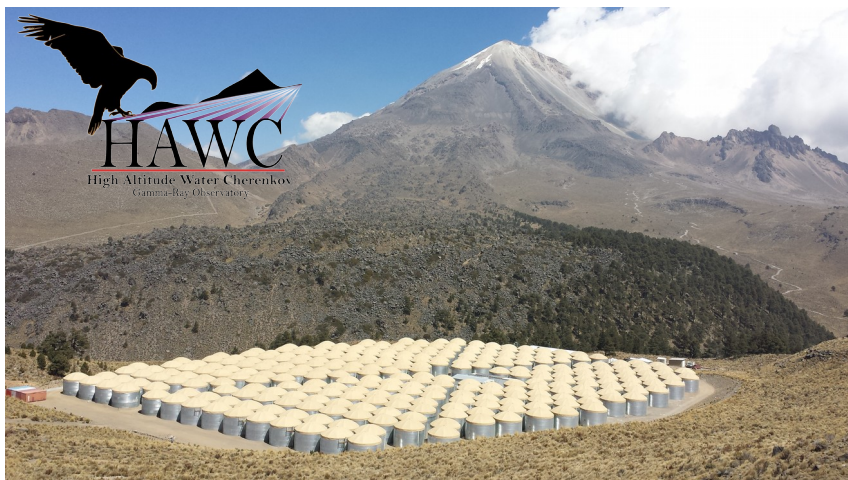


A complementary view of the Galactic Plane in TeV γ rays by HAWC & H.E.S.S.

