A detailed Morphology of the W 28 Region at TeV Energies as revealed by H.E.S.S.

E. BRION for the H.E.S.S. Collaboration

CEA-Saclay, DAPNIA

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The H.E.S.S. Collaboration

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Univ. Erlangen-Nürnberg
Univ. Hamburg
LSW Heidelberg
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APC Paris
CEA Saclay
Paris Observatory Meudon
LAPP Annecy
Univ. Grenoble
Univ. Montpellier II
CESR Toulouse

Durham Univ.
Leeds Univ.
Dublin Inst. for Adv. Studies
Nicolaus Copernicus Astronomical Center Warsaw
Astronomical Observatory Cracow
Institute of Physics Cracow
Institute of Nuclear Physics Cracow
Space Research Centre Warsaw
Charles Univ. Prag
Yerevan Physics Institute Yerevan
Univ. Adelaide
Univ. Namibia Windhoek
North West Univ. Republic of South Africa

~ 30 institutes
~ 130 physicists and astrophysicists
(mainly in France and Germany)

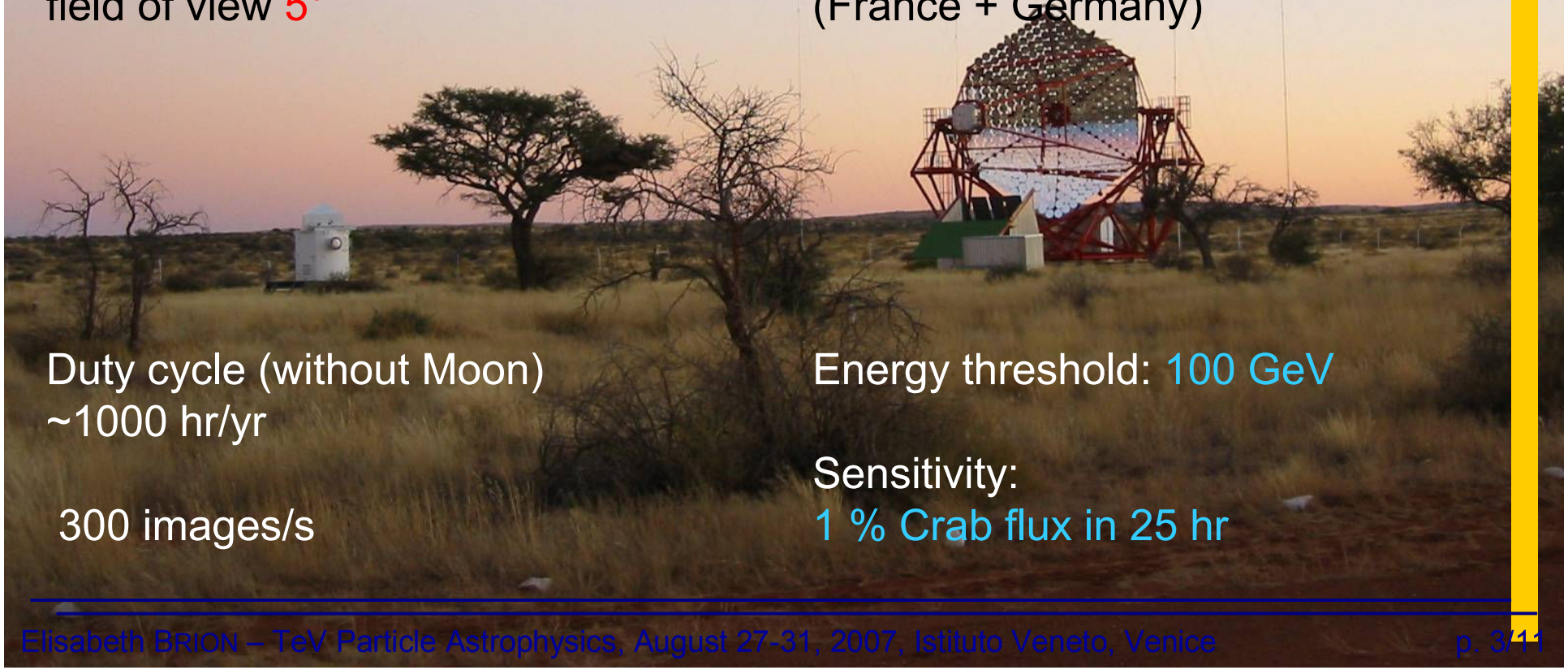
H.E.S.S.

