Analyse et interprétation des données de H.E.S.S., Observations multi-longueur d'onde, Cas scientifique CTA,

Les Vestiges de supernova et Nébuleuses de pulsars

Fabio Acero, Diane Fernandez, Yves Gallant, Alexandre Marcowith, Jérémie Méhault, Matthieu Renaud, Anna Zajczyk

Sources à l'origine du rayonnement cosmique galactique observé sur Terre...

protons & noyaux : 99%
électrons : 1%

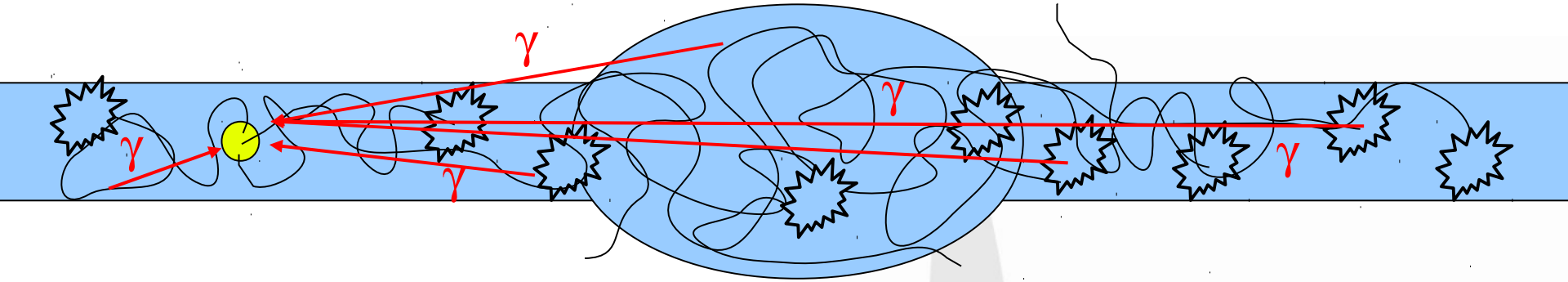
Origine ?

Propagation dans la matière & champ magnétique

Conditions ?

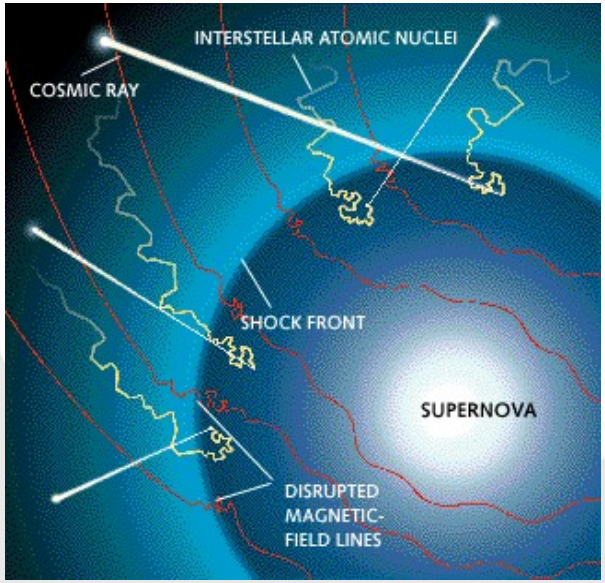
Accélération dans des sources extrêmes

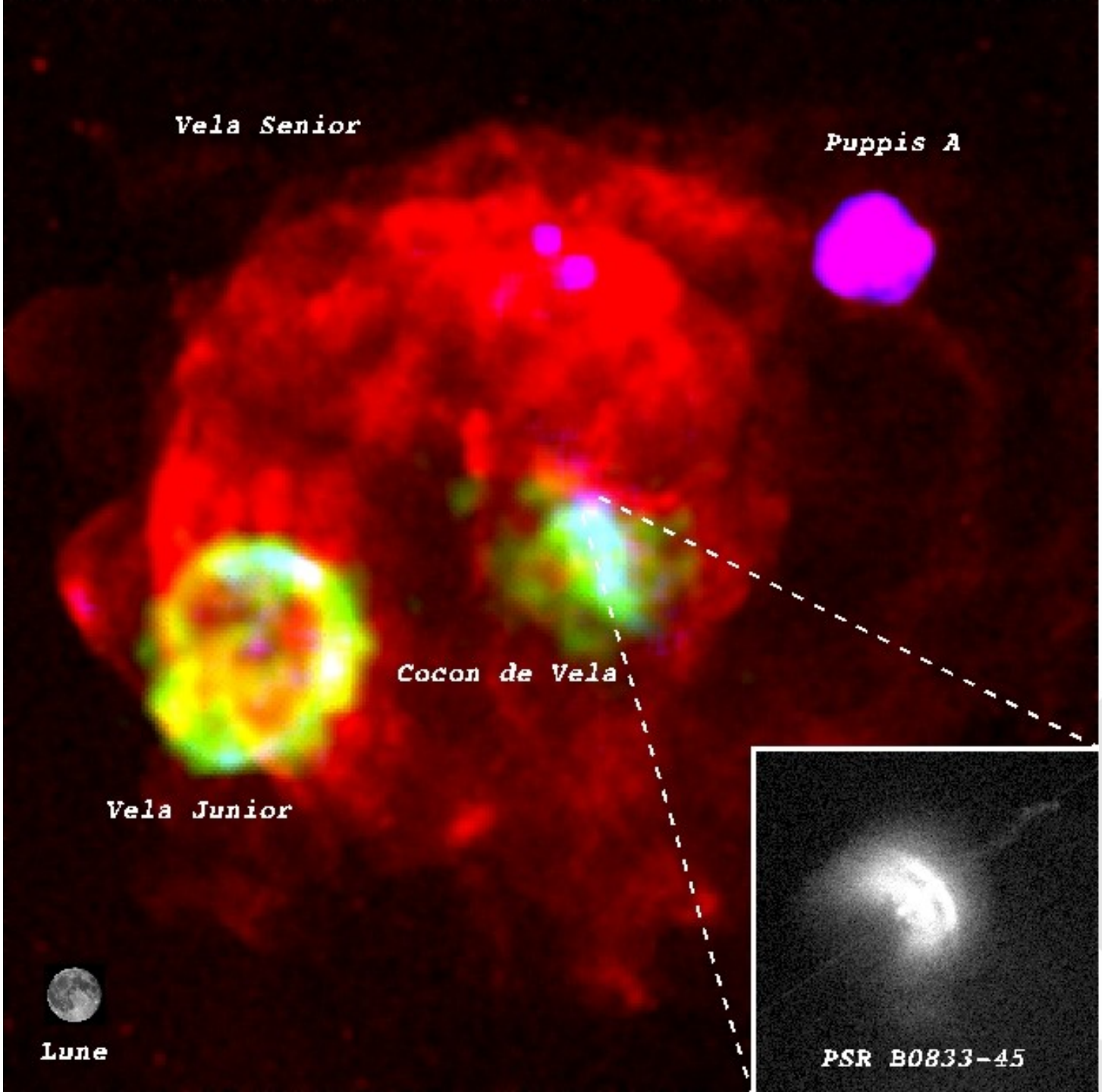
Nature ?