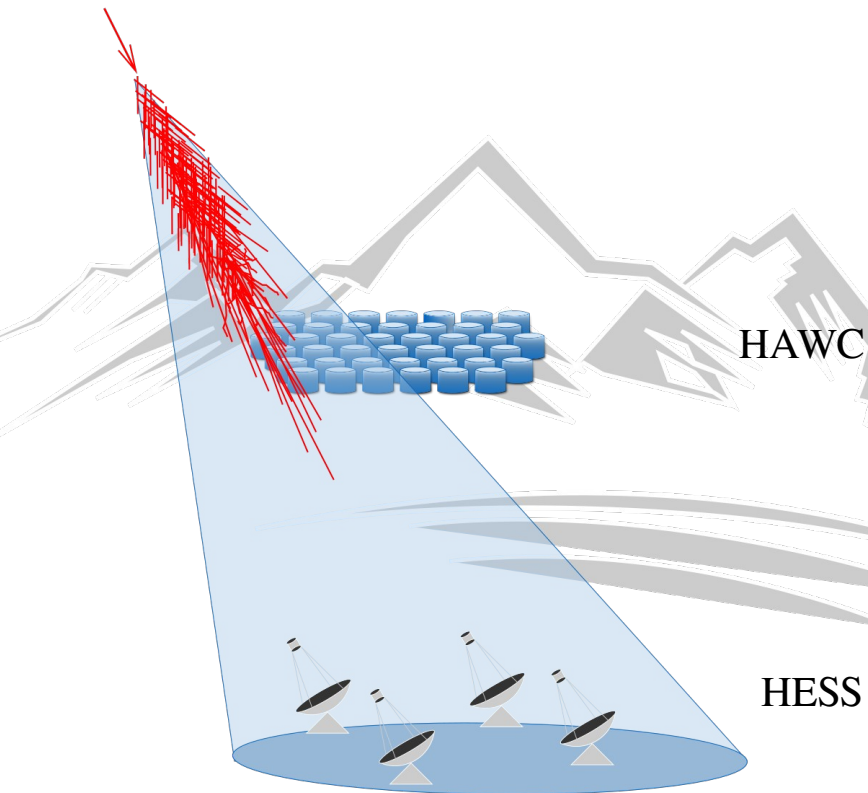


Armelle Jardin-Blicq
on behalf of the HAWC and HESS collaborations

ICRC 2019, Madison



WCD and IACT



Duty
cycle



~95%

Field
of view



90°

Energy
range



TeV

Angular
resolution



1-0.2°

Sky survey

Extended sources

Diffuse emission



~10%



5°



TeV