4 telescopes
individual mirrors 107 m^2

4 cameras 960 PMT
field of view 5°

fast online analysis

final analysis and calibration:
2 independent chains
(France + Germany)



Duty cycle (without Moon)
~1000 hr/yr

300 images/s

Energy threshold: 100 GeV

Sensitivity:
1 % Crab flux in 25 hr

The W 28 Region

- SNR W 28 (also G6.4-0.1):

centrally filled in X-rays + shell-like radio morphology

size 50' $\times$ 45'

age ~ 3.5 – 15 $\times$ 10^4 yr

distance ~ 1.8 – 3.3 kpc

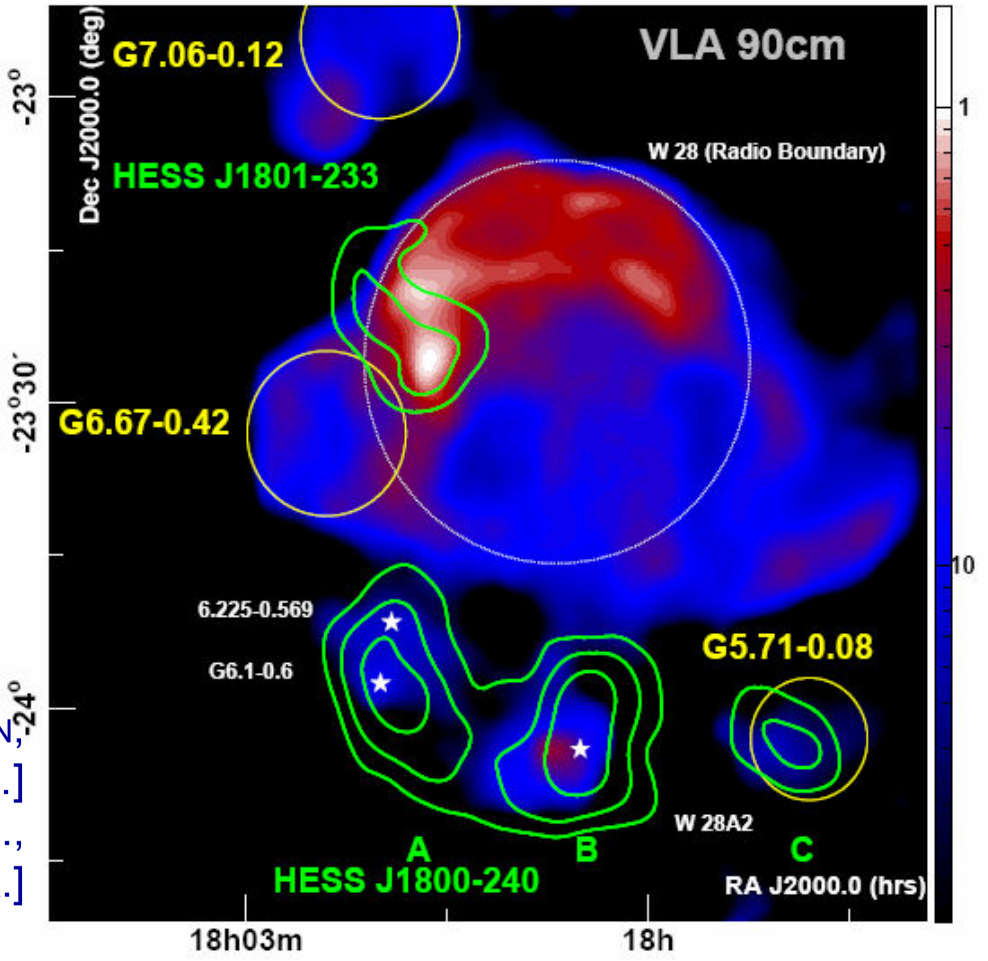
associated with GRO J1801-2320

- Several HII regions and dense molecular clouds with high concentration of OH masers (1720 MHz).

