

Exploring the Future Science of Space-based Gamma-ray Observations

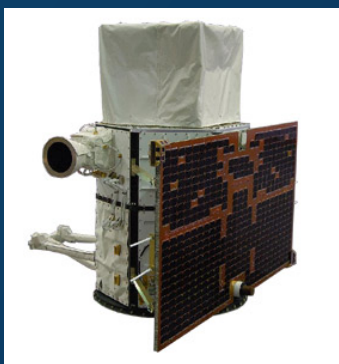
Liz Hays (NASA/GSFC)

On behalf of the Gamma-ray Science Interest
Group

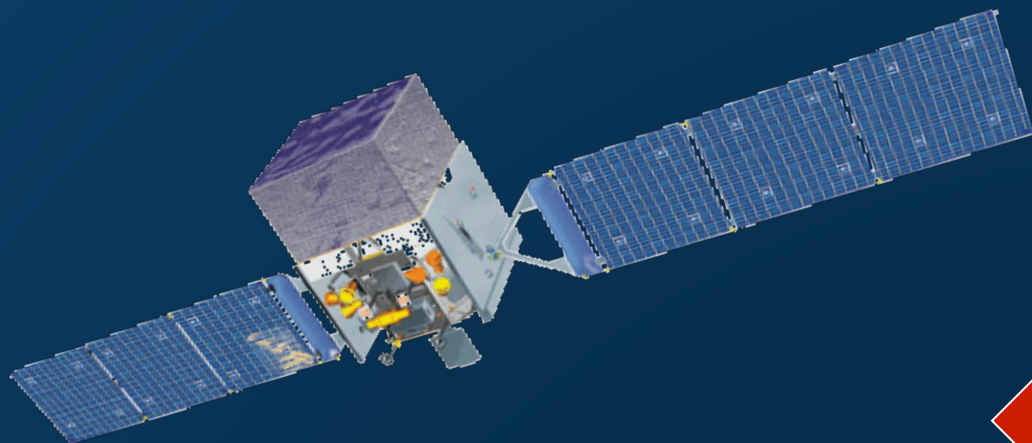
April APS, 2014

<http://pcos.gsfc.nasa.gov/sags/gammasag.php>

Space-based Gamma-ray Observatories



AGILE - GRID
30 MeV – 50 GeV

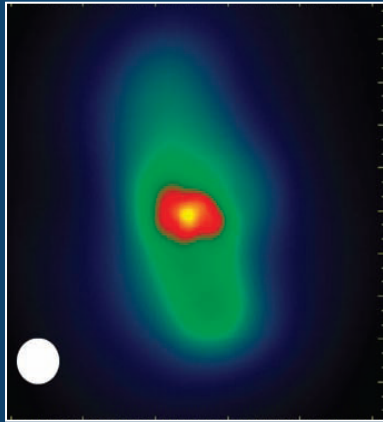


Fermi
GBM 8 keV – 40 MeV
LAT 20 MeV - >300 GeV

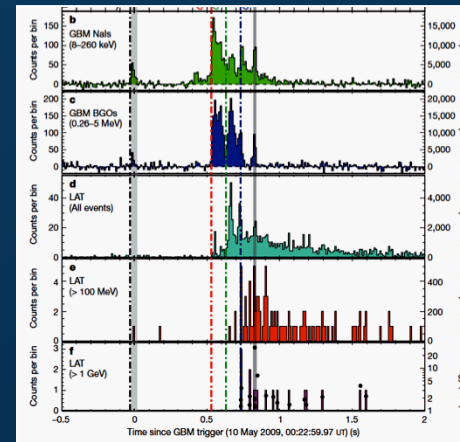
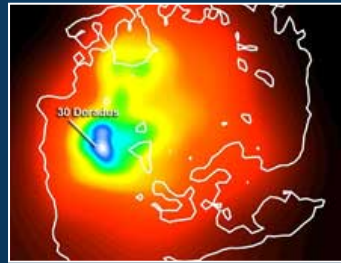
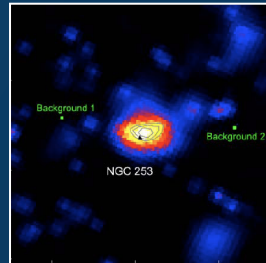
Multiwavelength