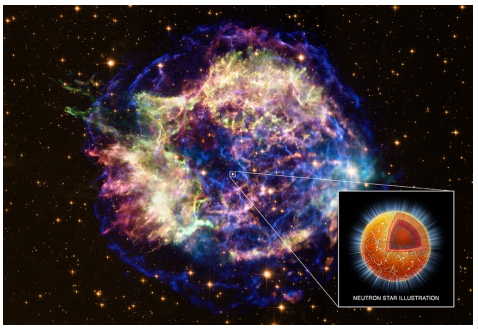
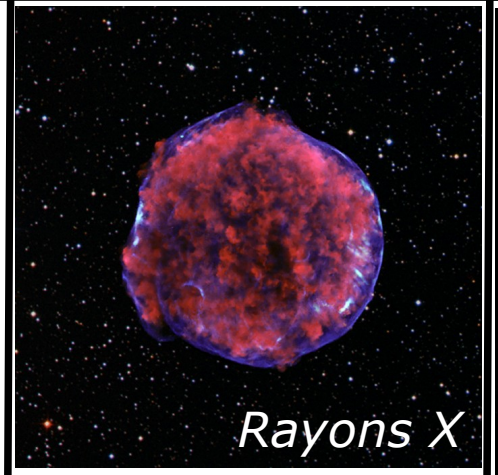
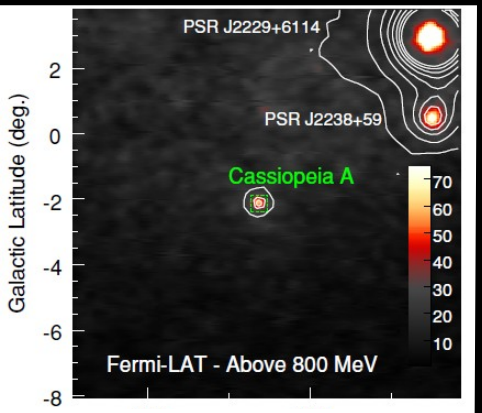
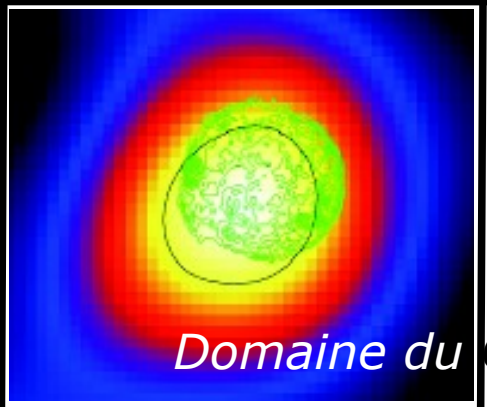
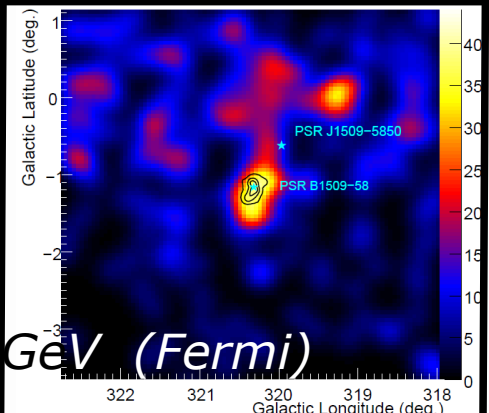
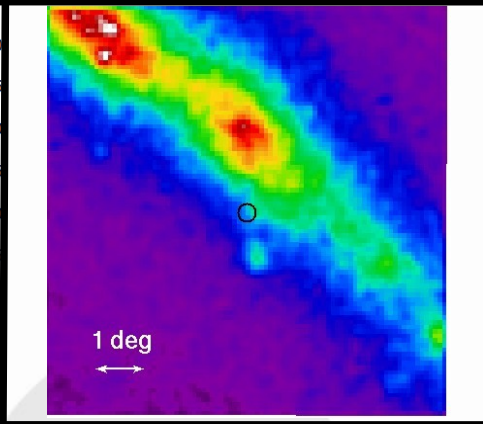
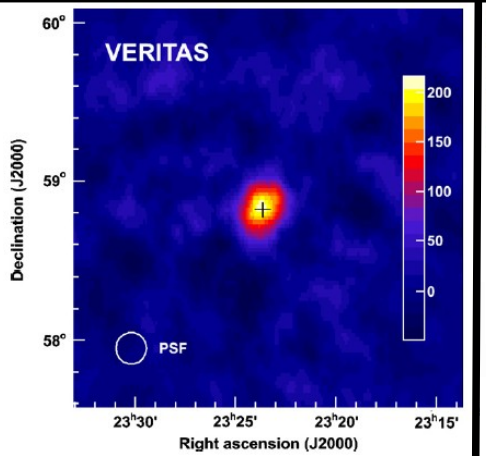
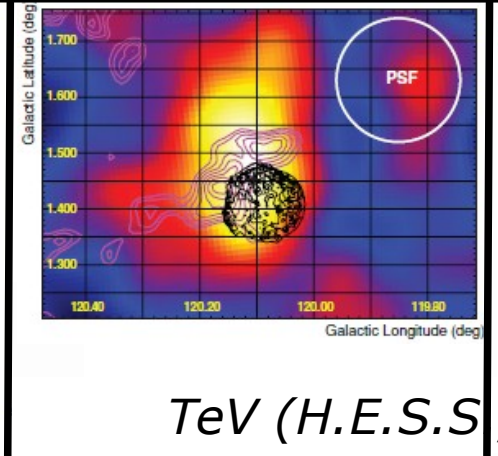
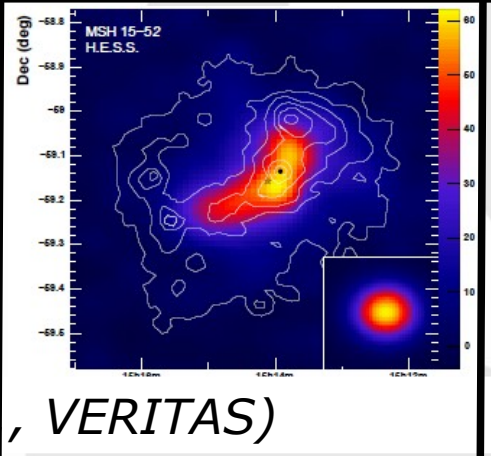
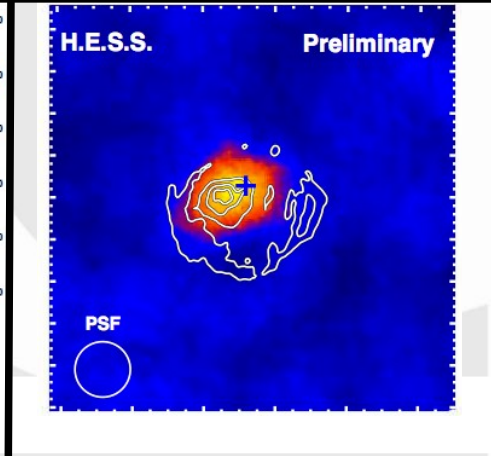
Une explosion stellaire a lieu environ 2-3 fois par siècle dans notre Galaxie.

- les éléments lourds synthétisés (*Carbone, Fer…)* sont relâchés dans le ISM...
- accélération de particules au cours de l'évolution du vestige de supernova...

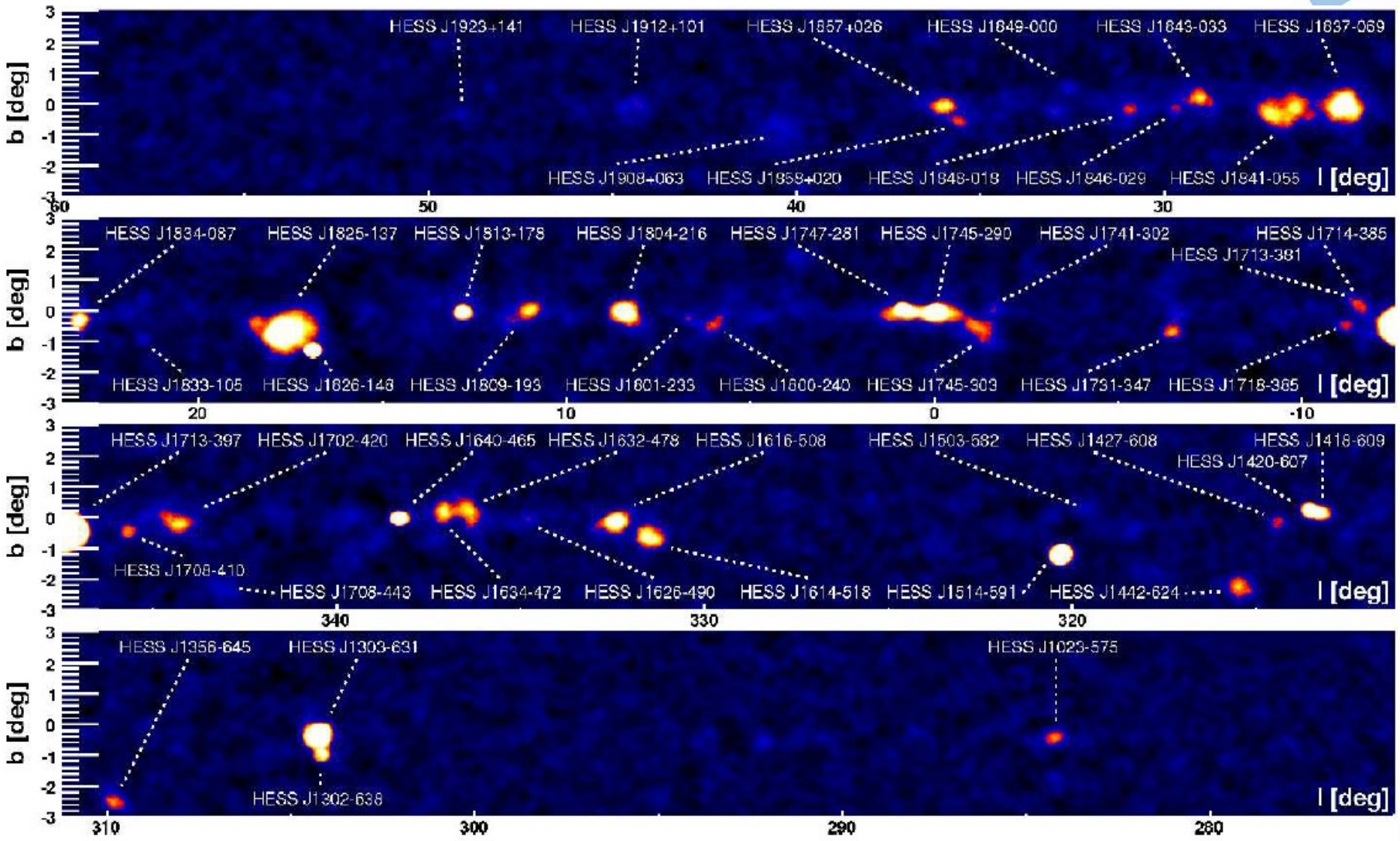




E < 1.3 keV
E > 1.3 keV
H.E.S.S.

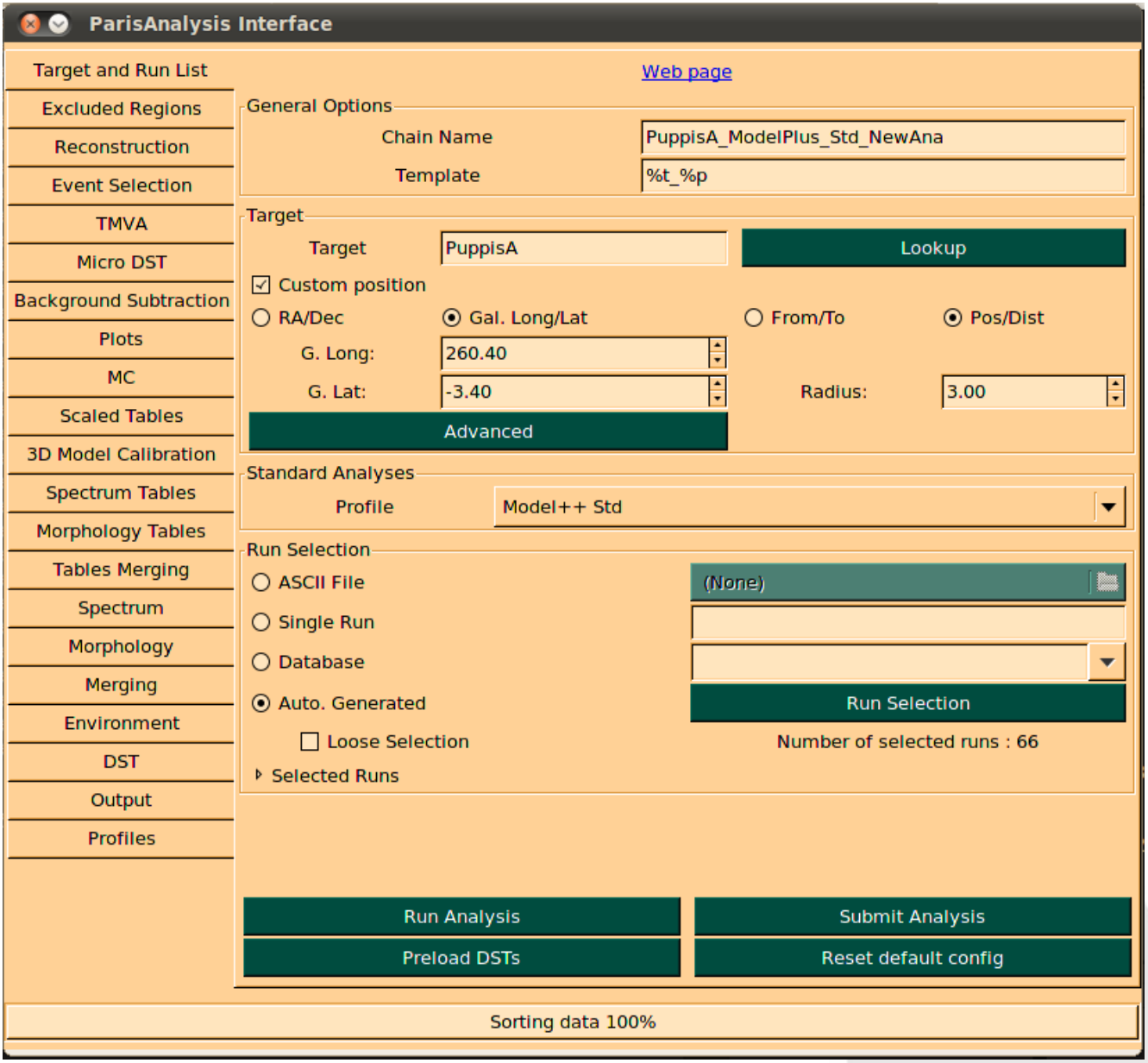
Cas A	Tycho (SN 1572)	MSH 15-52	G327.1-1.1
			
	Rayons X (Chandra)		
			
	Domaine du GeV (Fermi)		
			
	TeV (H.E.S.S, VERITAS)		

Balayage du plan galactique avec H.E.S.S.