Observations of the W 28 Region

Intensity map obtained by the VLA at 90 cm.

In green: 4-6 σ H.E.S.S. significance contours.



[G. ROWELL, E. BRION, et al., 30th ICRC, 2007.]
[F. AHARONIAN et al., submitted to A&A.]

H.E.S.S. Hillas analysis parameters:

Image cuts > 200 photoelectrons (p.e.).

PSF ~ 0.1°.

Exposure: 42 hrs.

Gaussian smooth of σ = 4.2'.

(Preliminary!) W 28 Region with the « Model + Hillas Analysis »

H.E.S.S. Excess map obtained with the Model analysis giving a lower threshold and a better sensitivity at low energies.

[Description of this analysis in M. DE NAUROIS, astro-ph/0607247, 2006.]

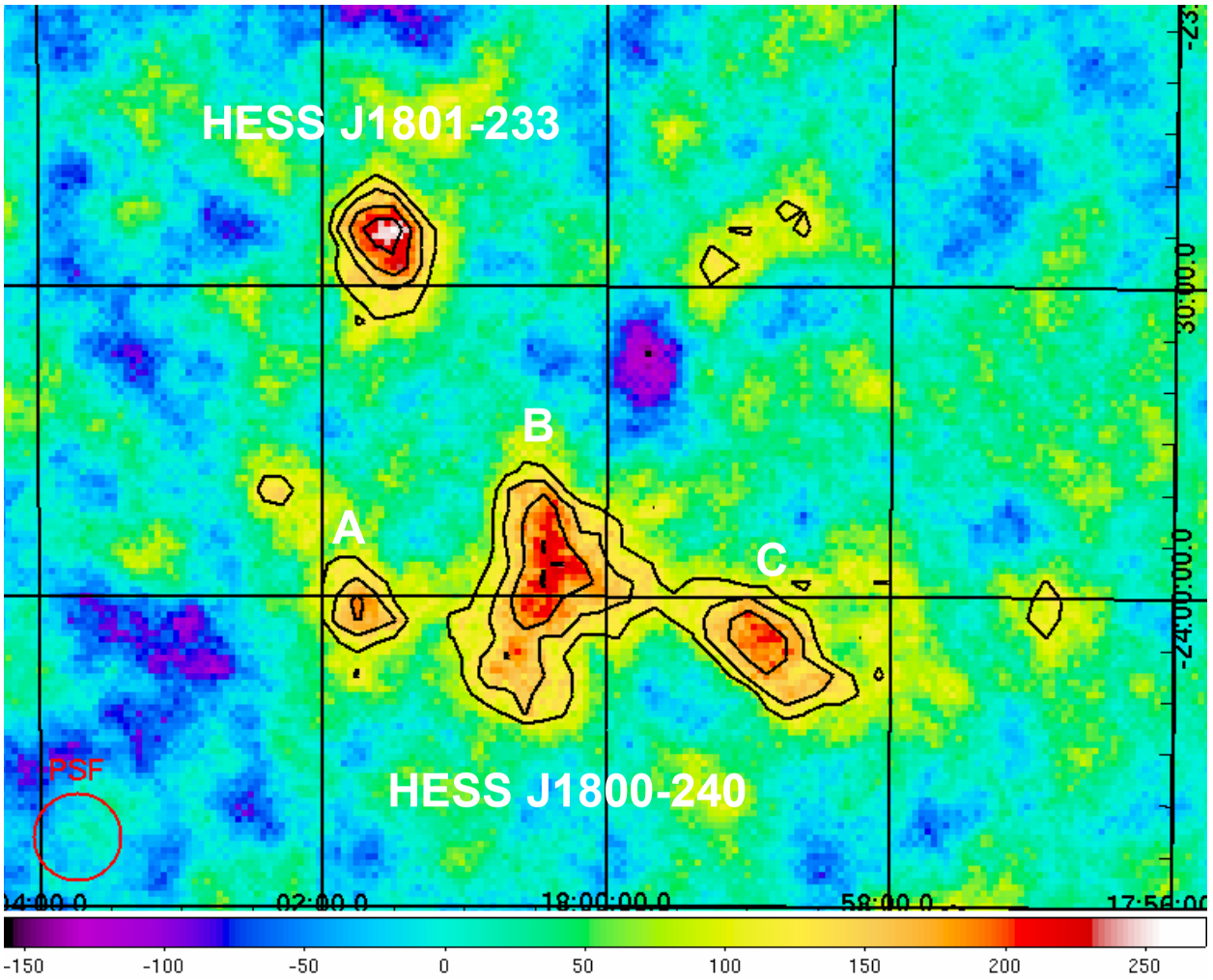


Image cuts > 60 p.e.

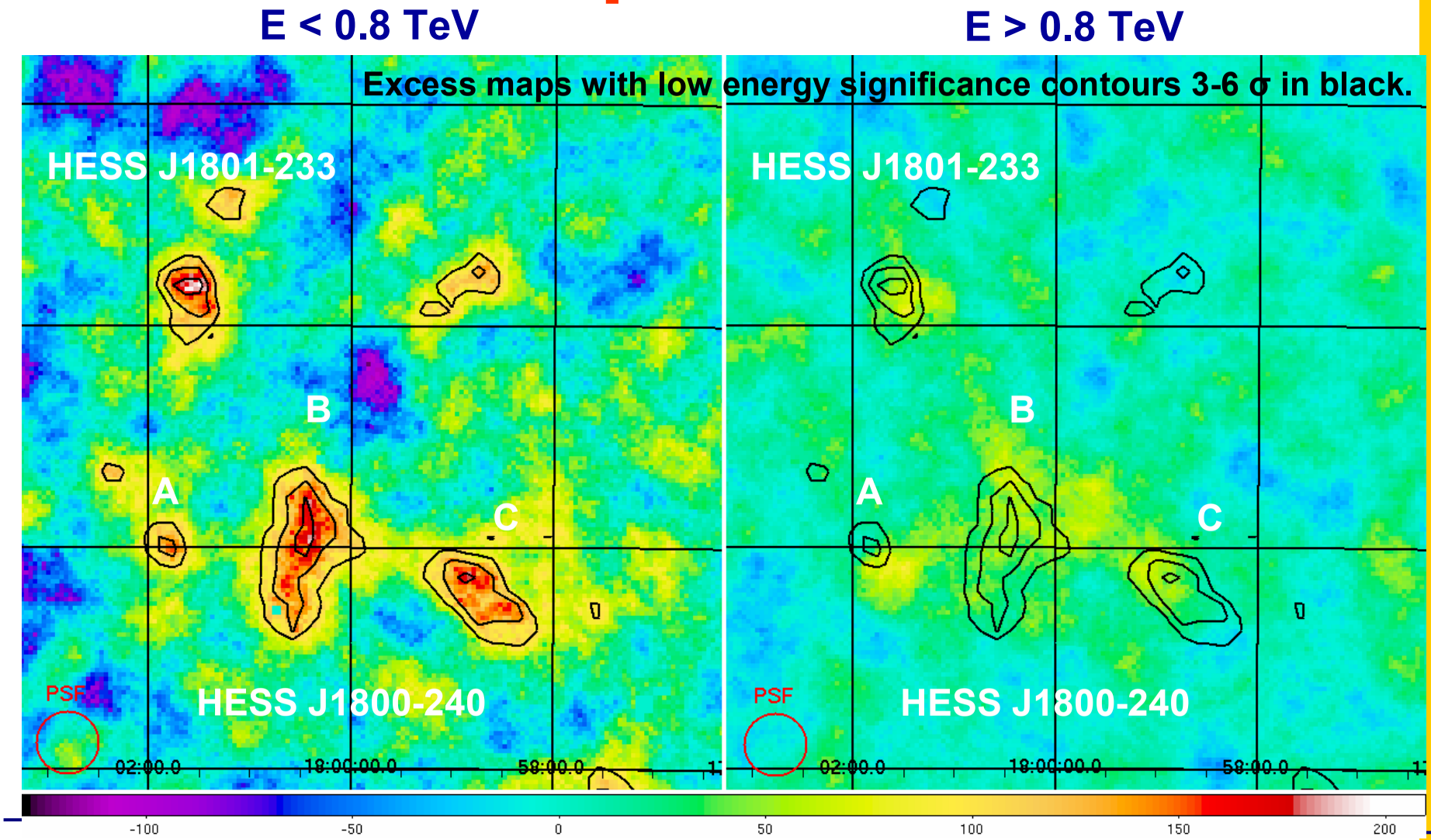
PSF: R = 0.07° at half max.

