

*Observing Galactic Sources at GeV & TeV
Energies
(A Short Summary)*

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Air -Cherenkov Telescopes

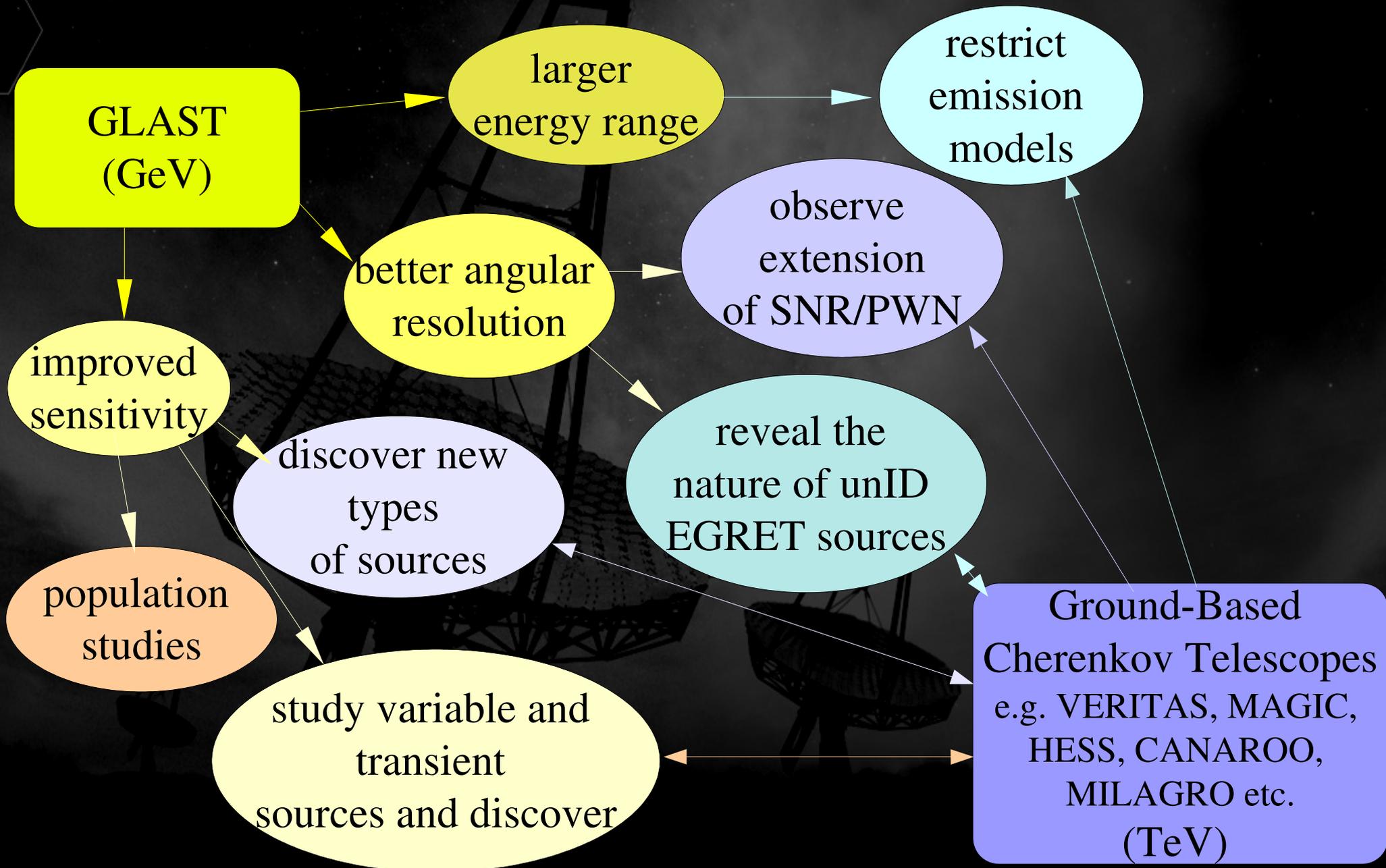
- ★ Past IACTs: HEGRA, Whipple, CANGAROO
- ★ Present/Future IACTs: H.E.S.S., MAGIC(2), CANGAROO-3, VERITAS