Plus de 50 sources détectées... dont **+20 dites « sombres »** (sans contrepartie en radio, X)

Analyse H.E.S.S. : « ParisAnalysis »



Sélection des runs en direction de la source d'intérêt

↓

méthodes de sélection et de reconstruction des évènements, estimation du fond

↓

Images, spectres, (courbes de lumière)

↓

Morphologie, position, paramètres spectraux

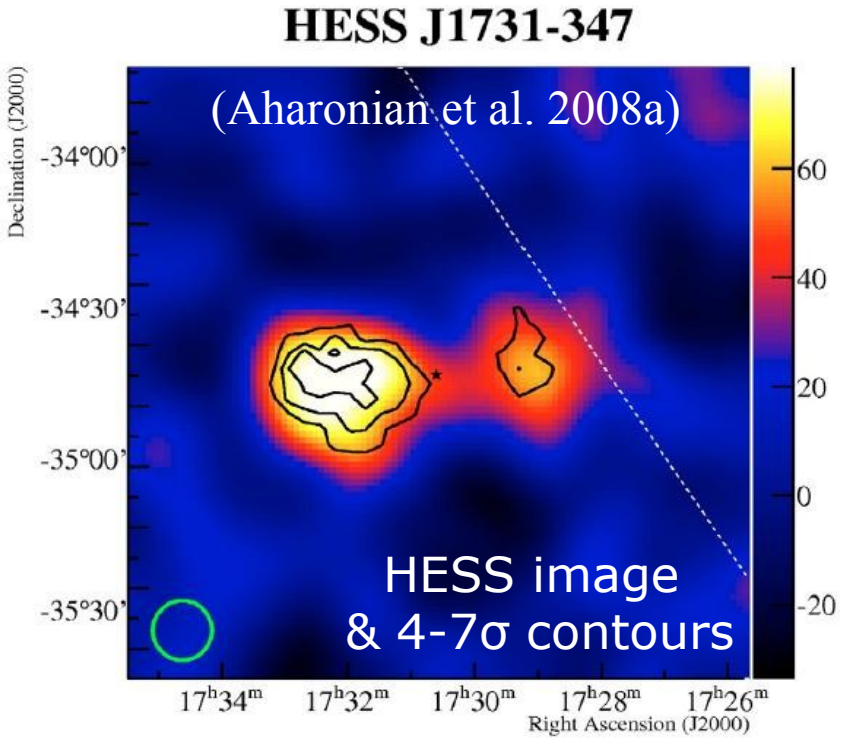
↓

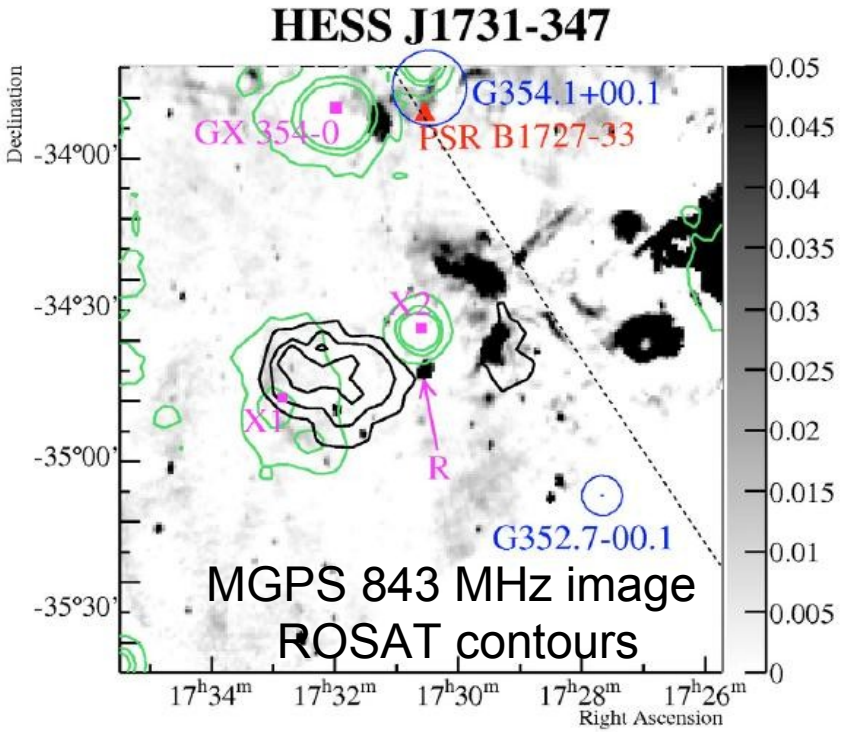
Analyse indépendante pour vérification

↓

Recherche de contreparties dans les données archivées MWL

Un vestige de supernova (SNR) : HESS J1731-347... révélé par H.E.S.S. !





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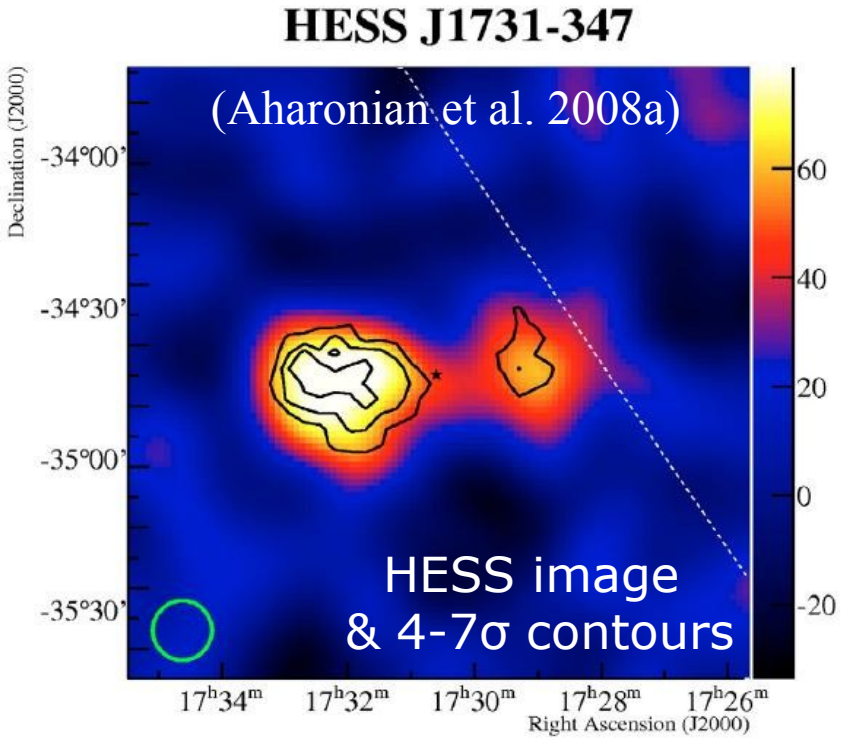
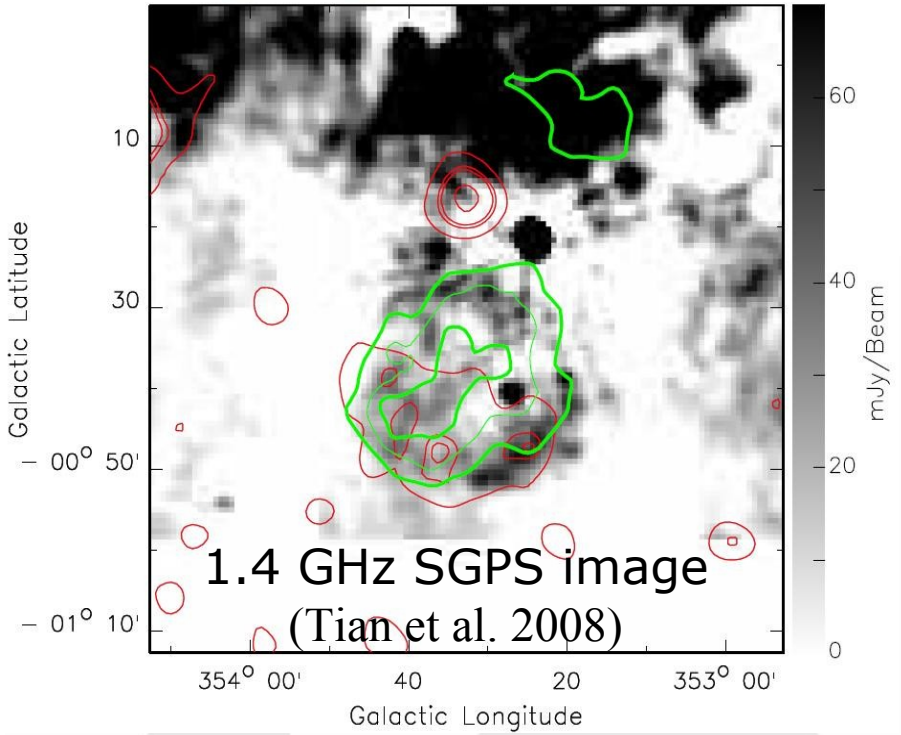
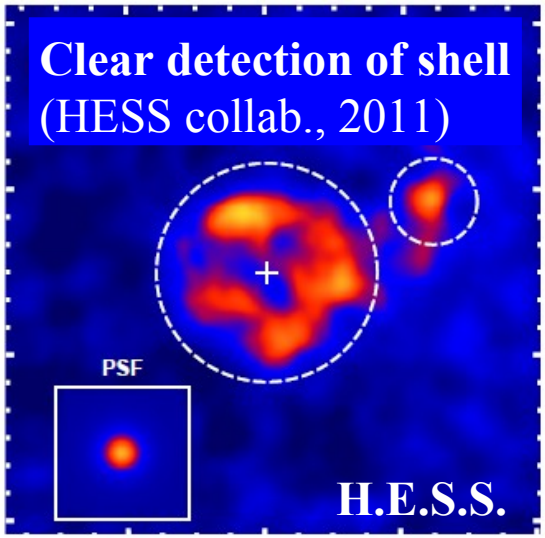