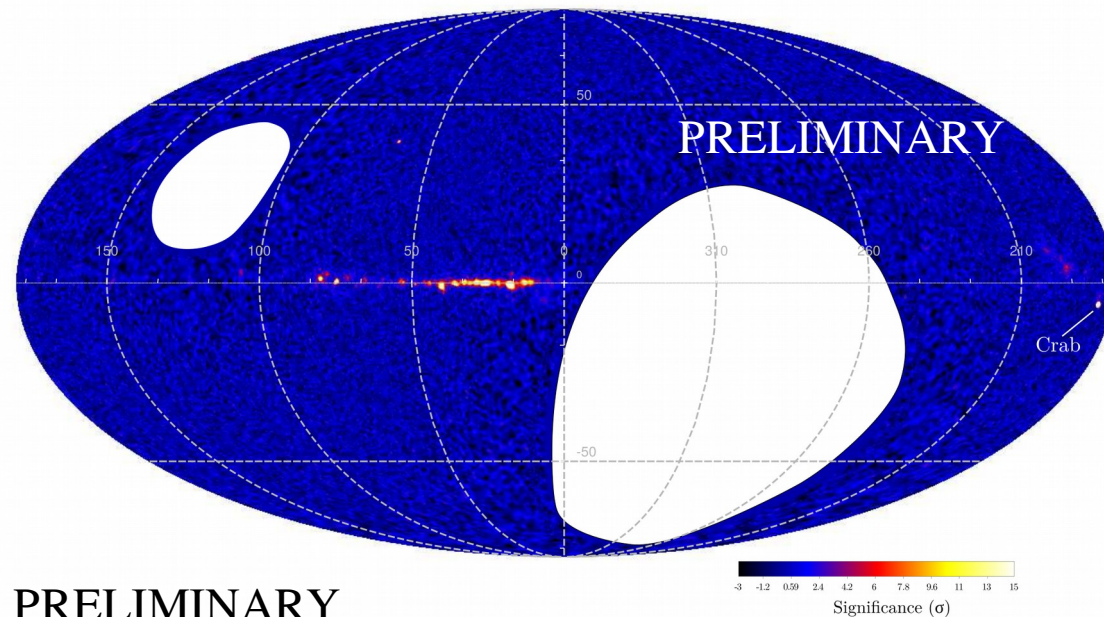


0.1-0.06°

*Deep survey in
limited regions*

*Detailed study
of sources*

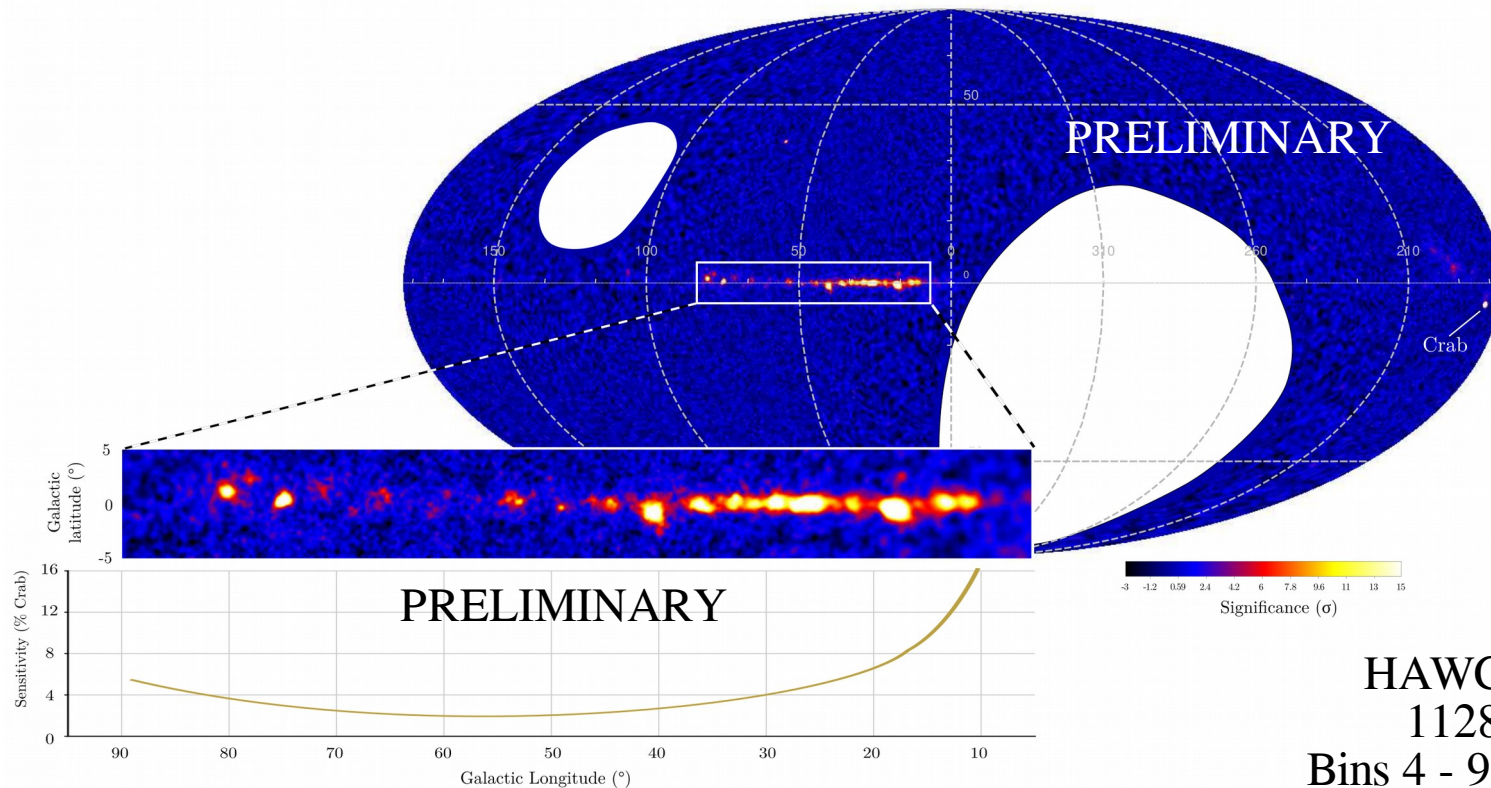
HAWC and HESS galactic plane maps

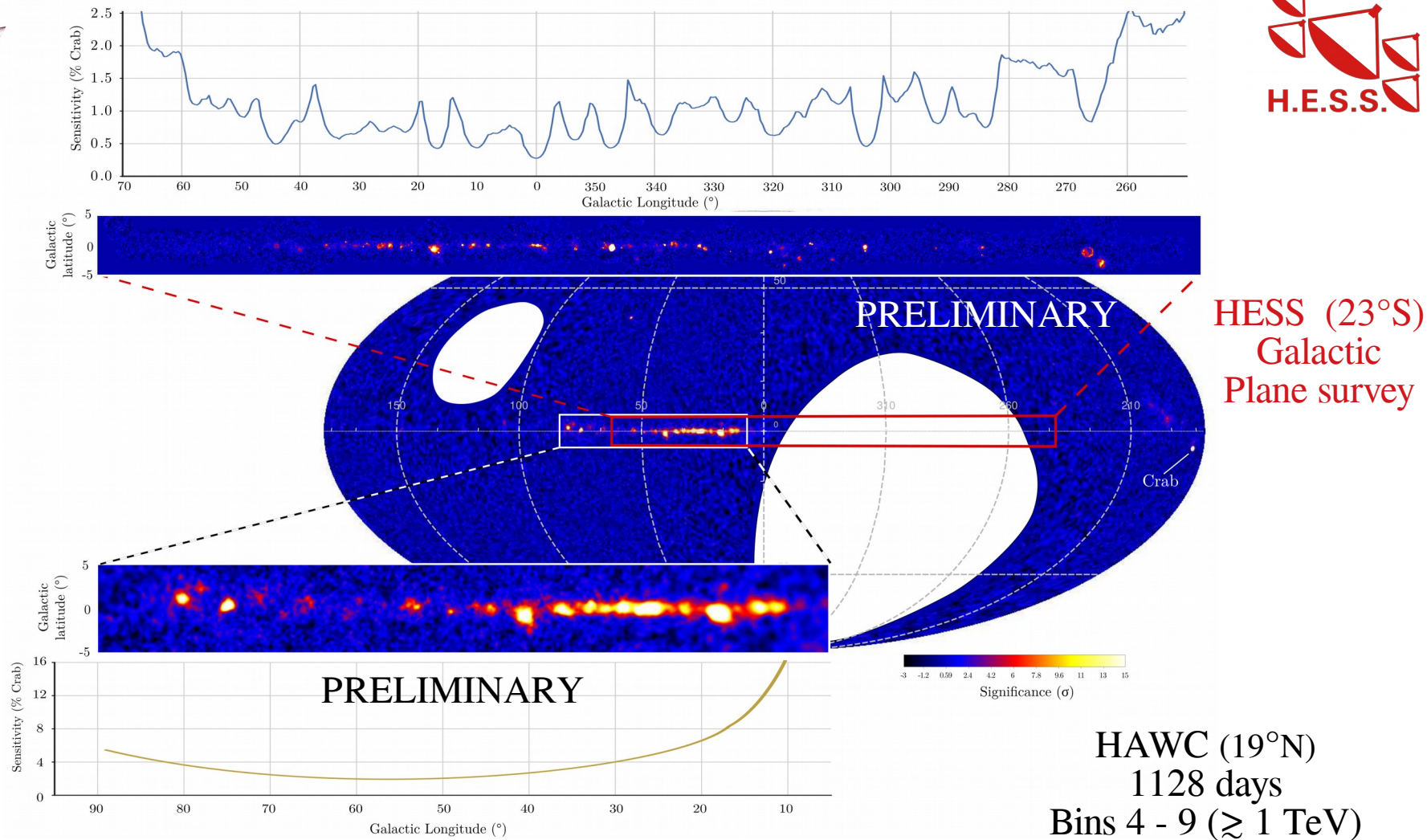


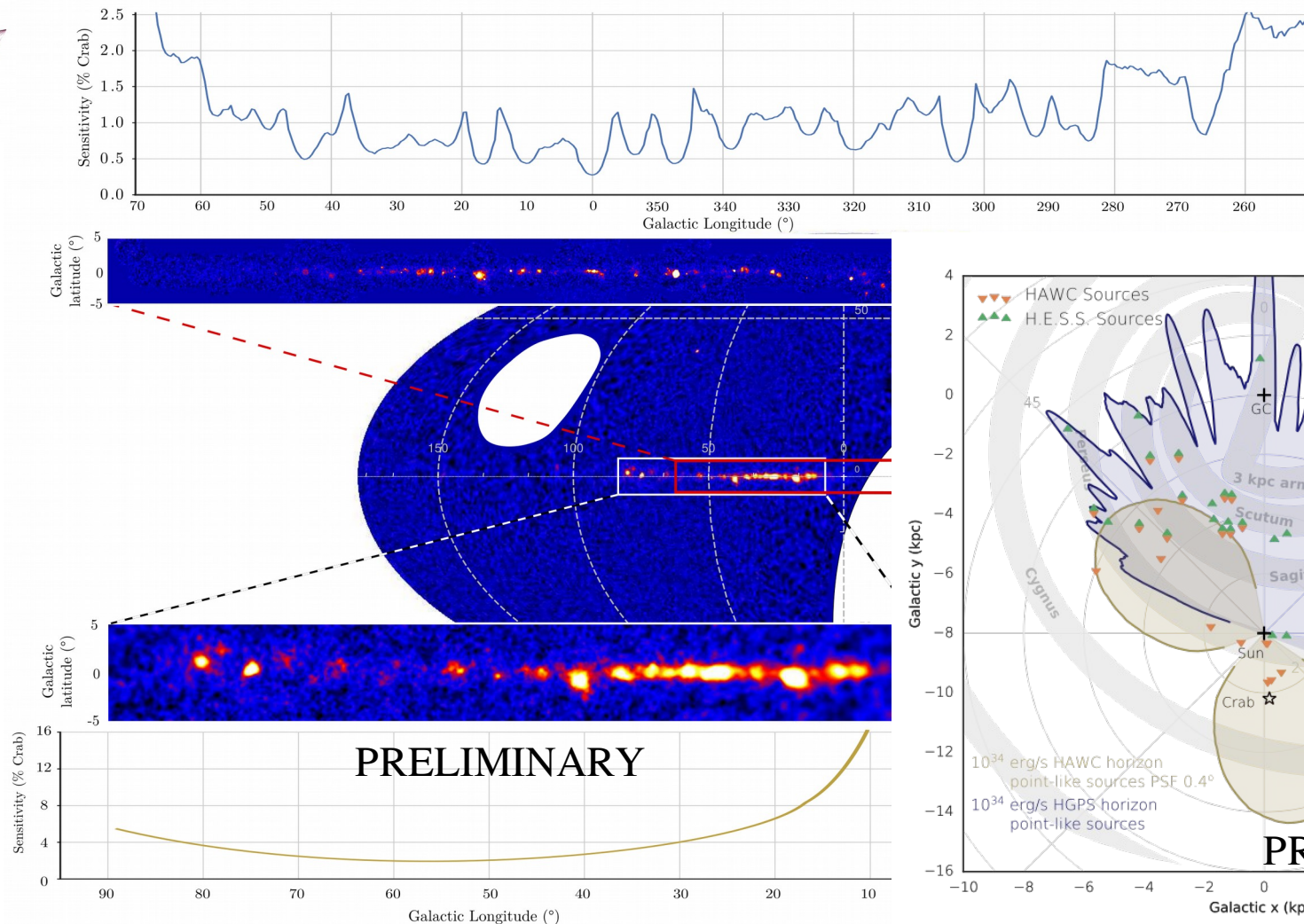
PRELIMINARY

HAWC (19°N)
1128 days
Bins 4 - 9 ($\gtrsim 1\text{ TeV}$)