GLAST and VERITAS

	EGRET	GLAST LAT	VERITAS
Energy Range	35 MeV – 30 GeV	20 MeV - ~ 300 GeV	~100 GeV – 50 TeV
Energy Resolution	<15%	<10%	15-20%
Duty cycle	100%	100%	12%
Field of View	0.5 sr	2.2 sr	3.5 deg
Angular Resolution	0.5deg @ 10 GeV	0.1 deg @ 10 GeV 0.42 deg @ 1 GeV	0.1 deg above 100 GeV
Effective area	~0.3m ²	~1 m ²	~10 ⁵ m ²
Point source sensitivity	1.2×10 ⁻⁸ cm ² s ⁻¹ E>1 GeV	1.5×10 ⁻¹⁰ cm ² s ⁻¹ E>1 GeV	10 ⁻¹¹ cm ² s ⁻¹ E>100 GeV

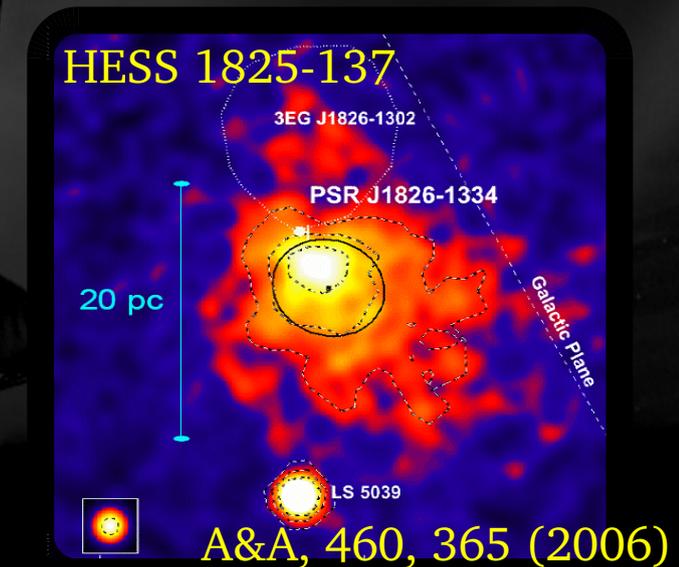
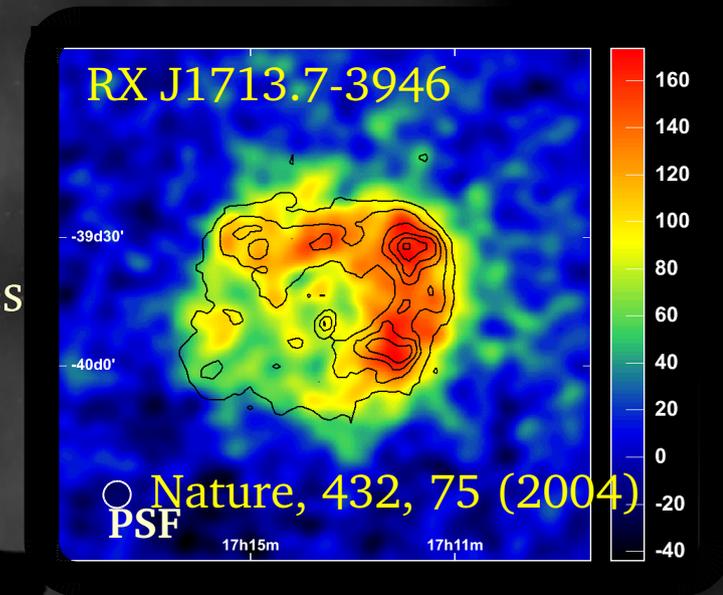
Summary Chart