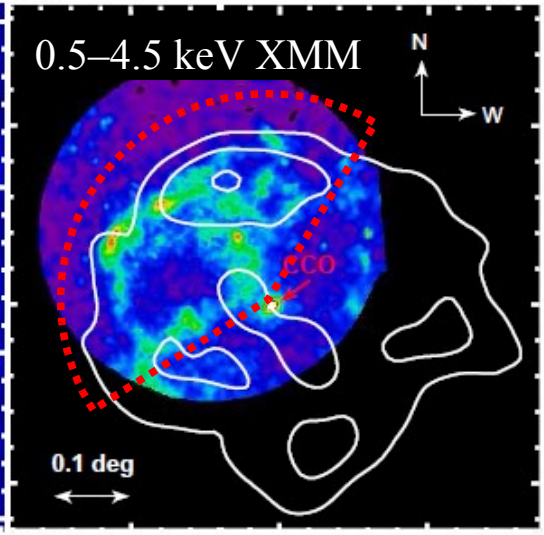


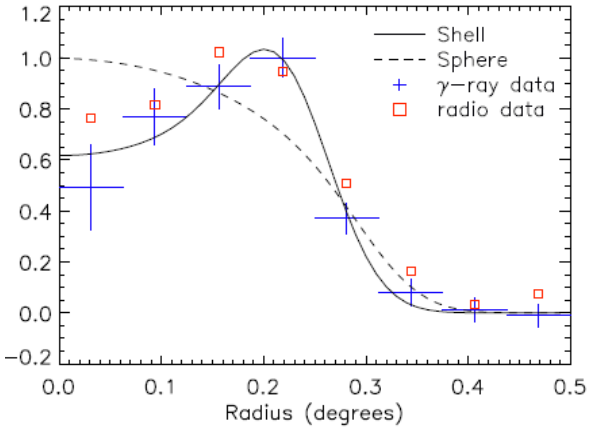
Un nouveau SNR à coquille G353.6-0.7 (Tian et al. 2008)

Absorption HI en direction d'une région HII adjacente : d = 3.2 ± 0.8 kpc
Emission ROSAT coïncidente avec une partie du SNR... nature ? âge ?

Un vestige de supernova (SNR) : HESS J1731-347... révélé par H.E.S.S. !

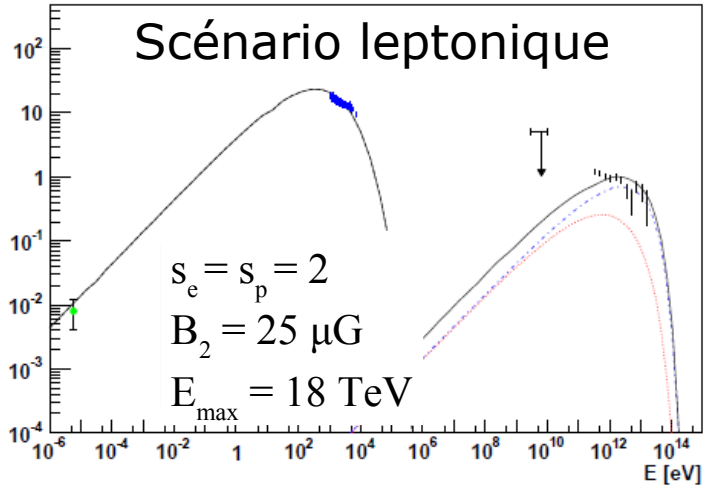


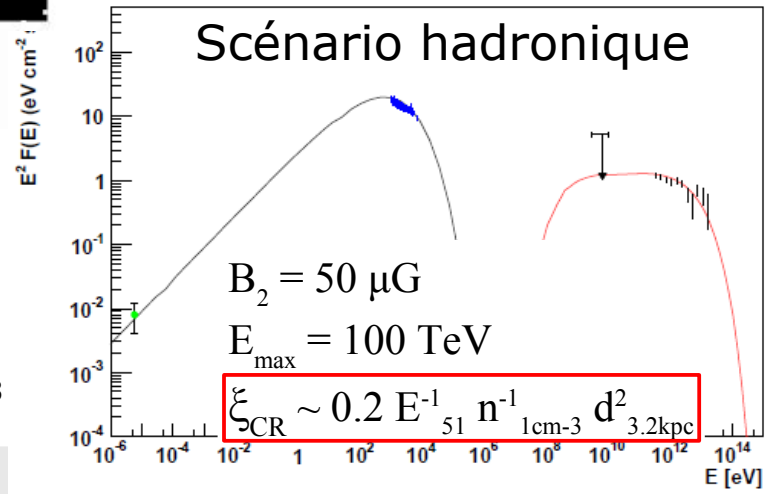




Absence d'émission thermique X

$n_{(kT>1keV)} < 0.01\ cm^{-3}$





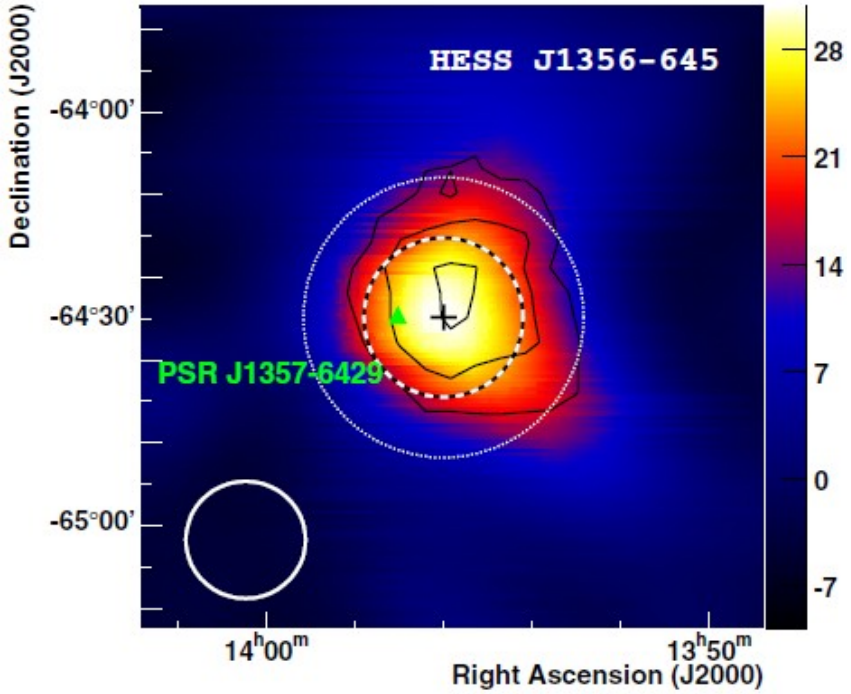
Astronomy & Astrophysics manuscript no. 16425
May 24, 2011

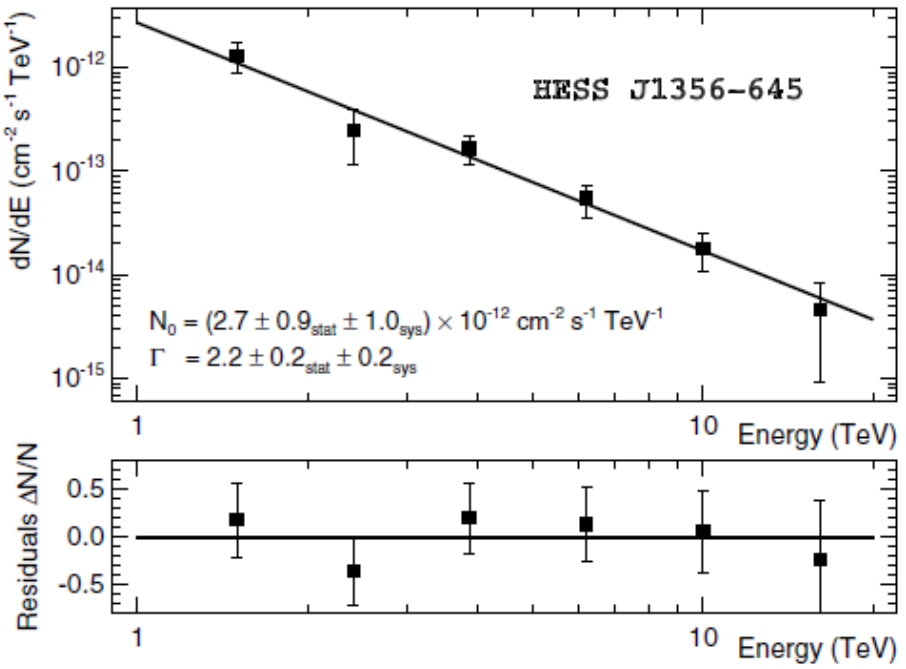
« Corresponding author » : **F.A.**

A new SNR with TeV shell-type morphology: HESS J1731-347

HESS Collaboration, A. Abramowski[1], F. Acero[2], F. Aharonian[3,4,5], A.G. Akhperjanian[6,5], G. Anton[7], A. Balzer[7],

Une nébuleuse de pulsar (PWN) : HESS J1356-645





Source au TeV étendue, proche d'un pulsar détecté en radio, « jeune » (τ_c = 7.3 kyr), énergétique ($\dot{E}$ = 3.1 × 10^{36} erg/s) et proche (2.4 kpc)...