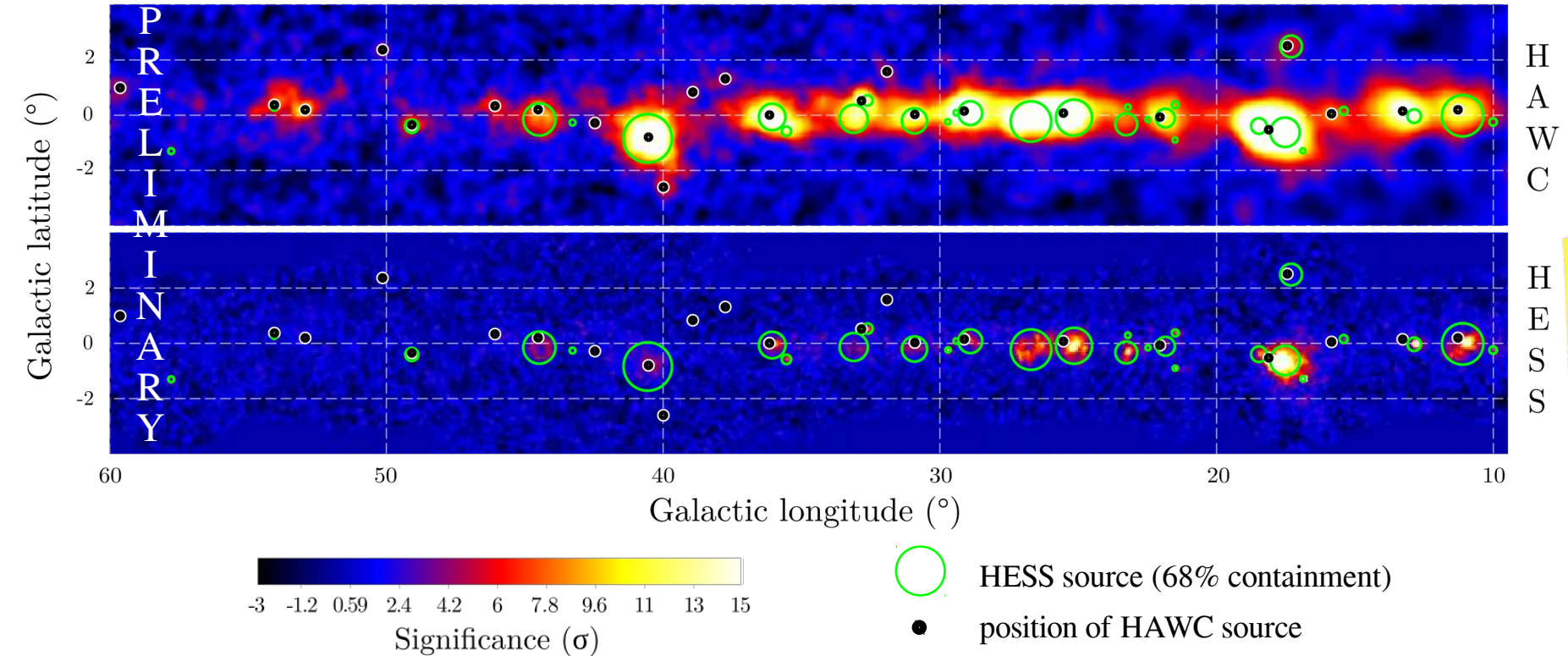
HAWC and HESS galactic plane maps





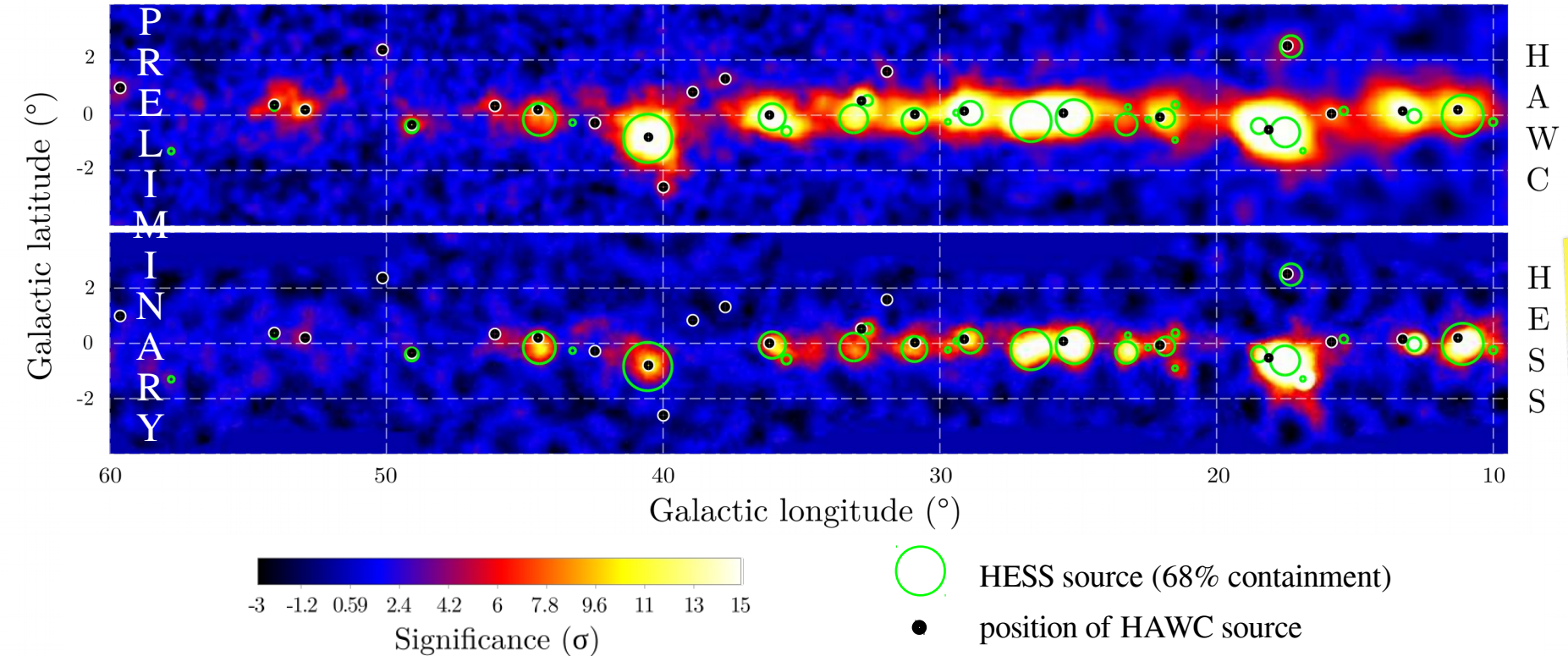


HAWC and HESS galactic plane maps > 1TeV



0.1°
correlation
radius

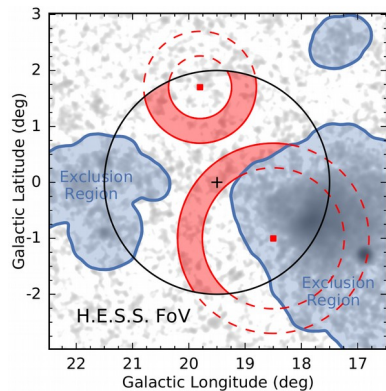
HAWC and HESS galactic plane maps > 1TeV



0.4°
correlation
radius

Background estimation

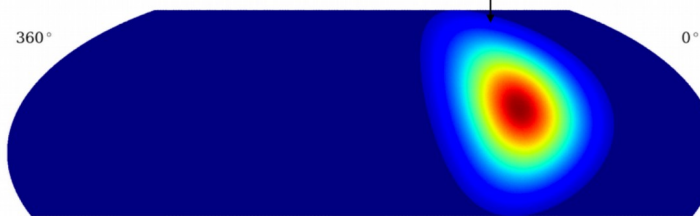
Ring background method in HESS



- takes into account exclusion regions and exposure
- applied for each run separately

Direct integration method in HAWC

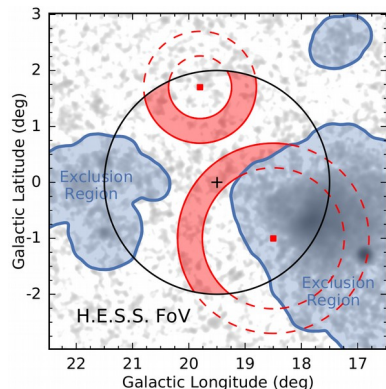
$$\text{bkg}(\text{RA}, \text{Dec}) = \int \text{rate}(t) \text{ eff}(\text{HA}, \text{Dec}) dt$$



- uses the whole FoV
- integration time of typically 2 hours
- constantly updated
- takes into account exclusion regions

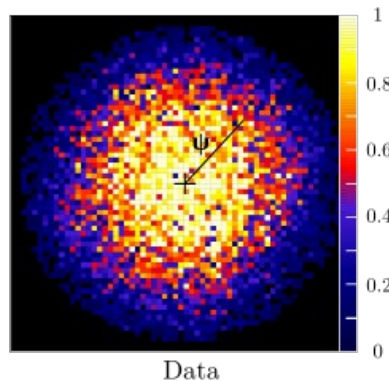
Background estimation

Ring background method in HESS



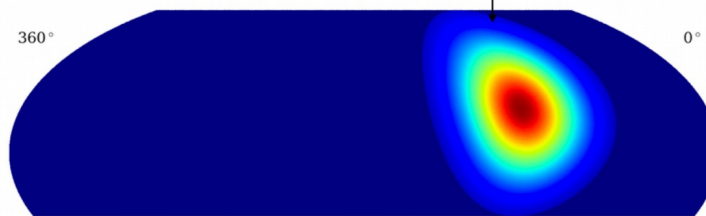
- takes into account exclusion regions and exposure
- applied for each run separately

Field of view background method

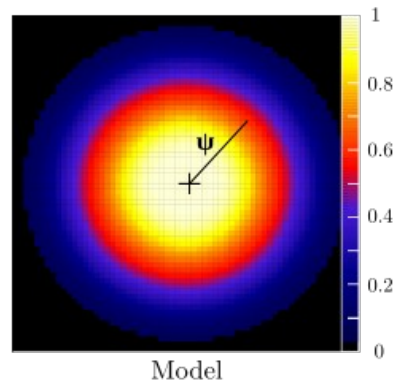


Direct integration method in HAWC

$$\text{bkg}(\text{RA}, \text{Dec}) = \int \text{rate}(t) \text{ eff}(\text{HA}, \text{Dec}) dt$$