Source Localization : Supernova Remnants

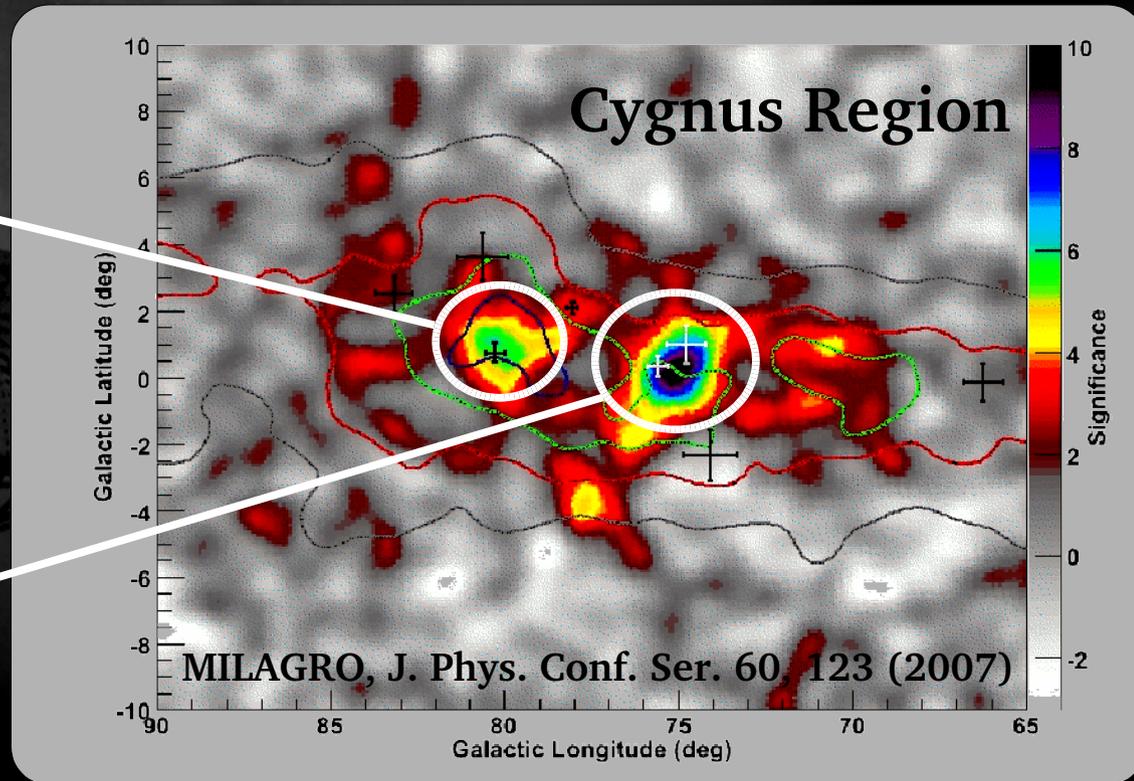
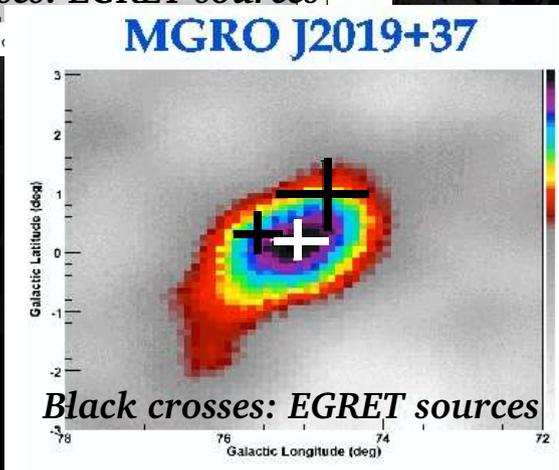
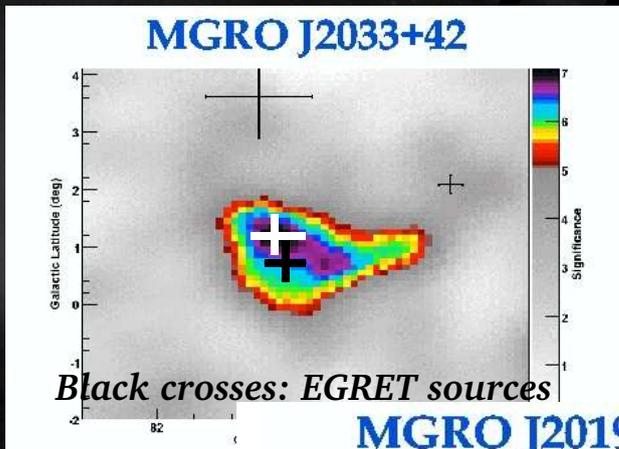
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- ★ **Shell-type SNRs** : The shells of the SNRs are the sites of acceleration
 - ★ Separate shell-emission from PWN emission by MW studies in GeV, TeV and X-ray energy regimes
- ★ **PWNe** : Extended emission of gamma-rays from GeV to TeV energies
 - ★ Possible scenarios of the extended emission?
- ★ In some PWN the pulsar is asymmetrically positioned
 - ★ Ultra-relativistic particles lose energy to Synchrotron and IC-emission as they move away from the pulsar
- ★ For details see talk by P.Slane (this meeting) & talk by E. Hays, GLAST Chicago Meeting (2006)