A&A 533, A103 (2011)
DOI: 10.1051/0004-6361/201117445

Astronomy & Astrophysics

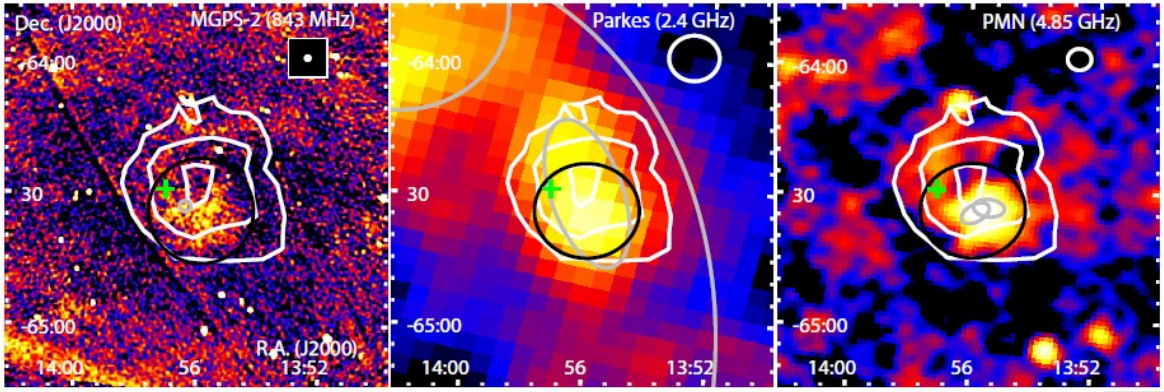
« Corresponding authors » : **M.R. & F.A.**

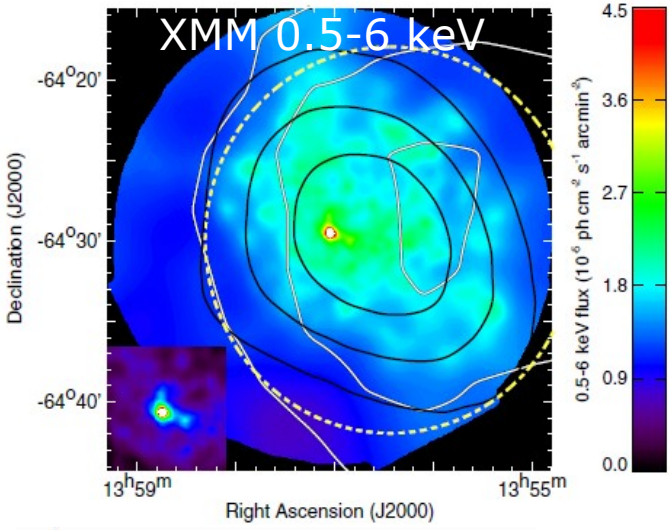
Discovery of the source HESS J1356-645 associated with the young and energetic PSR J1357-6429

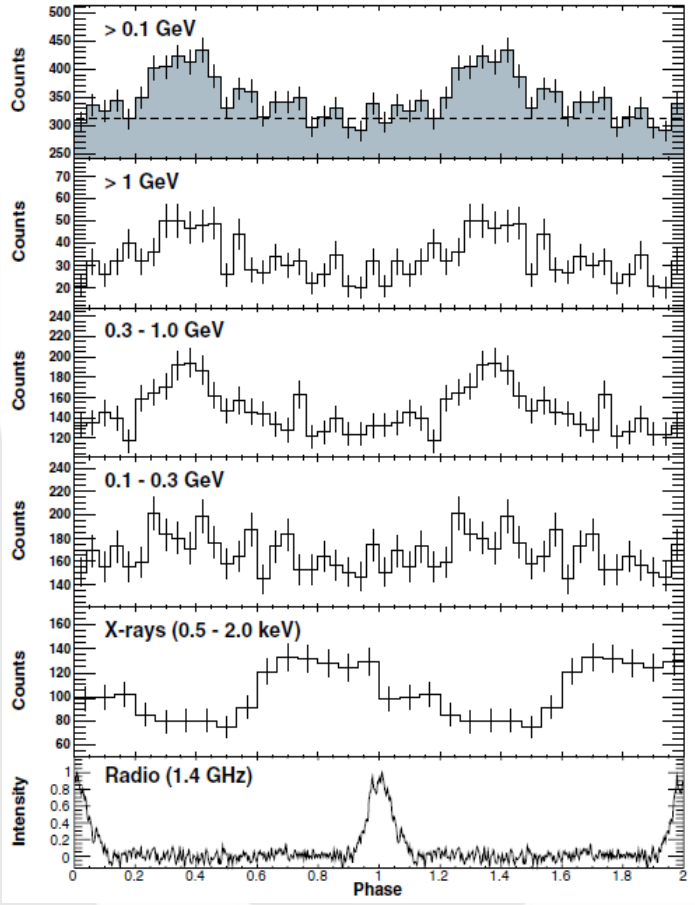
H.E.S.S. Collaboration, A. Abramowski[1], F. Acero[2], F. Aharonian[3,4,5], A. G. Akhperjanian[6,5], G. Anton[7], A. Balzer[7],

Une nébuleuse de pulsar (PWN) : HESS J1356-645

Images radio (0.843, 2.4, 4.85 GHz)

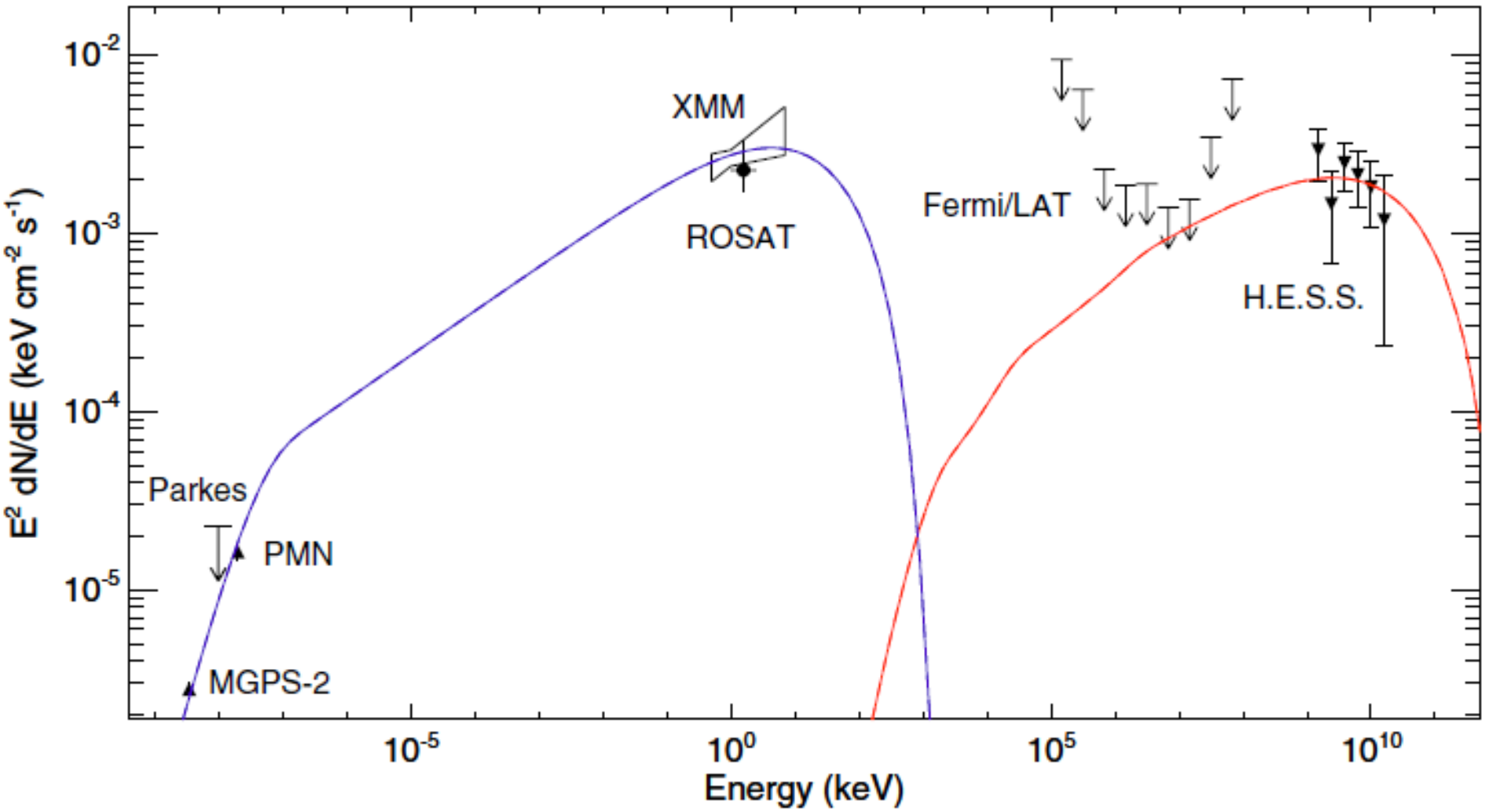






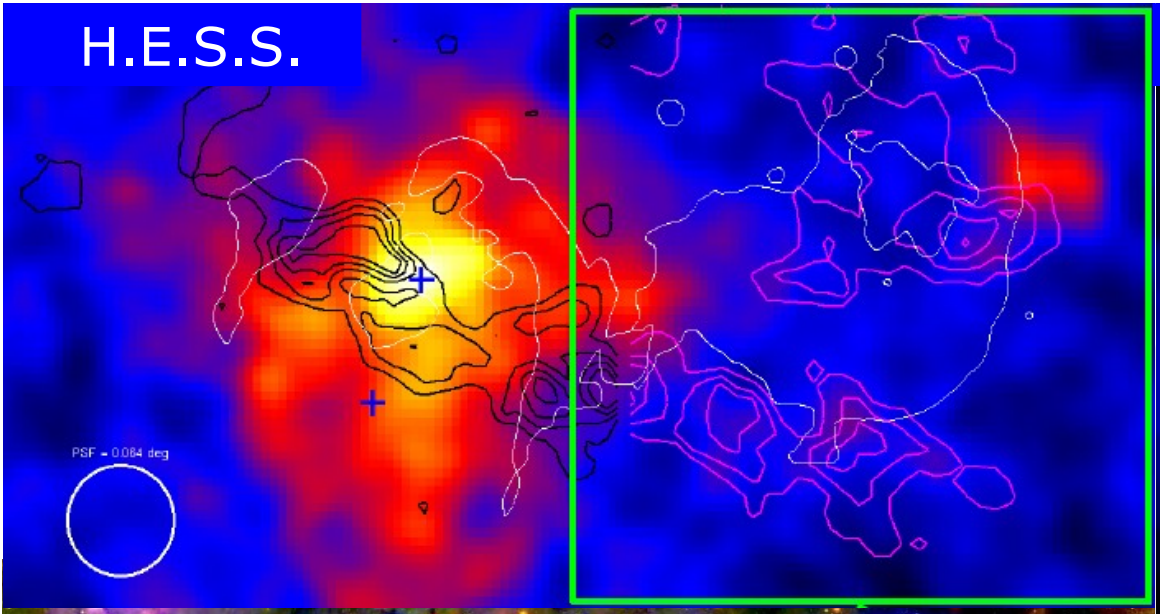
Contreparties radio et X détectées, contraintes au GeV → PWN « évoluée »