Multimessenger

New Views of the Universe: Examples

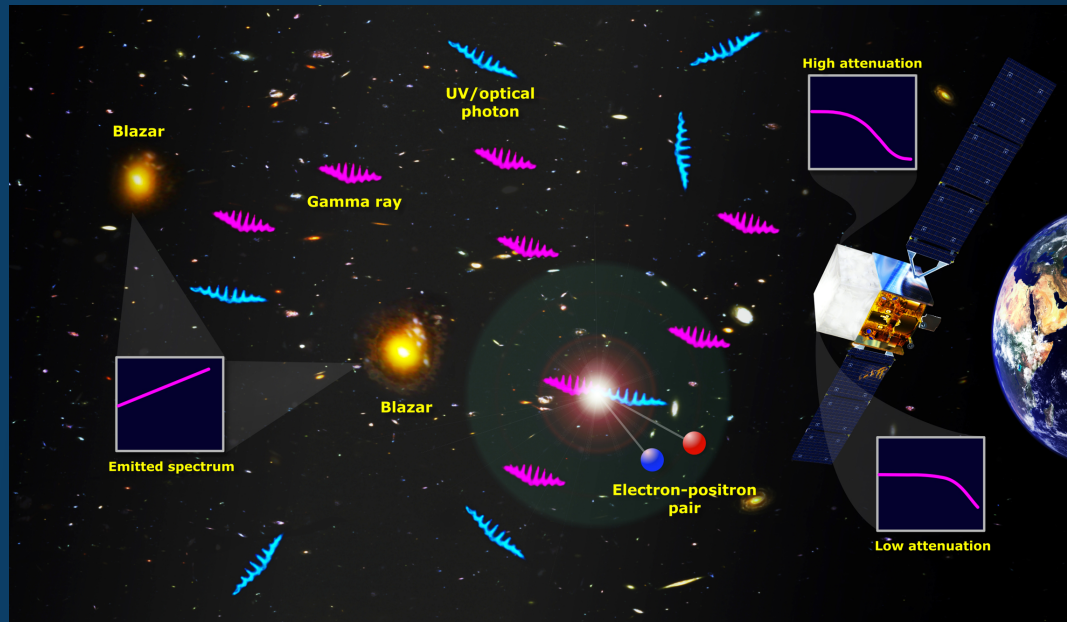


Radio Galaxies, Starburst Galaxies, LMC and SMC

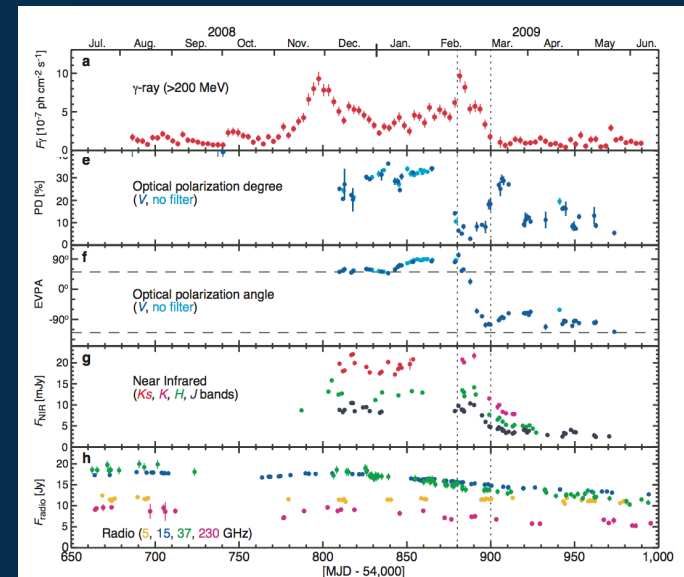


GRB emission and constraints on Lorentz Invariance Violation
Abdo et al. 2009

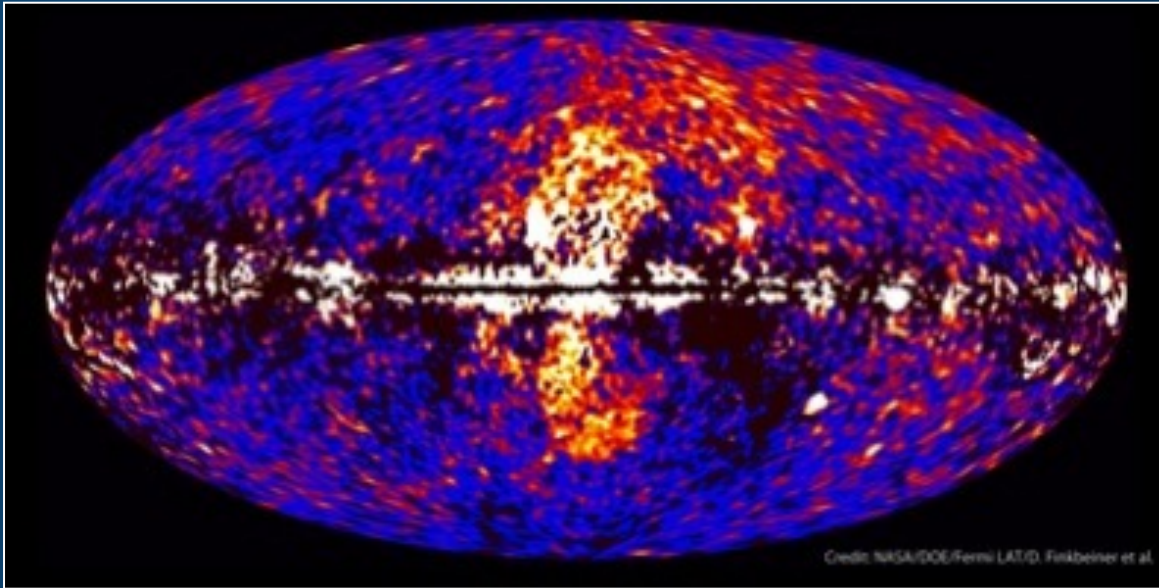