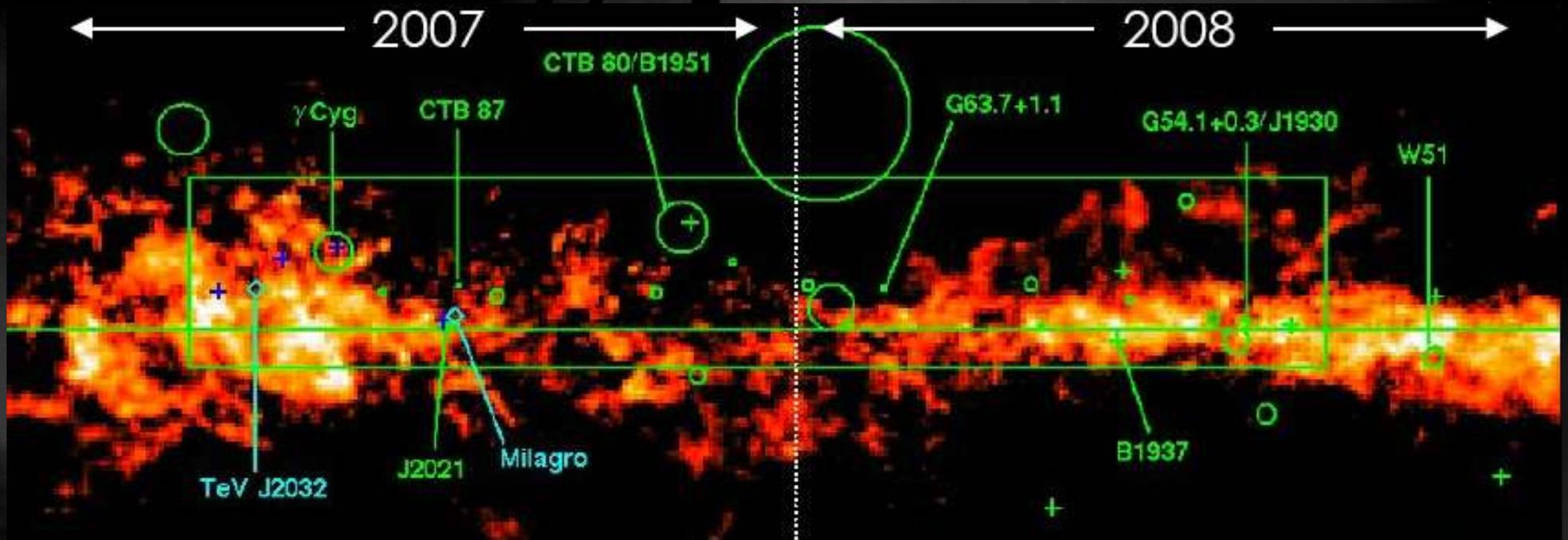


Source Localization: EGRET Associations

- ★ Resolve the gamma-ray emission (e.g. in Cygnus region) and clarify the unidentified EGRET - TeV source associations
- ★ VERITAS 2007 Sky Survey Region (see talk by A.Weinstein given at the GLAST UCLA Meeting)



VERITAS SkySurvey



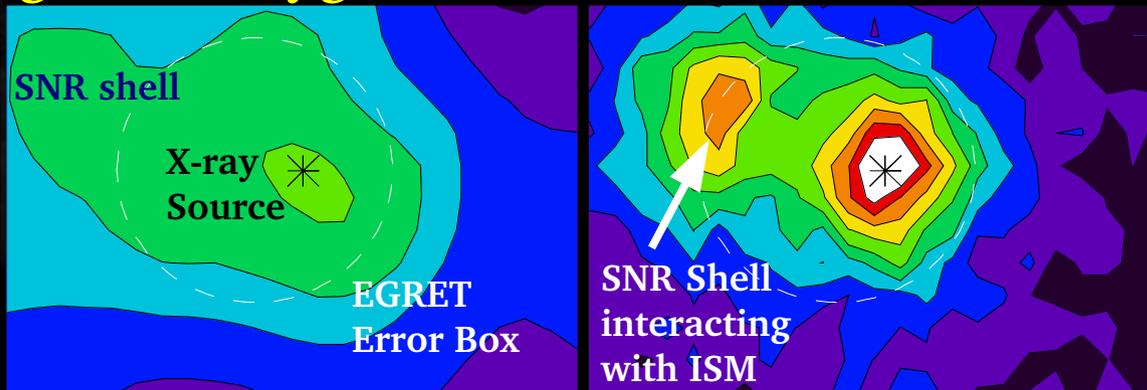
Cygnus Region: $52 < l < 82, -1 < b < 4$