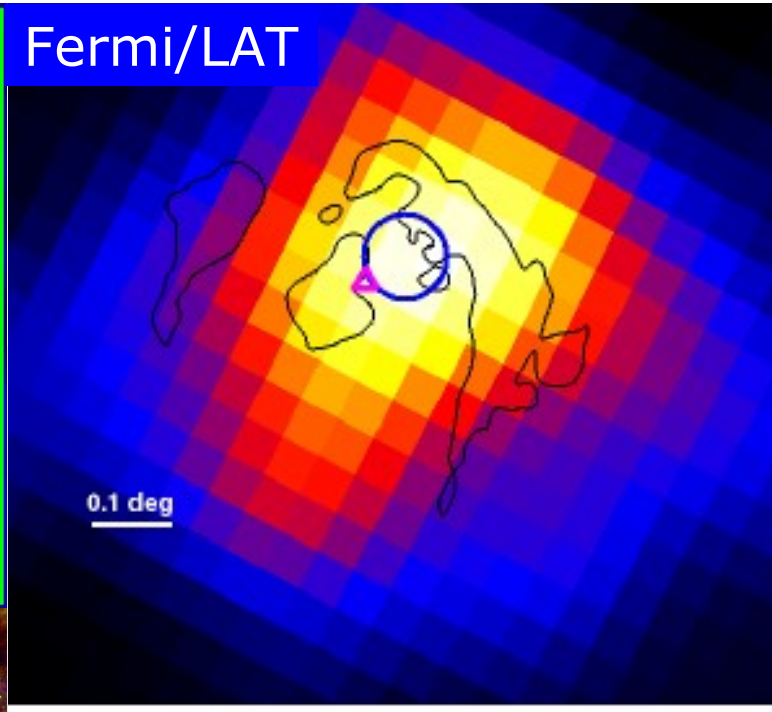
Une nébuleuse de pulsar (PWN) : HESS J1356-645

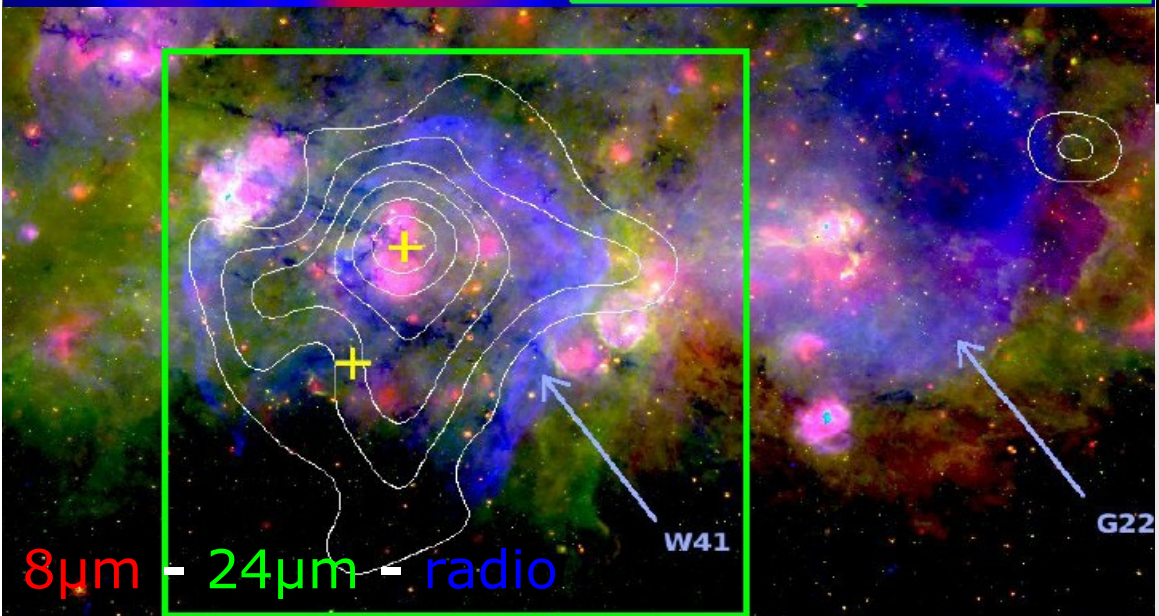


Contreparties radio et X détectées, contraintes au GeV → PWN « évoluée »

SNR en interaction ou PWN ...? : Région de W41







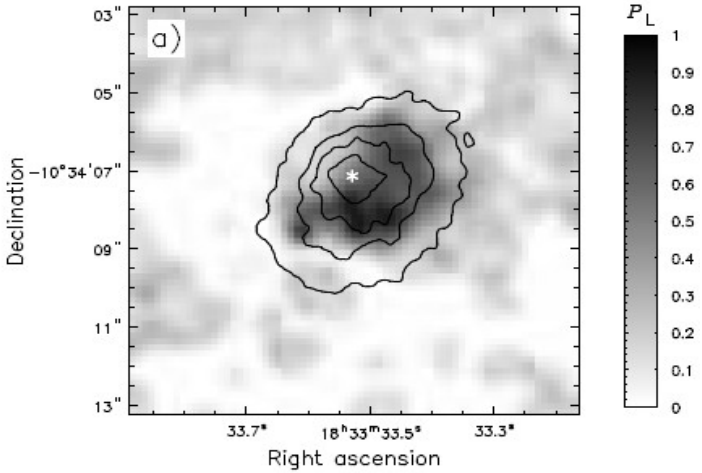
Nuage moléculaire
Candidat PWN
Nature émission GeV/TeV ?
Proposition d'obs. VLA
→ recherche de masers...

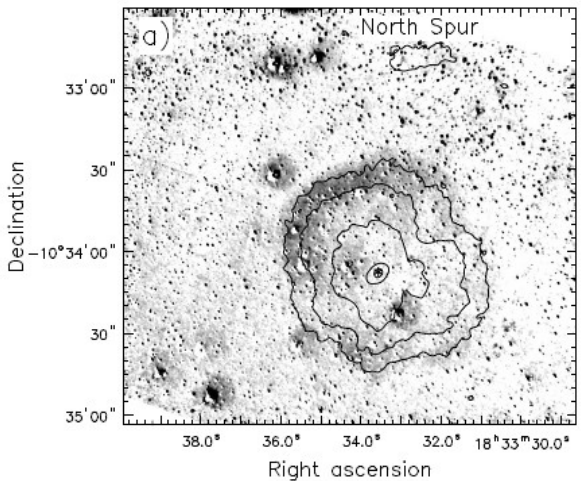
Thèse J. Méhault...
soutenance le 13/10/11 !

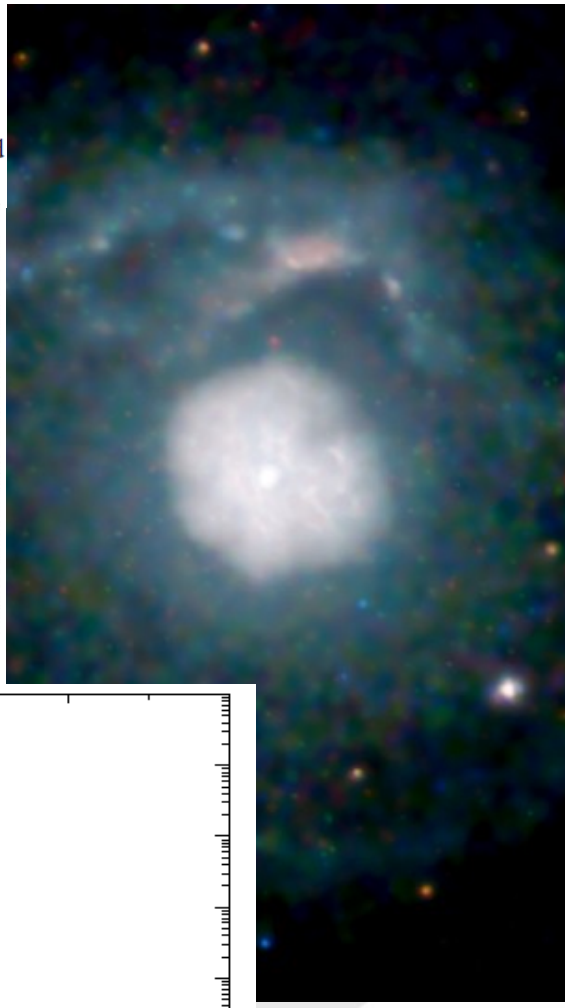
Programmes d'observations multi-longueur d'onde : radio, infra-rouge et X

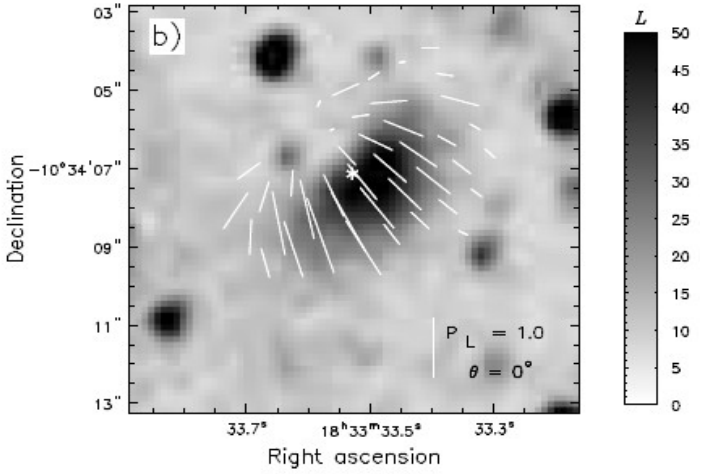
Infrared imaging and polarimetric observations of the pulsar wind nebula in G21.5-0.9

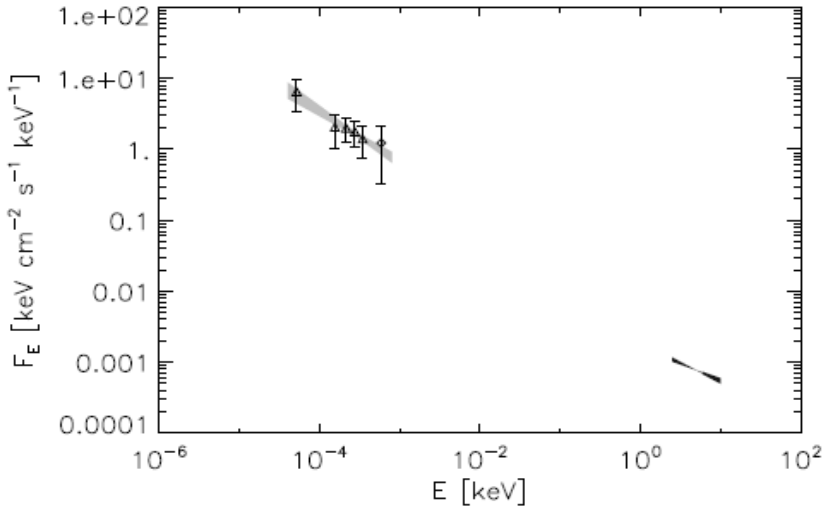
A. Zajczyk[1,2,⋆], Y.A. Gallant[2], P. Slane[3], S.P. Reynolds[4], R. Bandiera[5], C. Gouiffès[6], E. Le Floc'h[6], F. Comerón[7], and L. Koch Miramond[6]