Exposure: 50.3 hr.

Map oversampling of 0.07°.

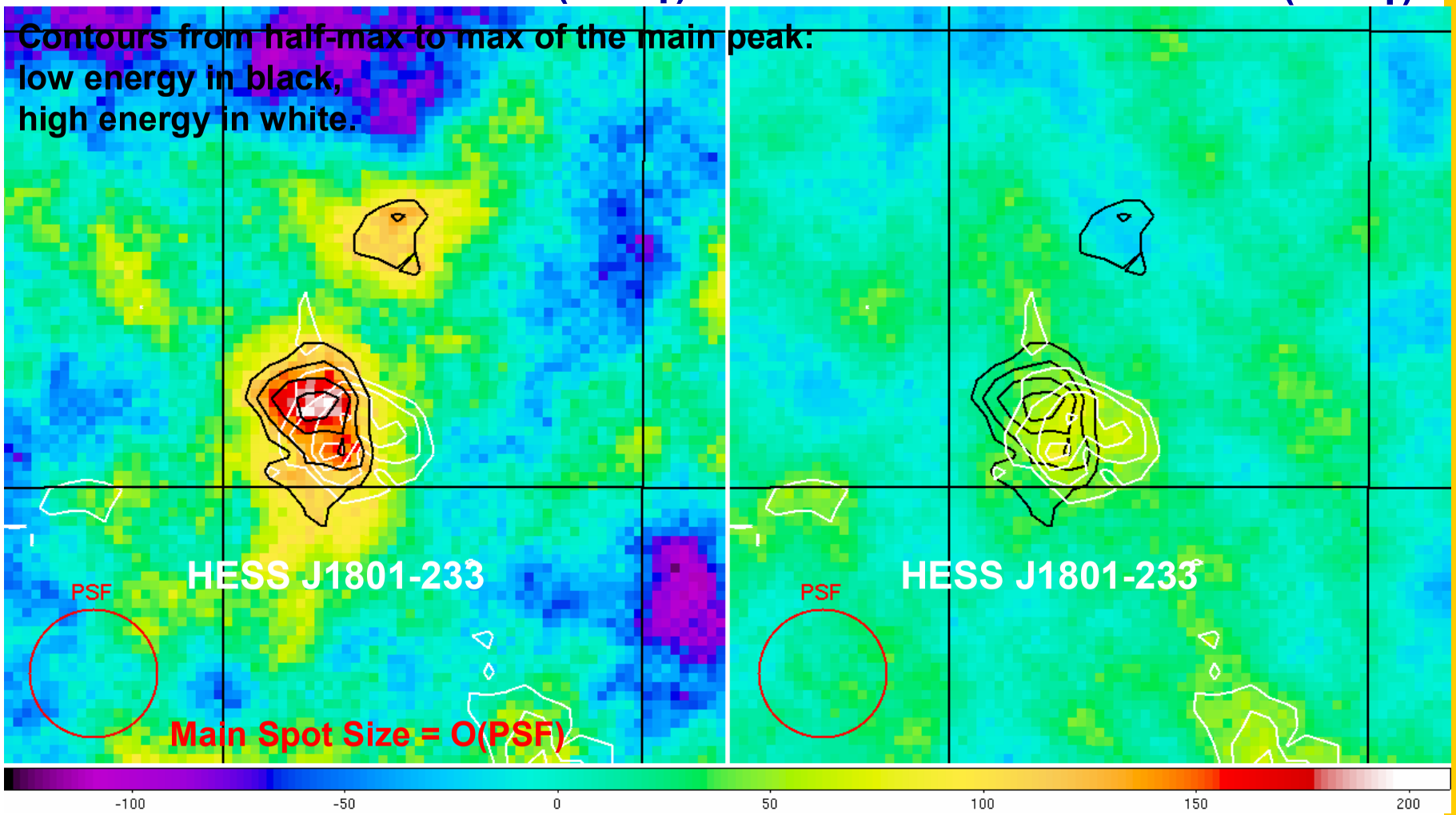
In black: 3-6 σ significance contours.