Supernova Remnants and Molecular Cloud Interactions

- ★ Spatial correlations with molecular clouds give hint about interactions of SNR shell with molecular clouds and the hadronic origin of gamma rays (see talk by Y. Butt at this meeting and talk by Y. Fukui for NANTEN at the GLAST UCLA Meeting, 2007)

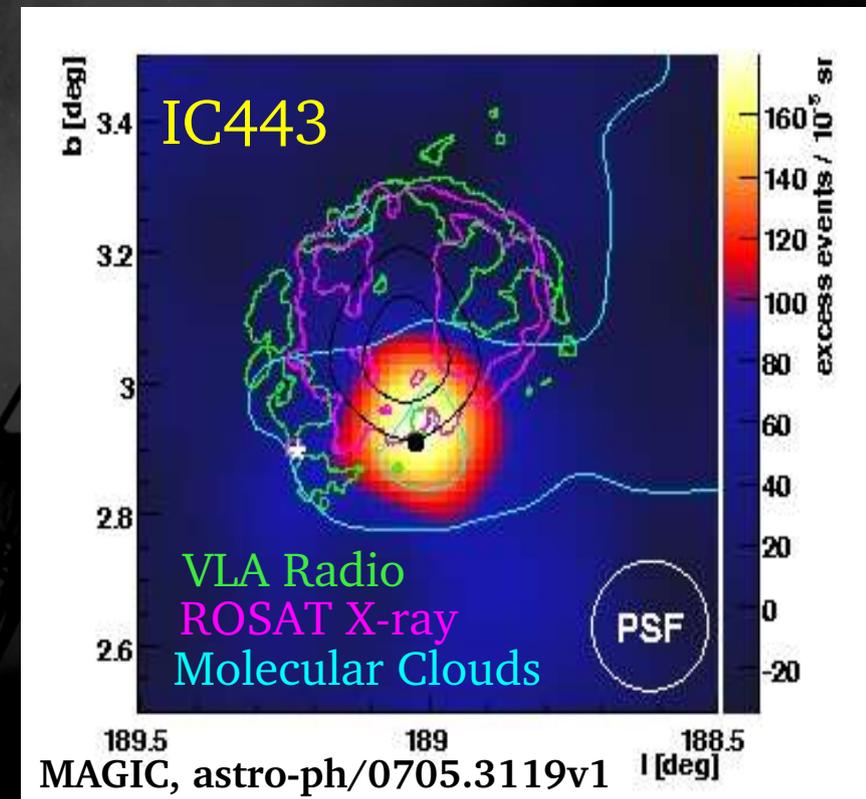
★ E.g. IC 443 and Gamma-Cygni
EGRET observations can't resolve the source of the gamma rays