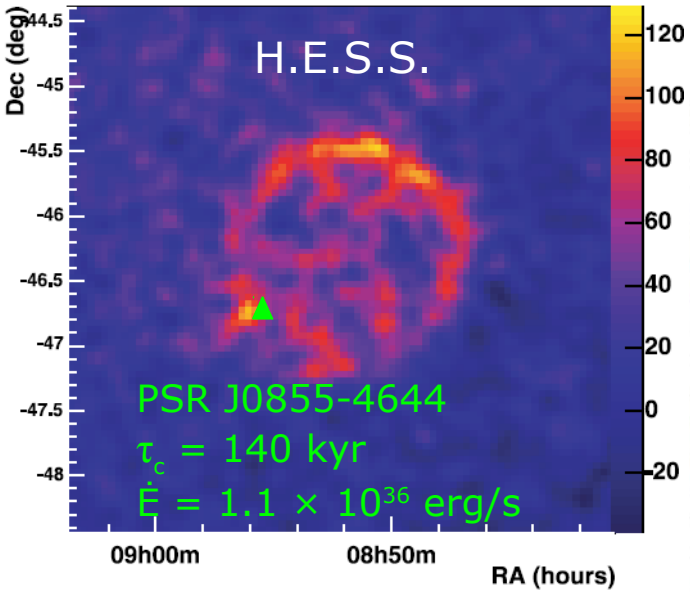






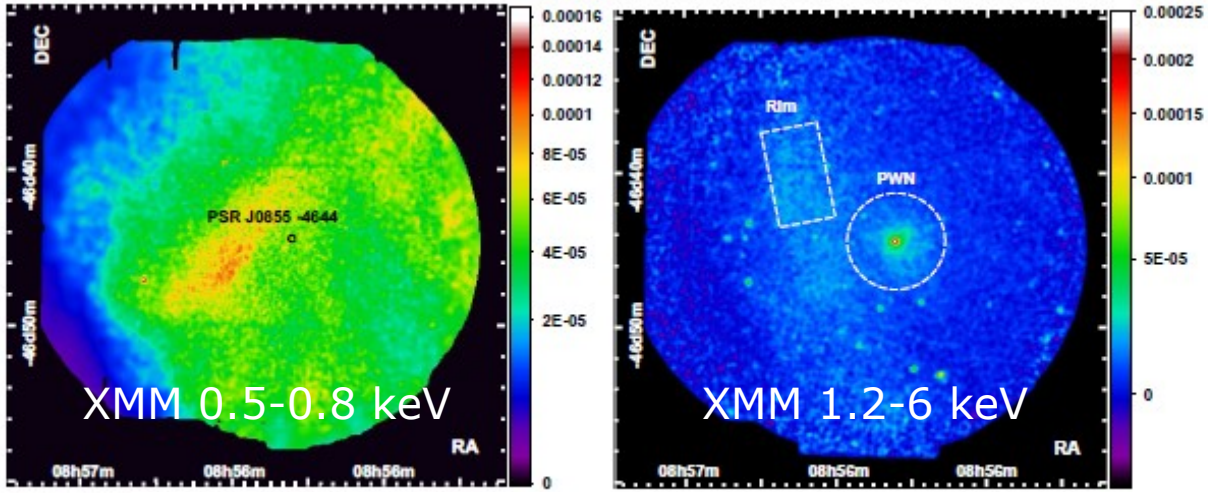


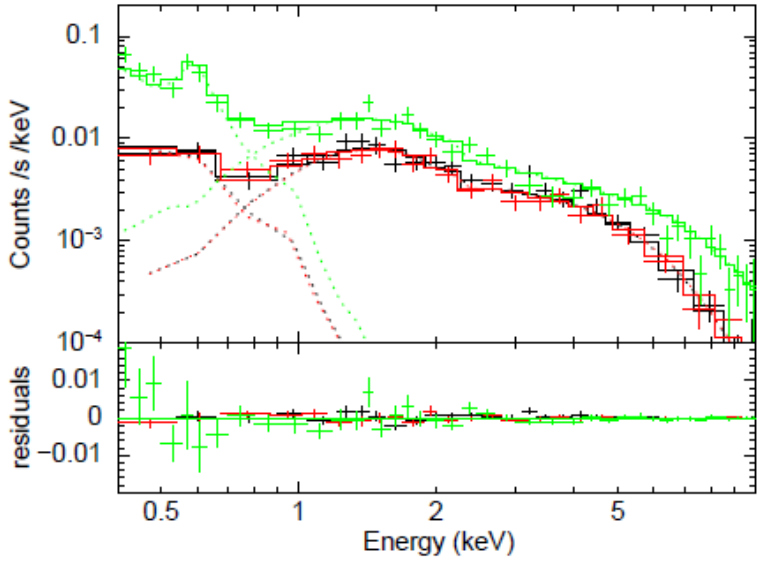
Programmes d'observations multi-longueur d'onde : radio, infra-rouge et X



A new nearby PWN overlapping the Vela Jr SNR

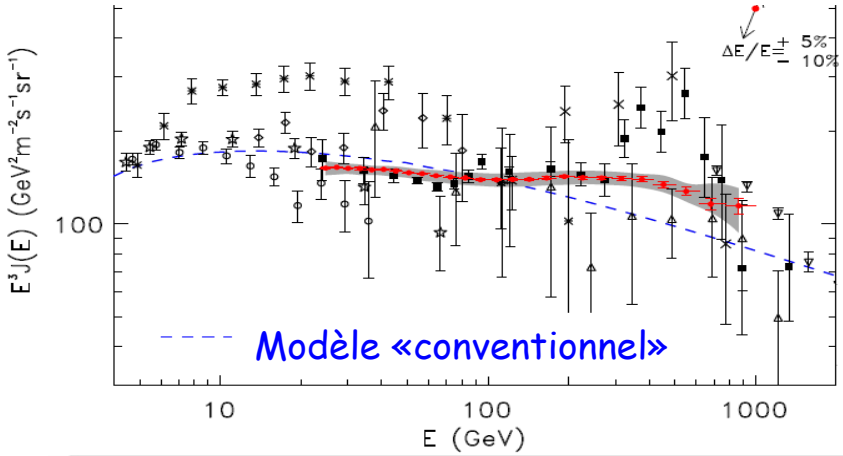
F. Acero[1], Y. Gallant[1], R. Terrier[2], M. Renaud[1] and J. Ballet[3]





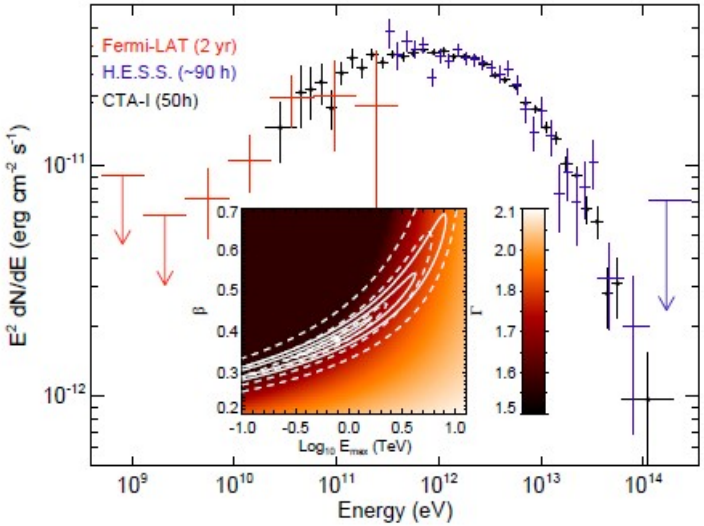
Comparaison N_H(X) et ^{12}CO → d < 0.9 kpc

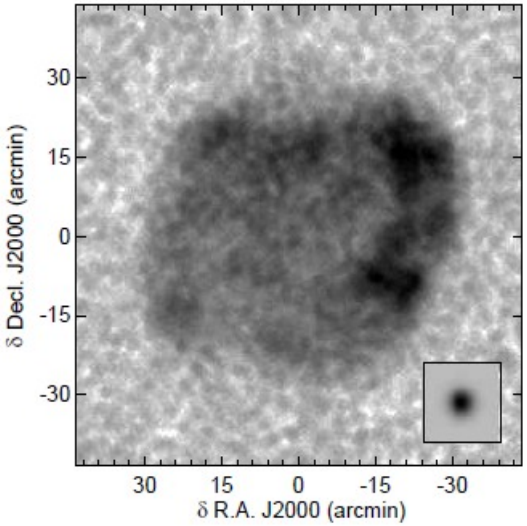
→ proche, jeune PSR ?! → e^-/e^+ cosmiques ?