Morphology seems Energy dependent

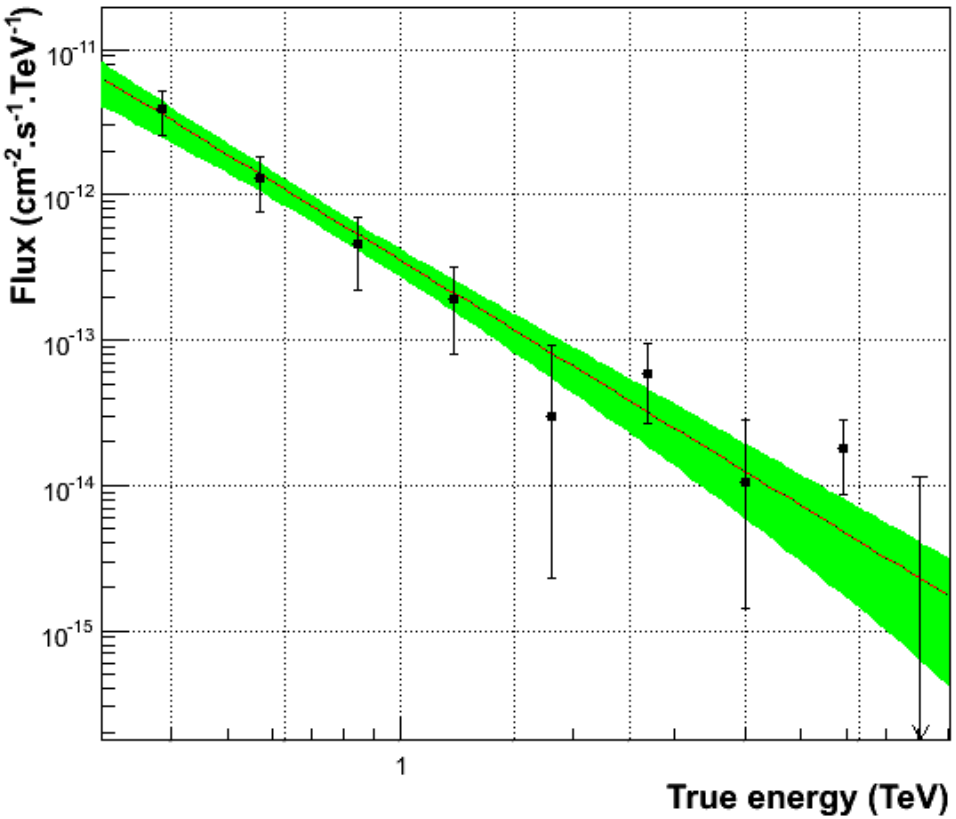


HESS J1801-233: Excess Maps

E < 0.8 TeV: 7.7 σ excess (375 γ) **E > 0.8 TeV: 5.2 σ excess (140 γ)**



(Preliminary!) HESS J1801-233 Power Law Spectrum Fit



With « Model + Hillas analysis », within 0.12°:

Spectral index $2.4 \pm 0.3_{stat}$

Flux $\Phi(E > 300\ GeV)$ $= (1.3 \pm 0.3) \times 10^{-12}\ cm^{-2}\ s^{-1}$ (≈ 1 % Crab flux)