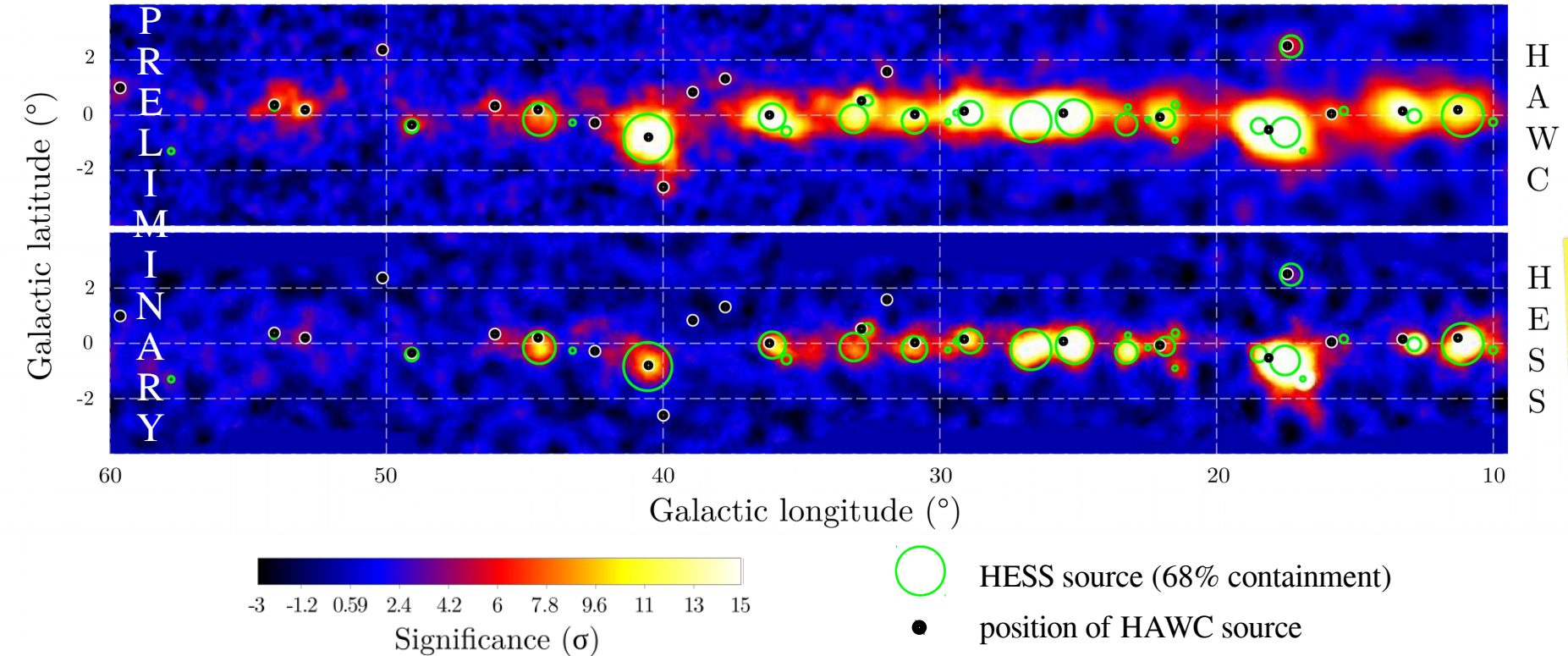


- uses the whole FoV
- integration time of typically 2 hours
- constantly updated
- takes into account exclusion regions



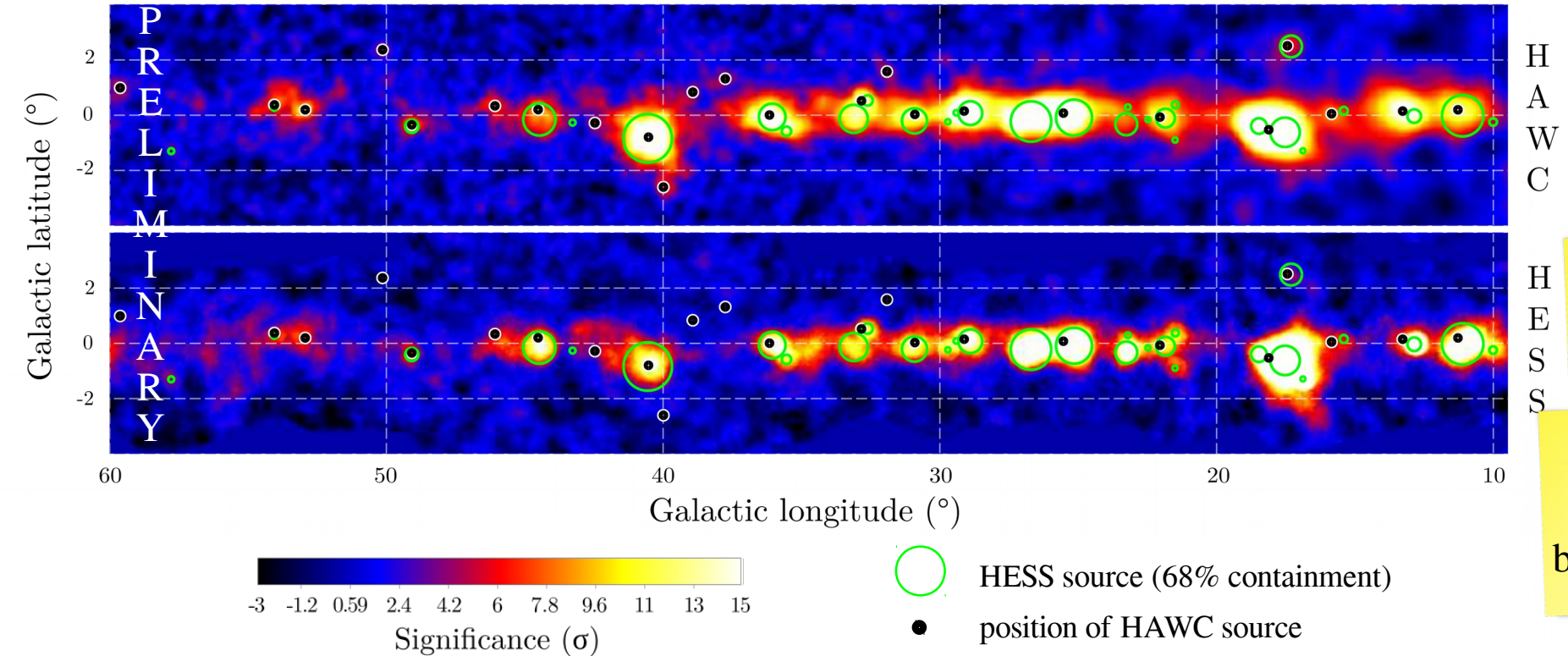
- uses the whole FoV
- tabulated using extragalactic FoVs, for different zenith angles
- applied for each run separately
- assume radial symmetry

HAWC and HESS galactic plane maps > 1TeV



0.4°
correlation
radius

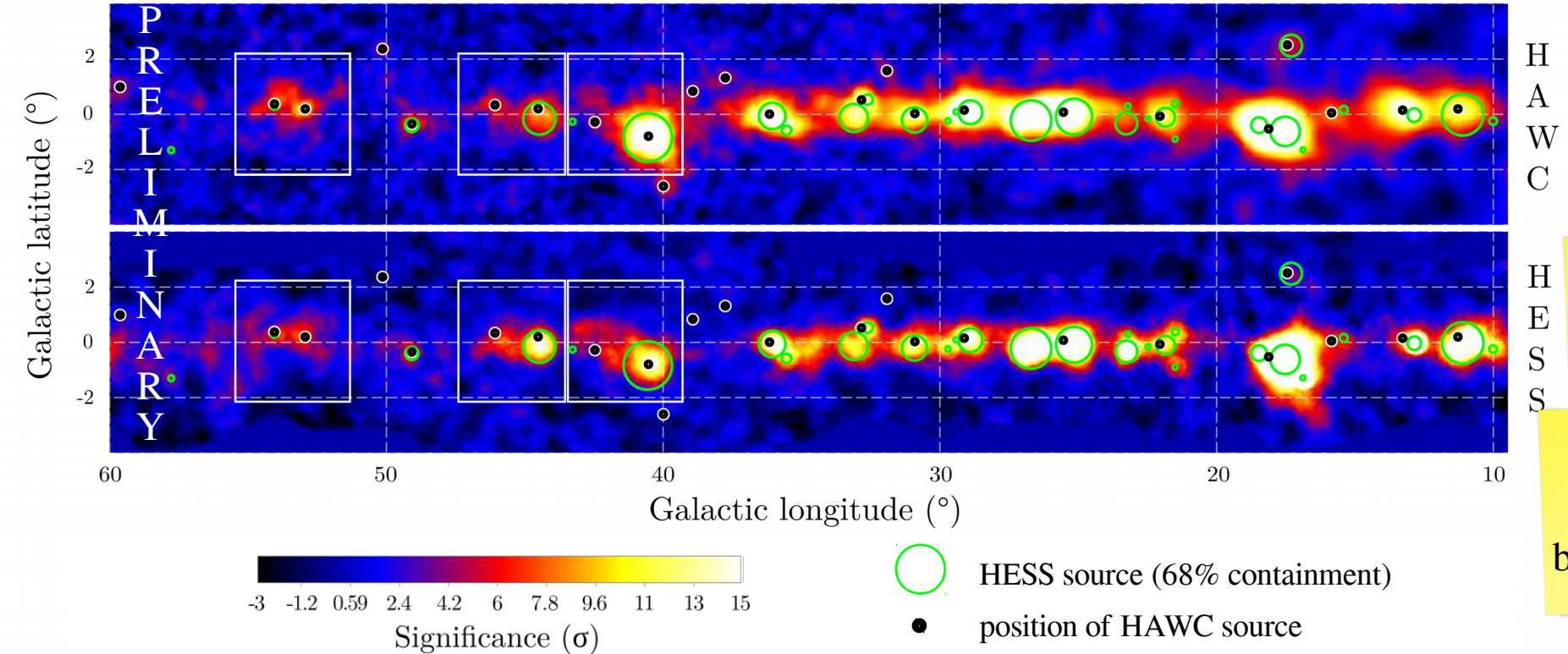
HAWC and HESS galactic plane maps > 1TeV