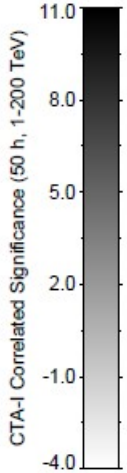


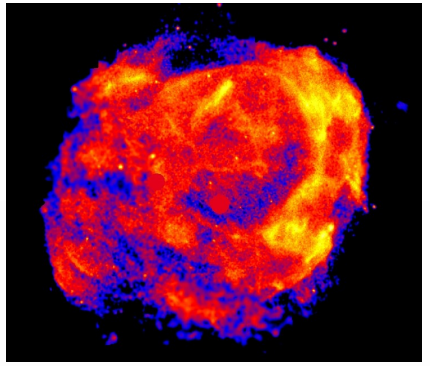
SNRs et PWNe : cas scientifique avec CTA

- Spectro-imagerie des SNRs brillants au TeV



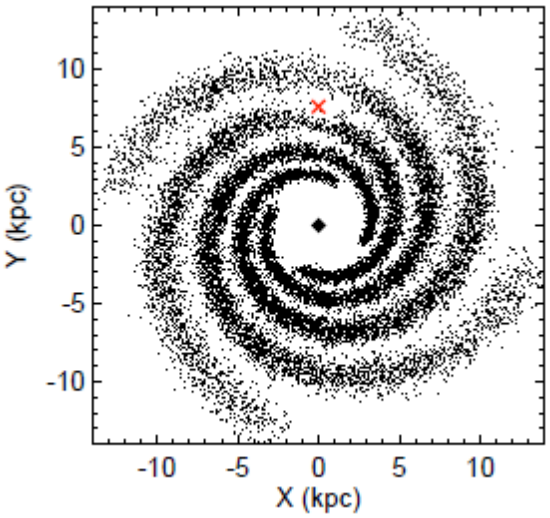


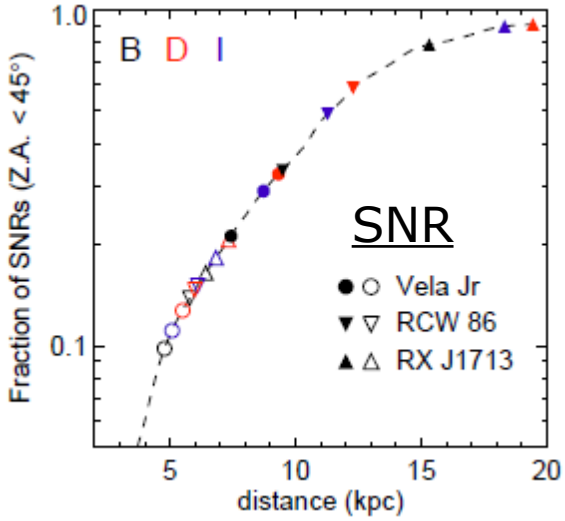


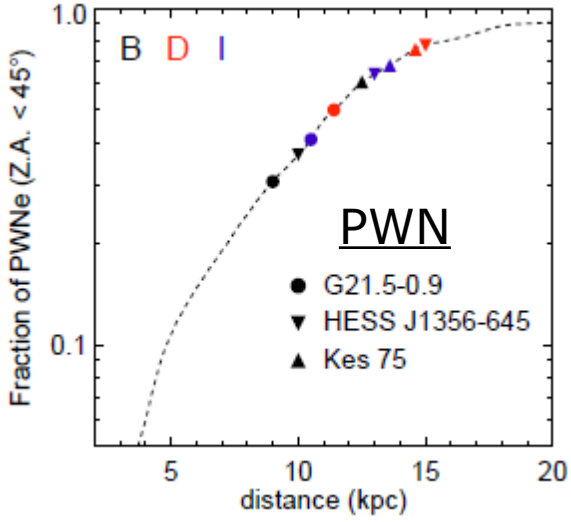


RX J1713 vu par XMM

- Etudes de population (nombres de sources attendues, niveau de confusion)







SNRs et PWNe : cas scientifique avec CTA

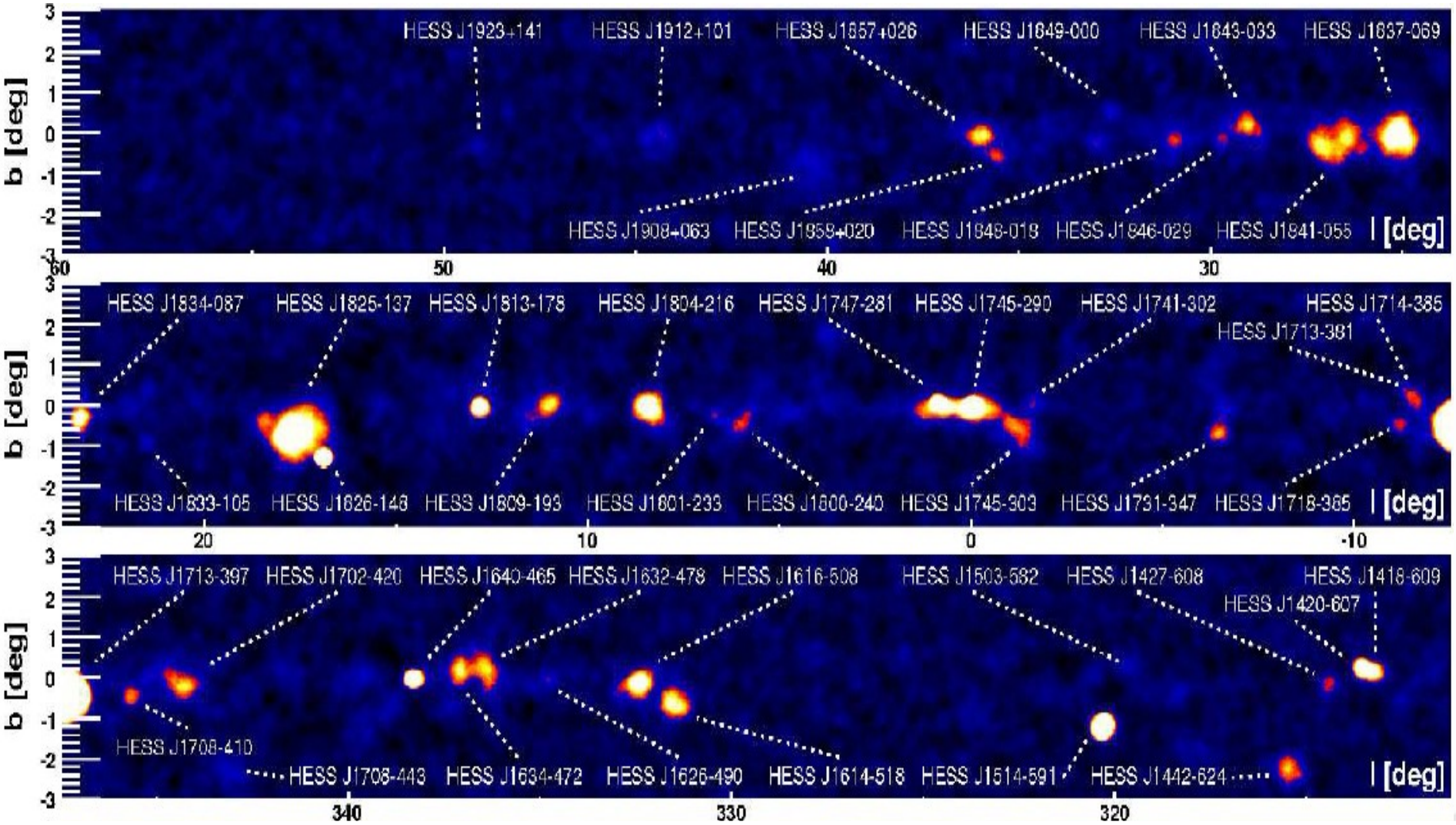


Image H.E.S.S. des régions centrales
de la Galaxie (2004 – 2009)

SNRs et PWNe : cas scientifique avec CTA

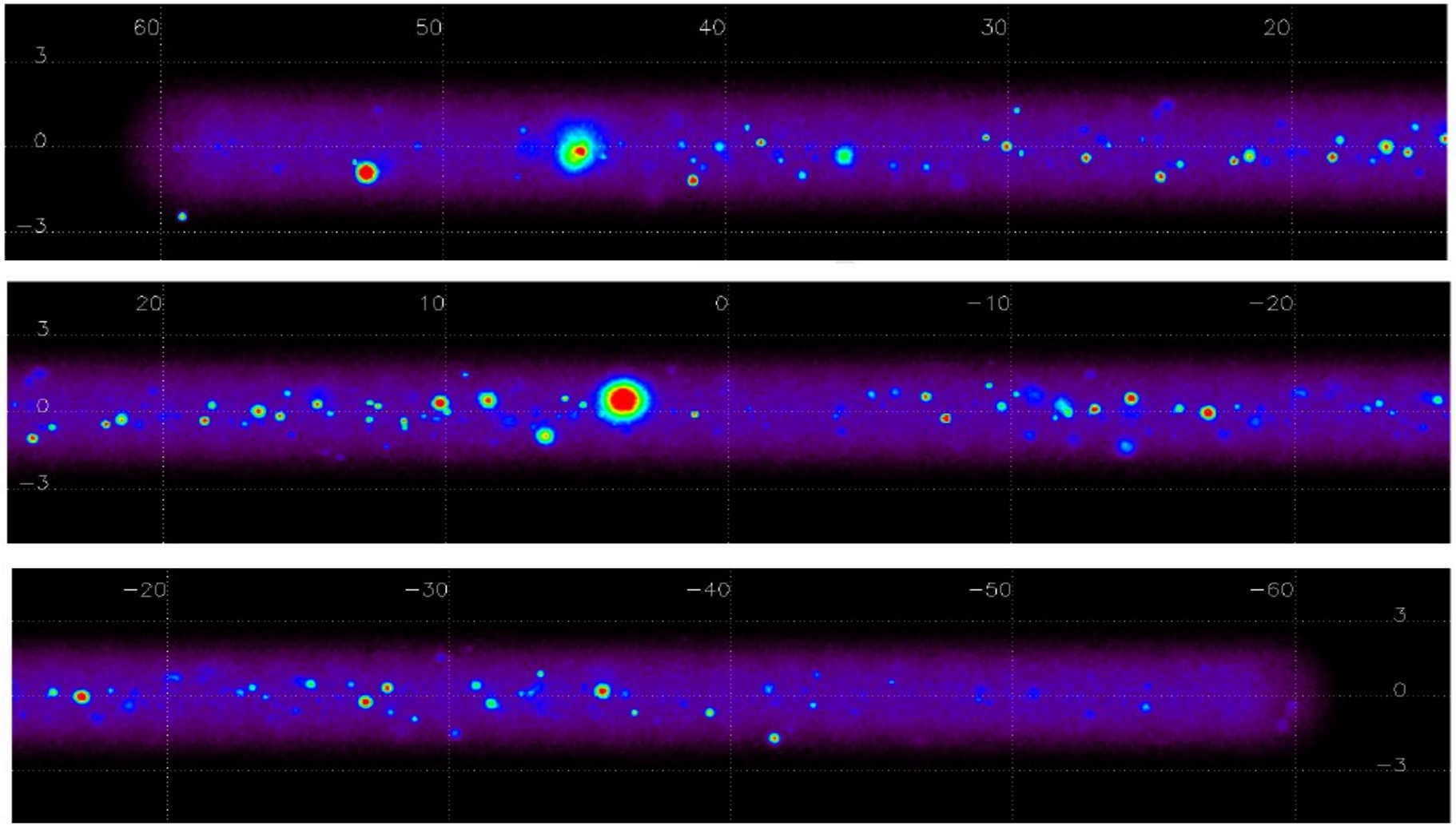


Image *simulée* CTA des régions centrales
de la Galaxie (~ 2-3 ans d'observation)