Flux $\Phi(1\ TeV) \approx 4 \times 10^{-13}\ cm^{-2}\ s^{-1}\ TeV^{-1}$

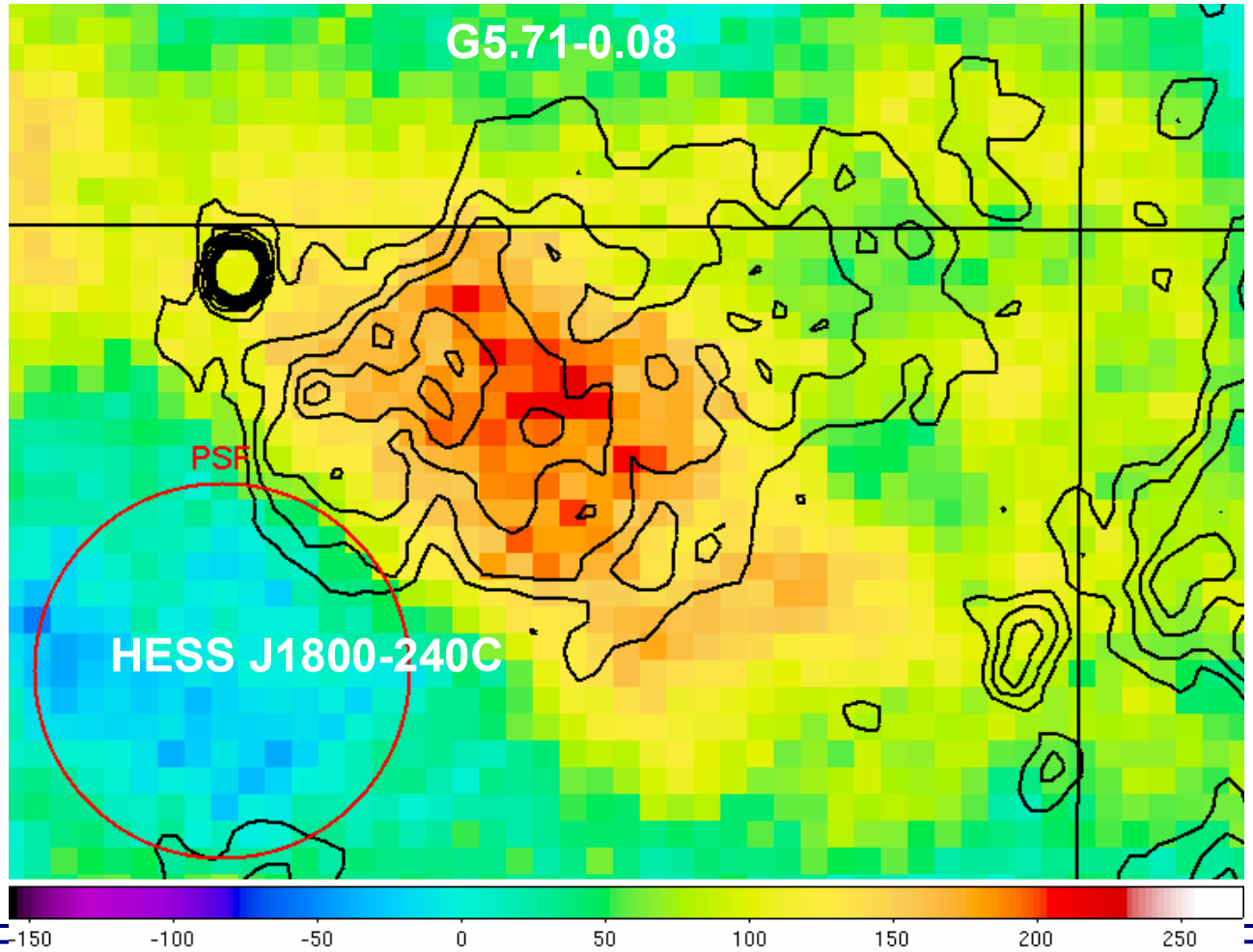
With Hillas analysis, within 0.2°:

Spectral index $2.7 \pm 0.3_{stat}$

Flux $\Phi(1\ TeV) \approx 10^{-12}\ cm^{-2}\ s^{-1}\ TeV^{-1}$

HESS J1800-240C

H.E.S.S. excess map with VLA observations at 90 cm (black contours) from C. L. BROGAN et al., ApJ 639, 2006. The H.E.S.S. excess coincides with the radio SNR candidate G5.71-0.08.



