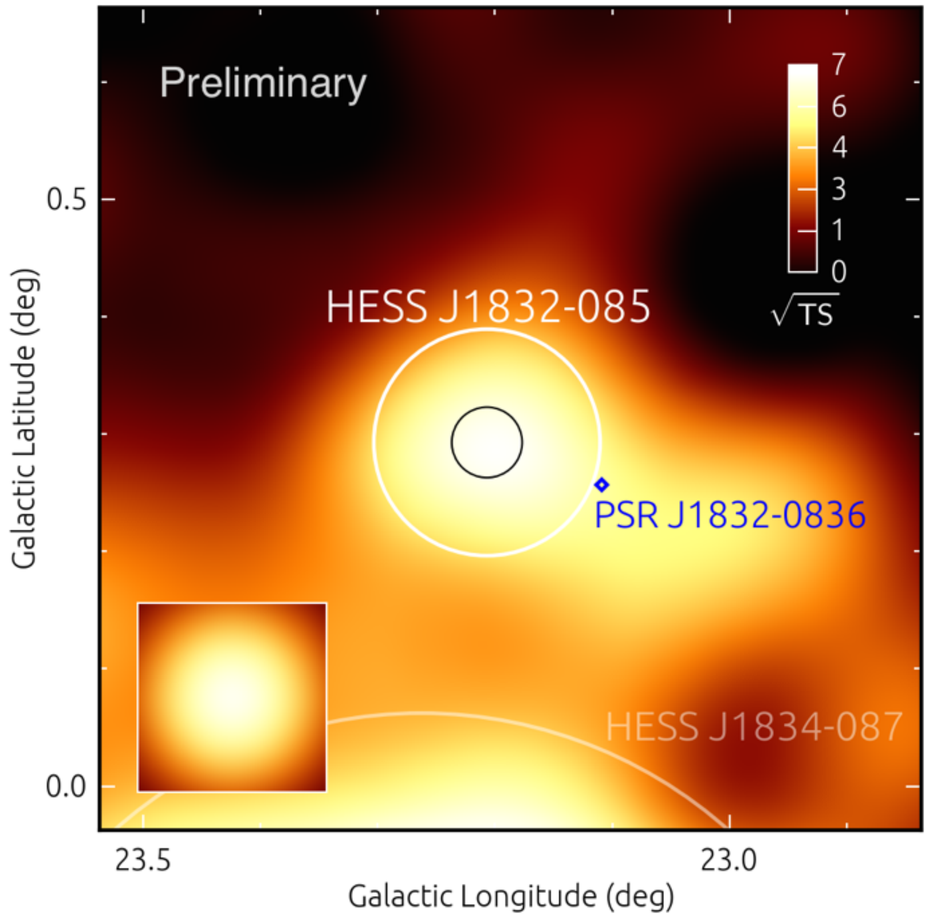
HESS J1828-099

- Position:
  (l, b) = (21.49, 0.38) deg
  (α, δ) = (277.25, -9.99) deg
- Extension upper limit:
  < 0.07 deg
- Flux: 1.7% Crab



HESS J1832-085

- Position:
  (l, b) = (23.21, 0.29) deg
  (α, δ) = (278.13, -8.51) deg
- Extension upper limit:
  < 0.05 deg
- Flux: 0.8% Crab



HESS J1844-030

- Position:
  (l, b) = (29.41, 0.09) deg
  (α, δ) = (281.17, -3.10) deg
- Extension upper limit:
  < 0.05 deg
- Flux: 1.0% Crab