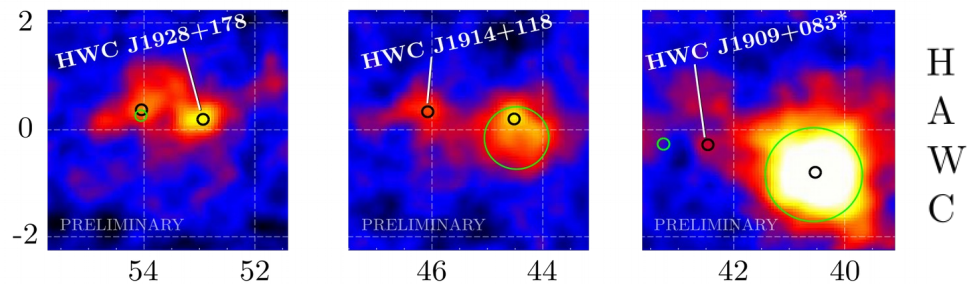


0.4°
correlation
radius

Field of
view
background

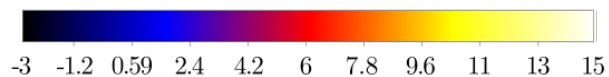
HAWC and HESS galactic plane maps > 1TeV





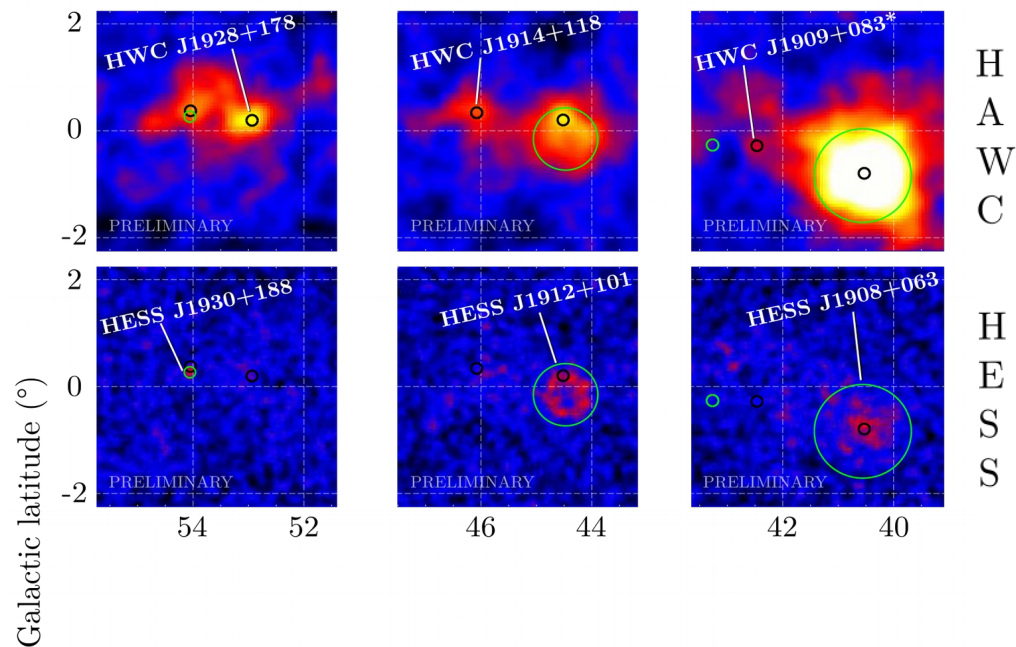
Galactic latitude (°)

- HESS source (68% containment)
- position of HAWC source

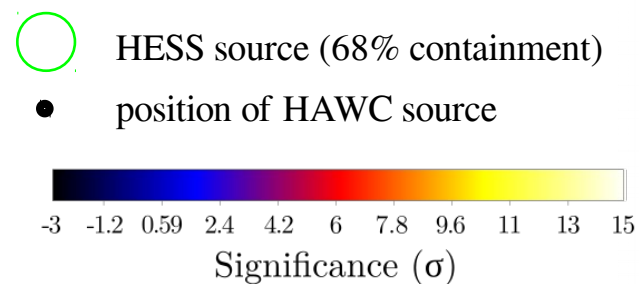


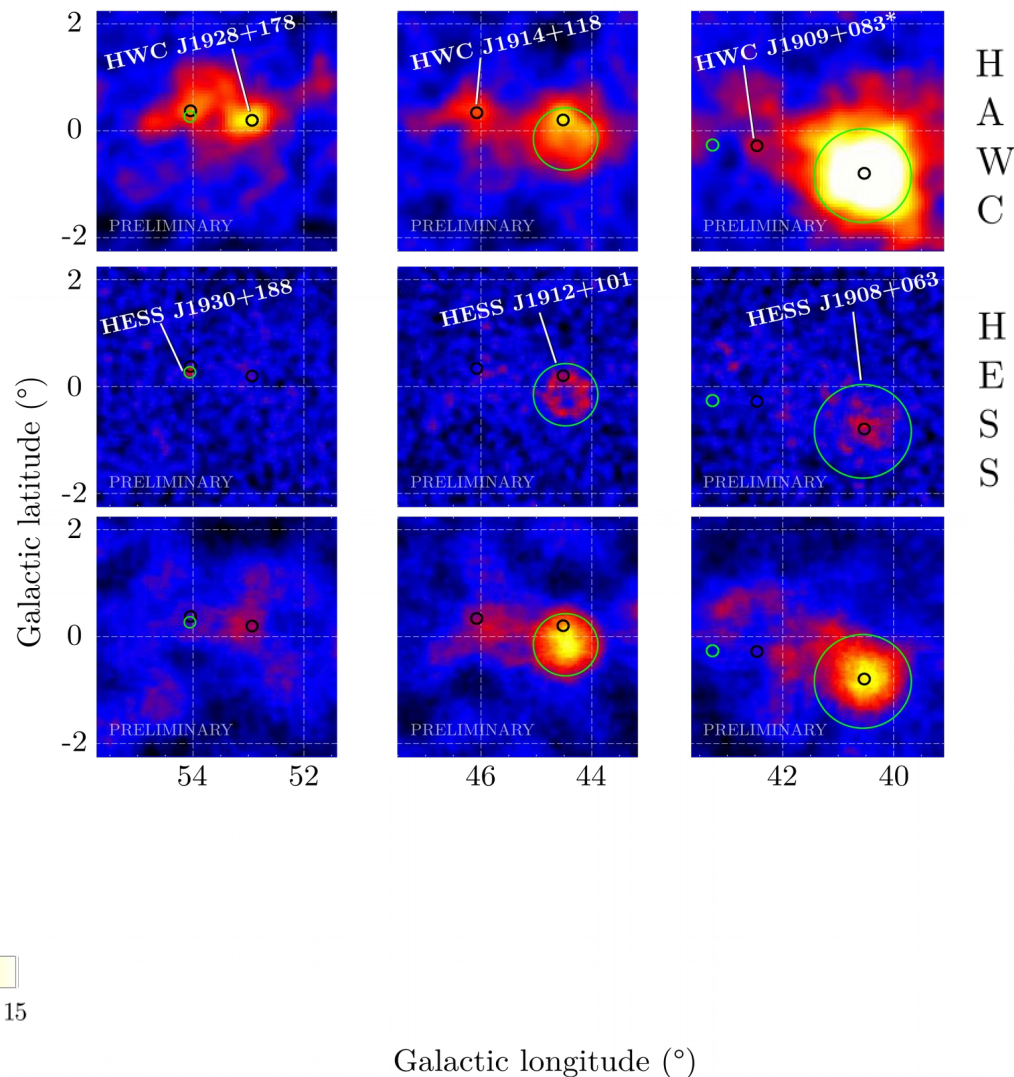
Significance (σ)