Summary

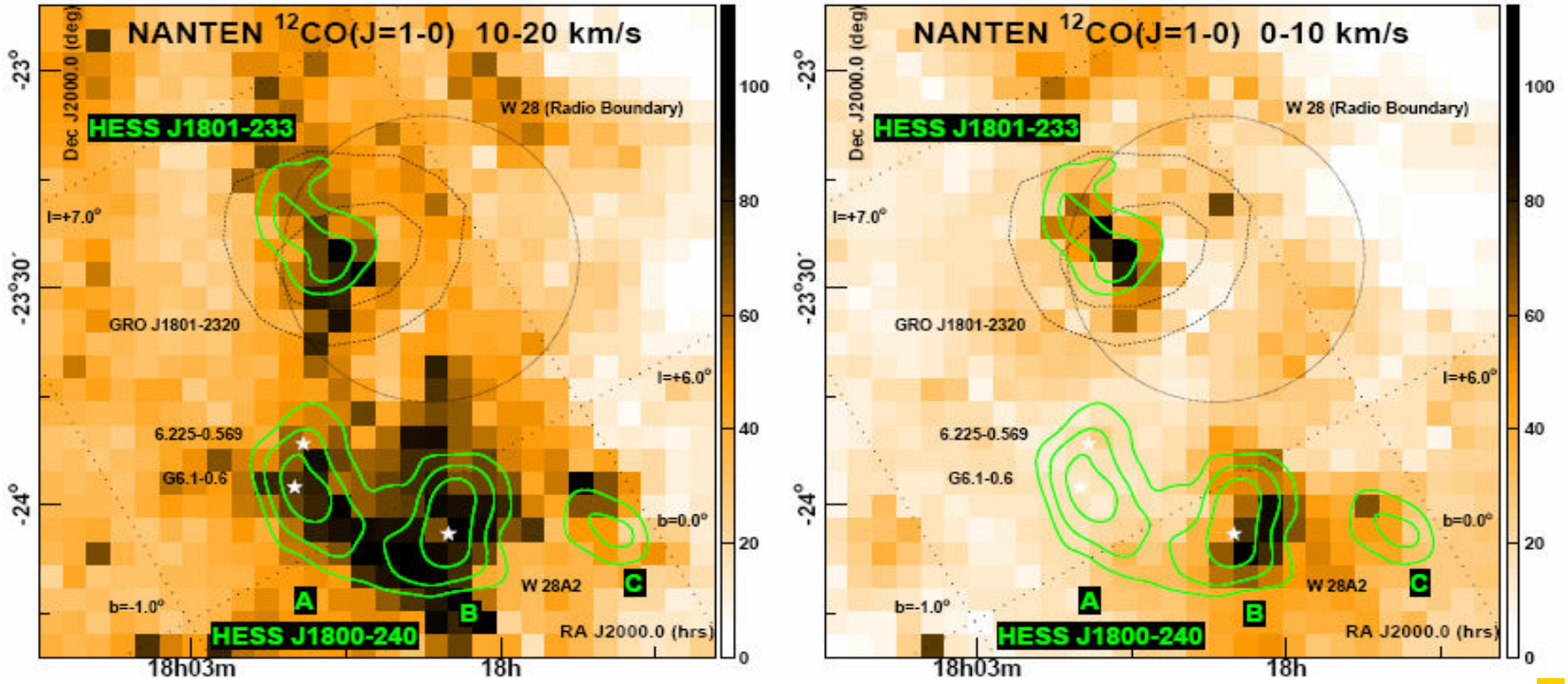
→ HESS J1801-233: the main spot is compact with a moderately hard spectral index ($2.4 \pm 0.3_{stat}$). Another weaker spot is detected at 4.7 σ but visible at low energy only, implying a softer energy spectrum (to be confirmed).

→ HESS J1800-240: the overall morphology of this extended and complex emission region also appears to vary with energy.

→ HESS J1800-240C: the compact TeV source is spatially coincident with the newly proposed SNR candidate G5.71-0.08.

Observations of the W 28 Region

NANTEN observations.



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