Extragalactic Background Light



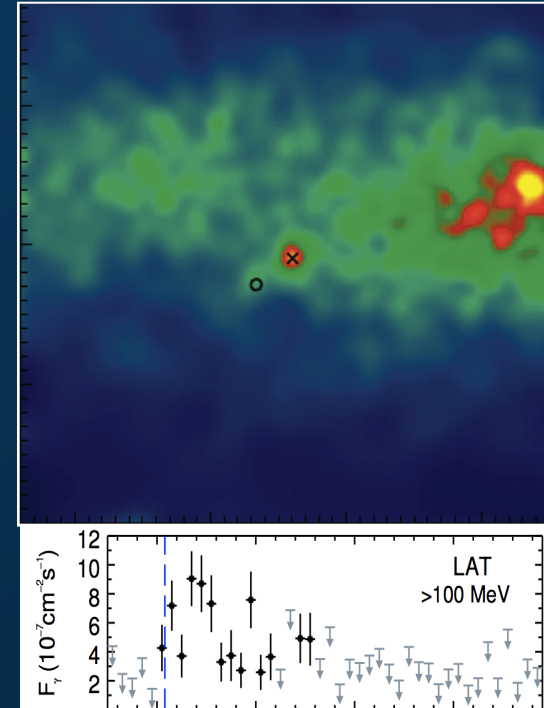
Quasar jet structure Abdo et al. 2010



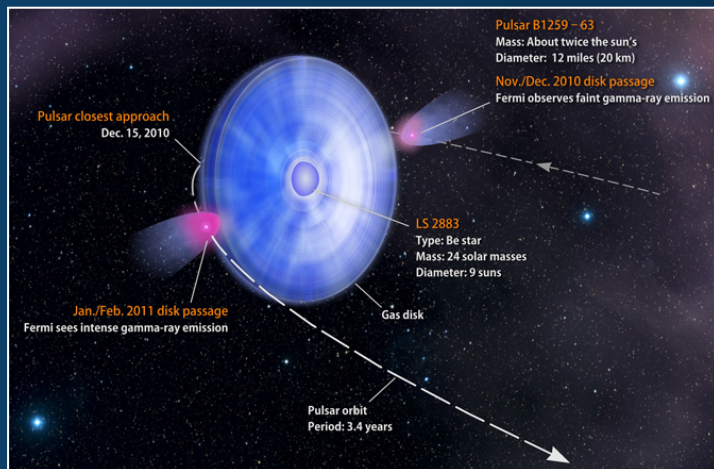
New Views of the Galaxy: Examples



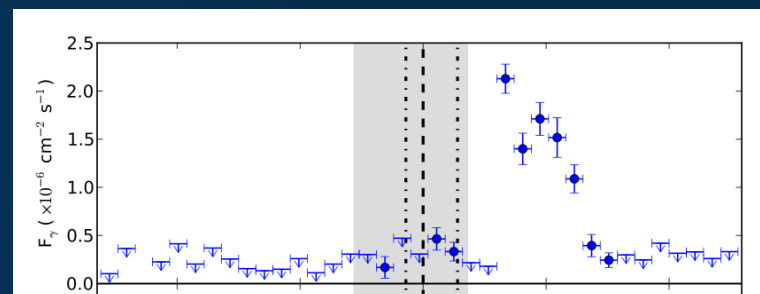
Fermi Bubbles Su et al. 2011



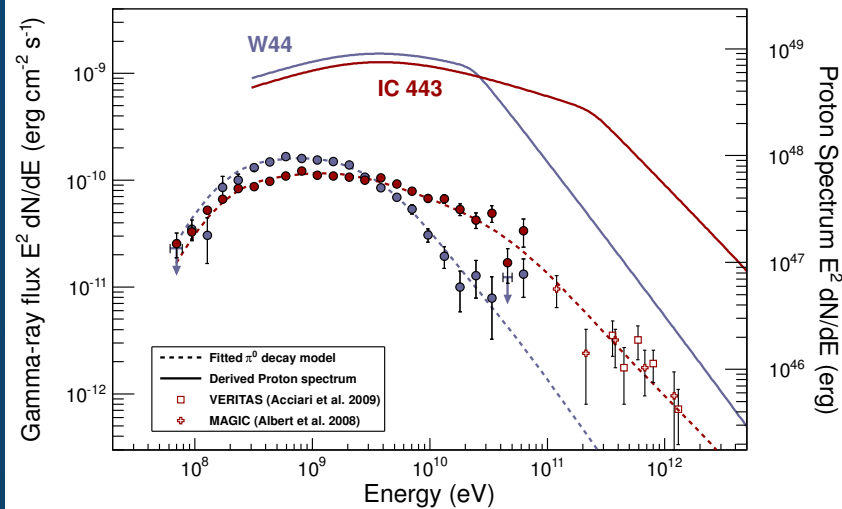