Galactic longitude (°)



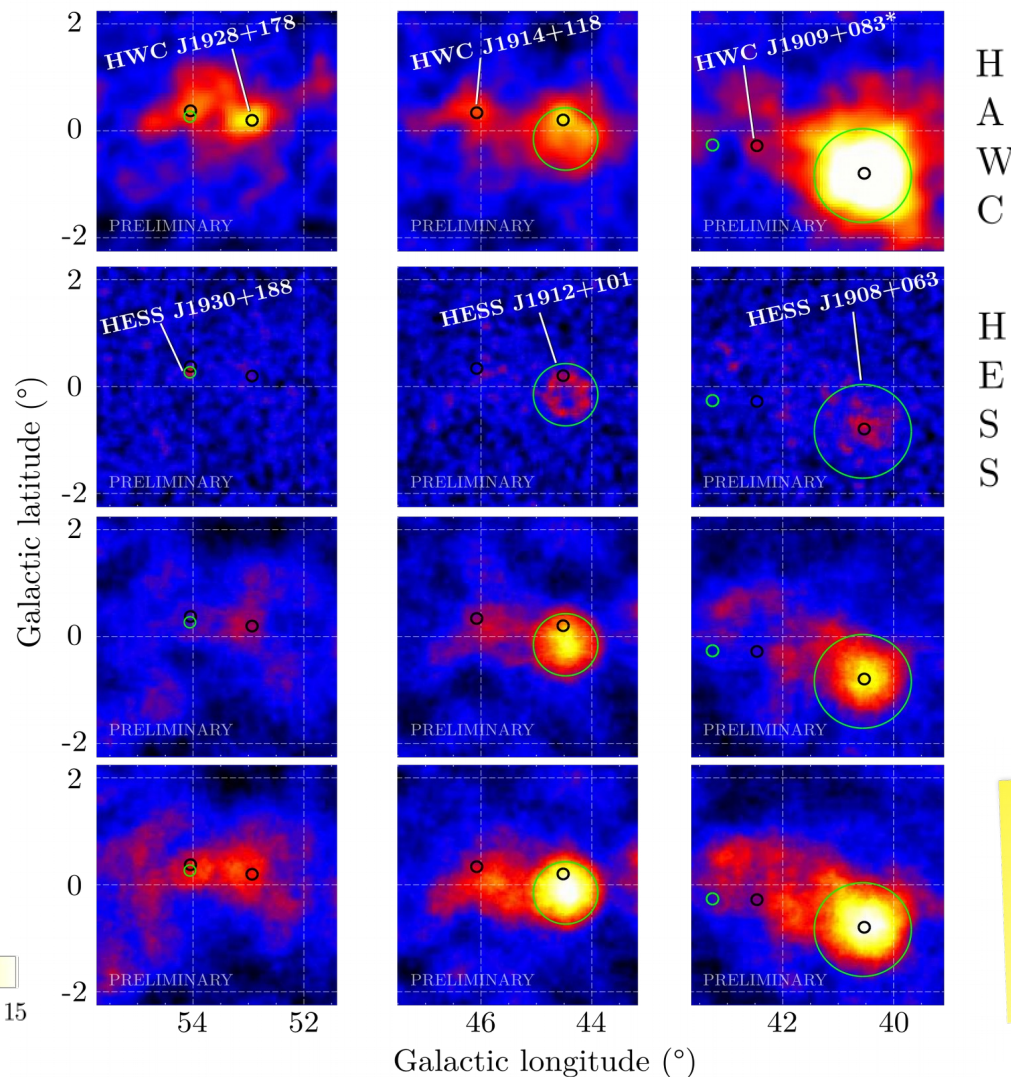
0.1 $^{\circ}$
correlation
radius





0.1°
correlation
radius

0.4°
correlation
radius



H
A
W
C

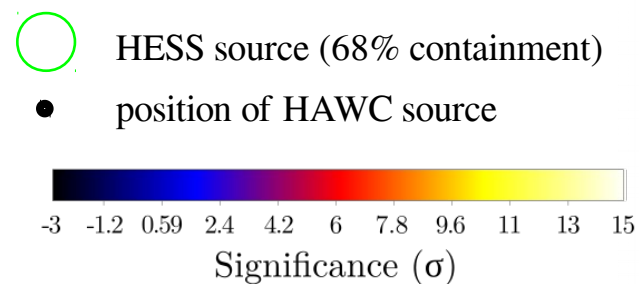
H
E
S
S

0.1°
correlation
radius

0.4°
correlation
radius

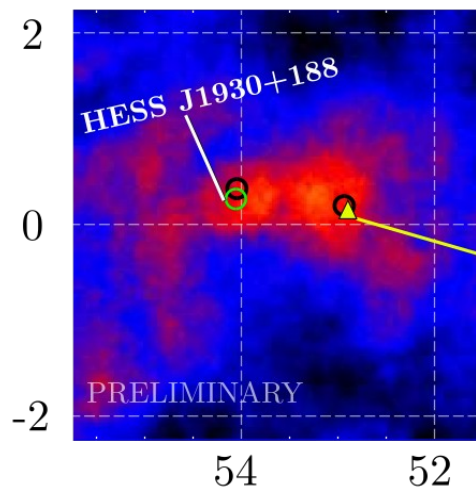
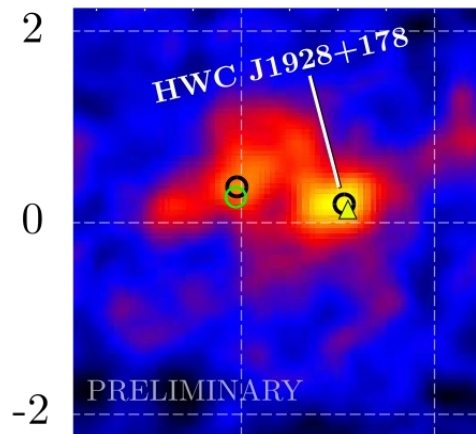
0.4°
correlation
radius

Field of
view
background



HWC J1914+118

Galactic latitude ($^{\circ}$)