gamma-Cygni *Pulsar or molecular cloud interaction?*



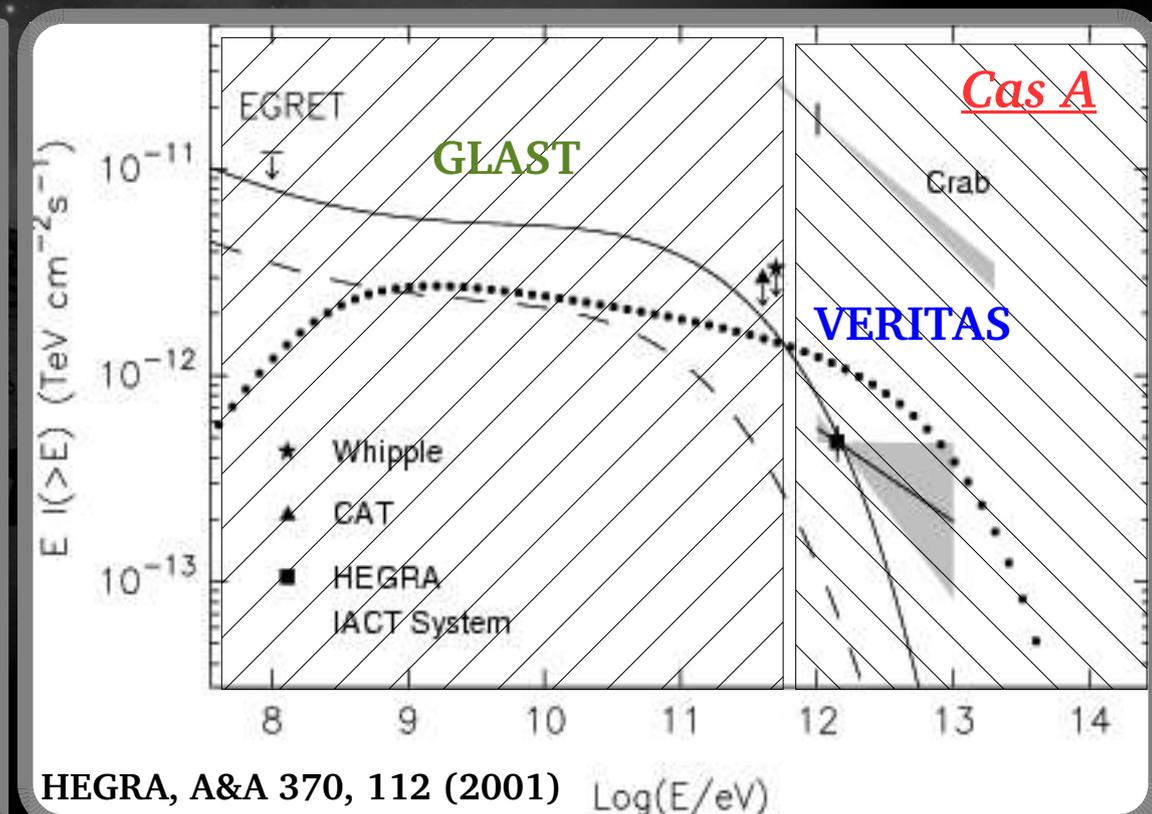
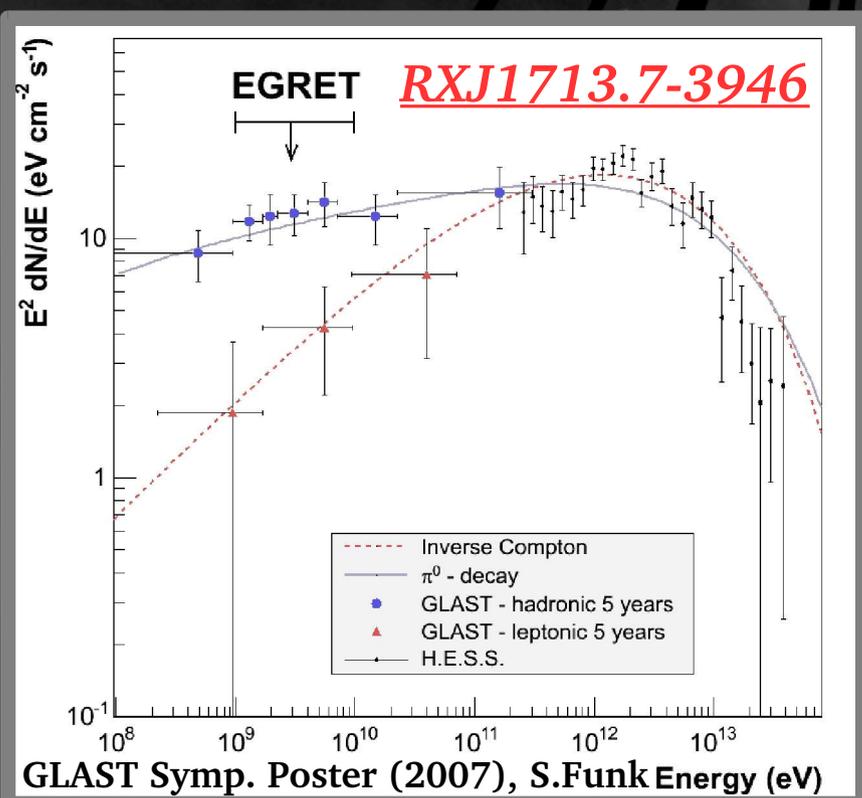
EGRET Data (>1GeV)
GLAST Meeting