PSR J1928+1746

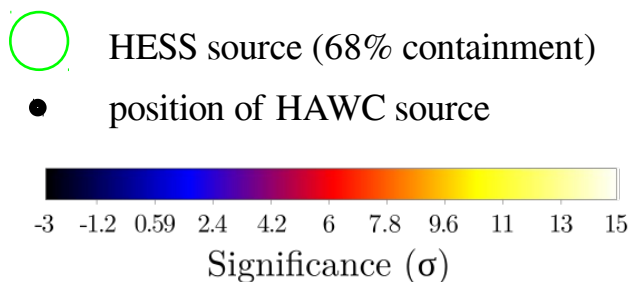
age = 82 kyr

dist = 4 kpc

$P = 0.7$ s

$\dot{E} = 1.6 \cdot 10^{36}$ erg s $^{-1}$

Galactic longitude ($^{\circ}$)



HWC J1914+118

PSR J1913+1145

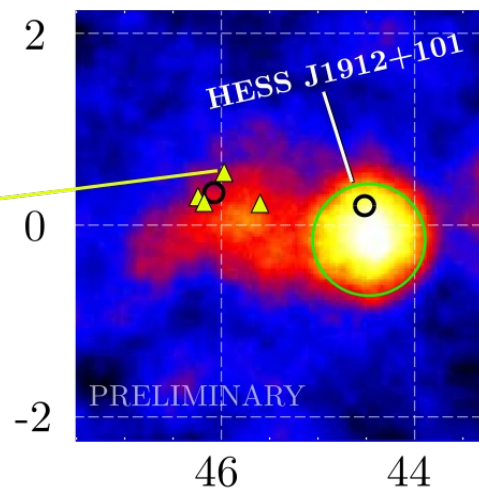
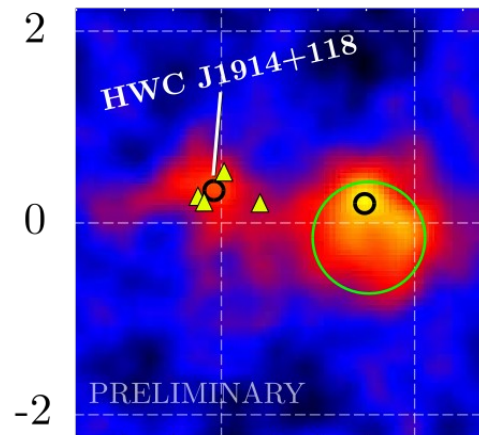
age = 967 kyr

dist = 13 kpc

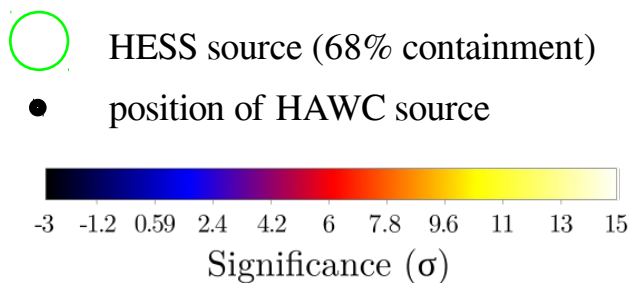
$P = 0.3$ s

$\dot{E} = 7 \cdot 10^{33}$ erg s⁻¹

Galactic latitude (°)



Galactic longitude (°)



HWC J1906+085

PSR J1907+0918

age = 38 kyr

dist = 8.2 kpc

$P = 0.22$ s

$\dot{E} = 3.2 \cdot 10^{35}$ erg s⁻¹

PSR J1908+0839

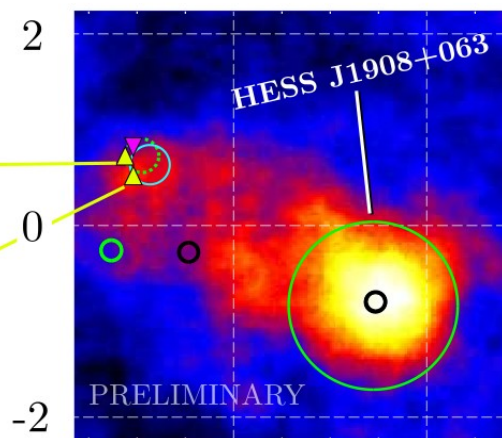
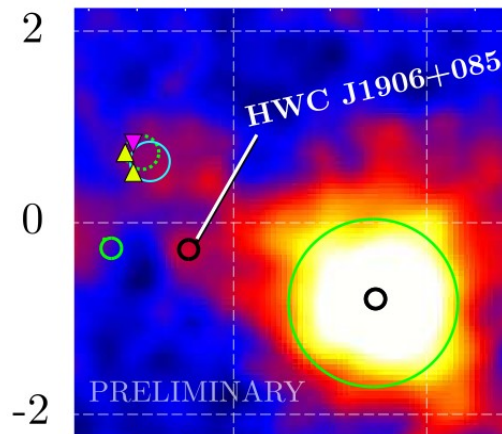
age = 1230 kyr

dist = 8 kpc

$P = 0.18$ s

$\dot{E} = 3.2 \cdot 10^{35}$ erg s⁻¹

Galactic latitude (°)



Galactic longitude (°)

○ HOTS J1907+091

▼ SGR 1900+14

age = 0.9 kyr

dist = 12.5 kpc

$P = 5.2$ s

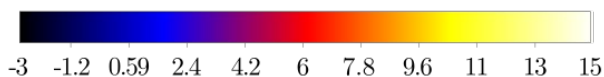
$\dot{E} = 2.6 \cdot 10^{34}$ erg s⁻¹

$B = 7 \cdot 10^{14}$ gauss

○ SNR G42.8+0.6

○ HESS source (68% containment)

● position of HAWC source



Significance (σ)

Conclusion

The differences between HAWC and HESS are understood : they see the same TeV sky

New way to look at HESS data – HESS confirmation of emission regions seen by HAWC

HAWC and HESS are two very different instruments but they are very complementary !

Outlook

Detailed analysis of each combined HAWC / HESS source

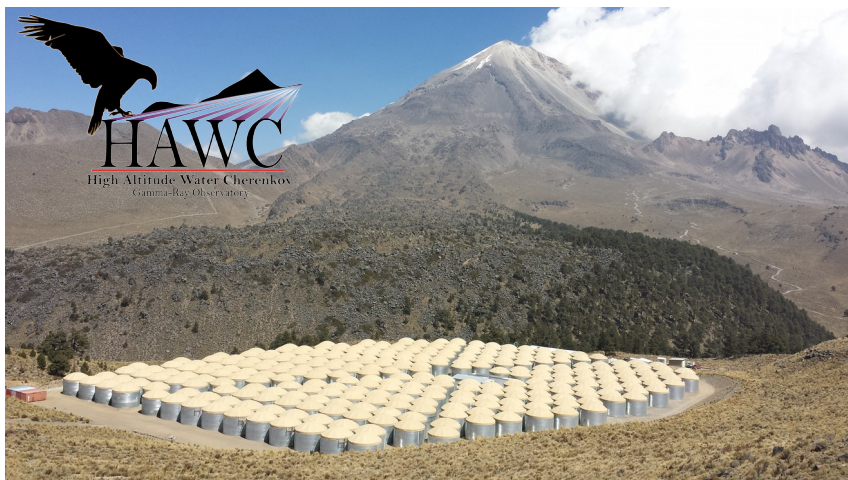
More HAWC data are available

Look at the other part of the HESS Galactic plane using the new approach presented here

Paper in preparation



Thank you !



Armelle Jardin-Blicq
on behalf of the HAWC and HESS collaborations

ICRC 2019, Madison