GLAST Simulation
Boston, MA



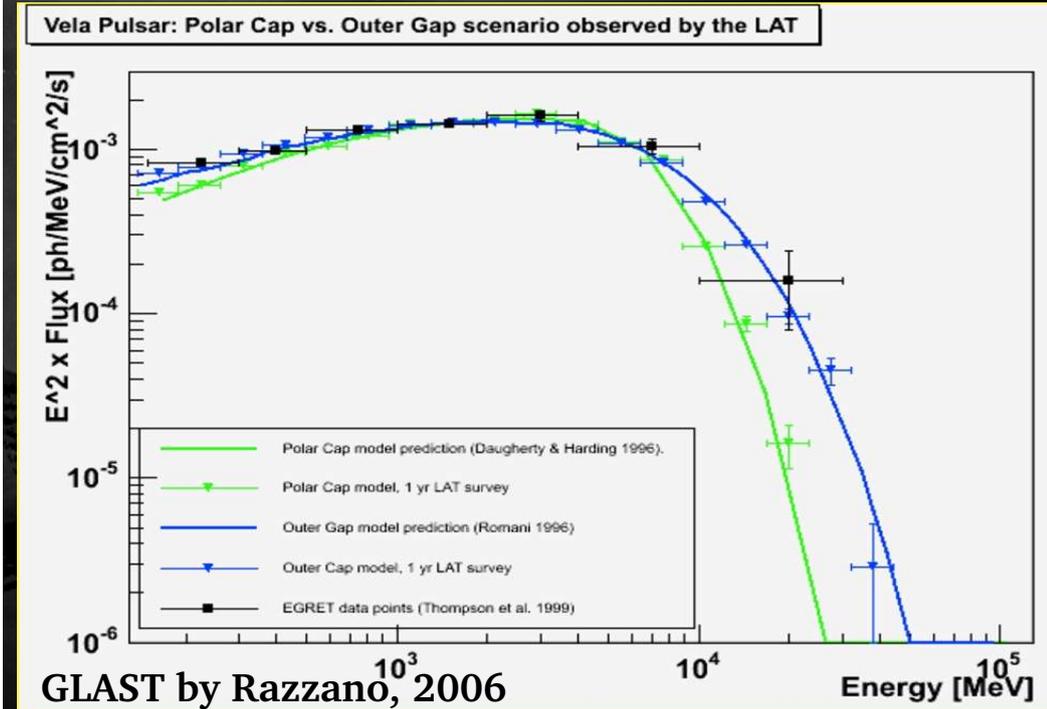
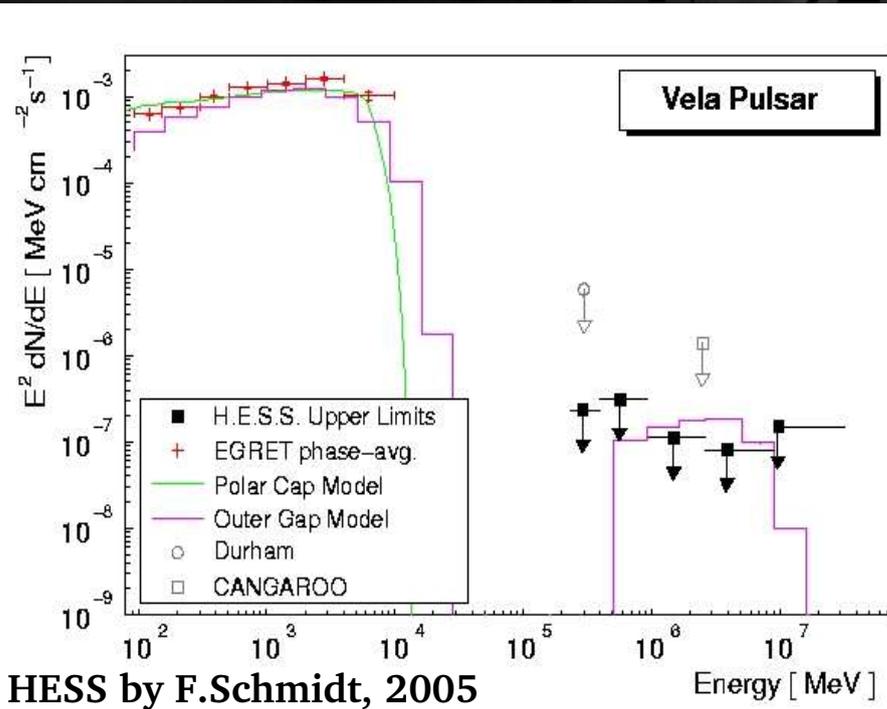
Spectra : Supernova Remnants

- ★ Constrain the gamma-ray emission mechanisms
 - ★ GLAST is going to provide final evidence to the main emission processes and acceleration mechanism in shell-type SNRs



Spectra : Pulsars

- ★ Main emission mechanisms are Outer Gap and Polar Cap



X-Ray Binary (XB) Systems

- ★ **HMXB:** TeV emission already detected from **PSR B1259-63**, **LS 5039**, **LSI+61303** (see detailed talk given by J.Holder at this meeting)
 - ★ All radio sources. LS 5039 and LSI+61303 have EGRET associations
 - ★ TeV energies: All point-like sources and modulation in emission
 - ★ High-mass O or Be type companions with eccentric orbits
- ★ It is not certain if LS 5039, LSI+61303 are microquasar or rotation-powered-pulsar binaries. Thus,
 - ★ GLAST would probe pulsar winds, where synch. emission comes probably from particles shock-accelerated in the pulsar wind with equatorial wind from Be star, and search for the link between microquasars and accretion
 - ★ Also simultaneous observations in GeV and TeV energies of already detected sources and new sources
 - ★ GLAST has potential for discovering new HMXBs
- ★ **LMXB:** transient sources. Weak X-ray emission, except rare outbursts
 - ★ GLAST may detect LMXB, which might constrain SEDs of those sources
- ★ See more on this subject in G. Dubus, 1st GLAST Symposium, 2007

Colliding Winds in WR Binary Systems

★ WR Binaries : Similar to pulsar+O/B binaries

★ **But** unlike a single massive star, the collision of the winds of double massive stars might produce strong shocks that can accelerate electrons and hadrons

★ WR Star+O/B Star (WR 147, WR 146) or WR Star+WR Star (Rare combination. E.g. WR 20a binary star system)

★ Colliding Wind Scenarios

★ Collision regions exposed to the strong radiation & magnetic fields

★ Extended non-thermal radio emission and strong synchrotron emission from the collision region (relativistic electrons)

★ Ref.: A.Reimer, O.Reimer, astro-ph/0705.1539v1

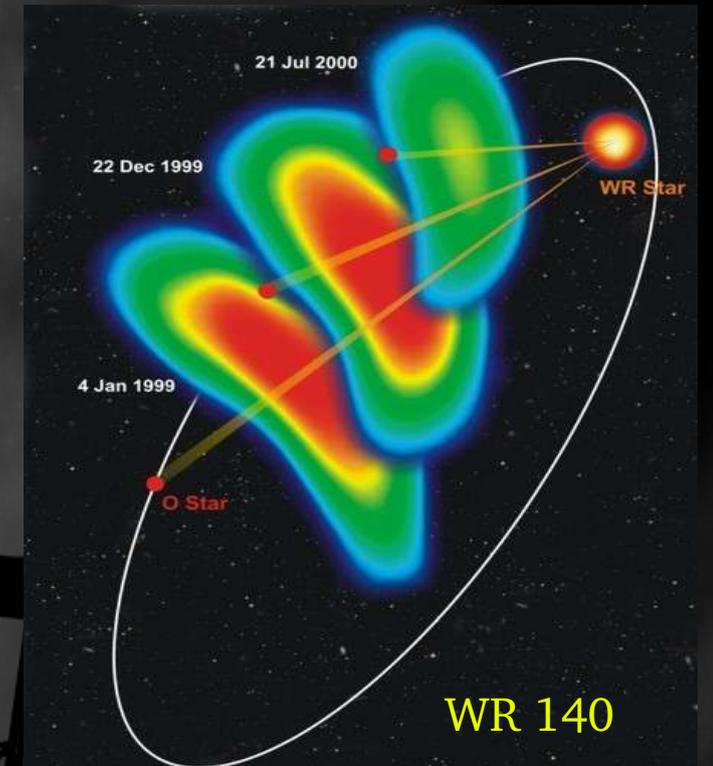


Illustration of the radio emission

★ H.E.S.S. Detection of HESS J1023-575 in the WR 20a binary system located in the Westerlund2 star cluster (H.E.S.S. Press Release, February 5th 2007)