Gamma Rays from Novae
e.g. Abdo et al. 2010



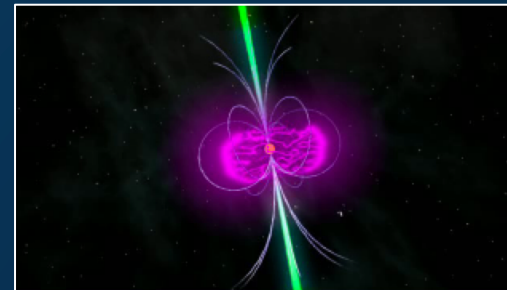
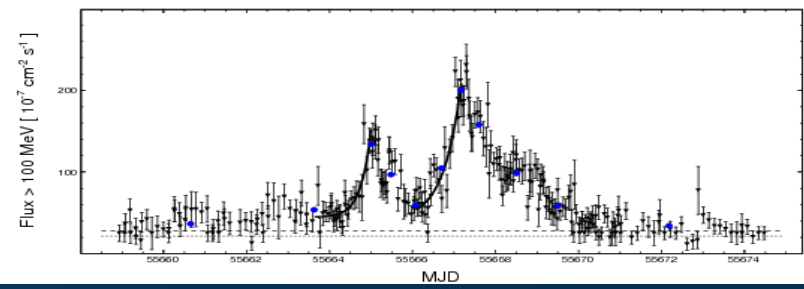
γ -ray Binaries
e.g. Abdo et al. 2011



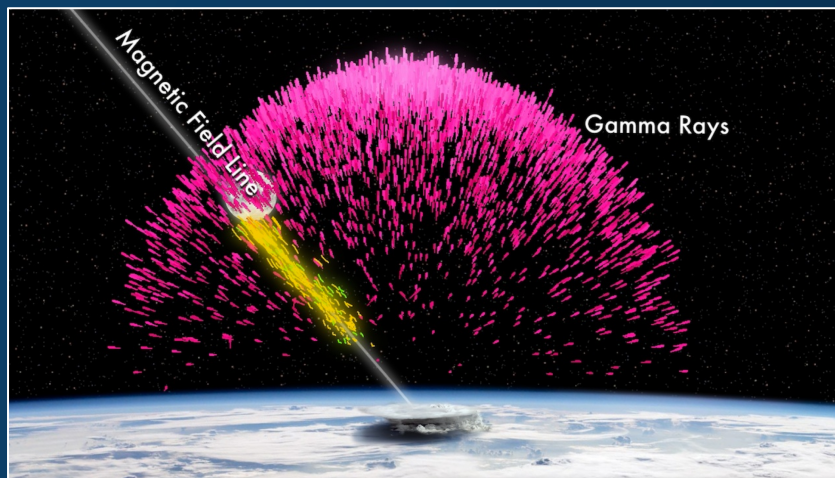
Particle Acceleration and Magnetic Fields



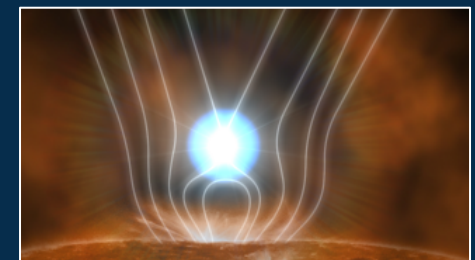
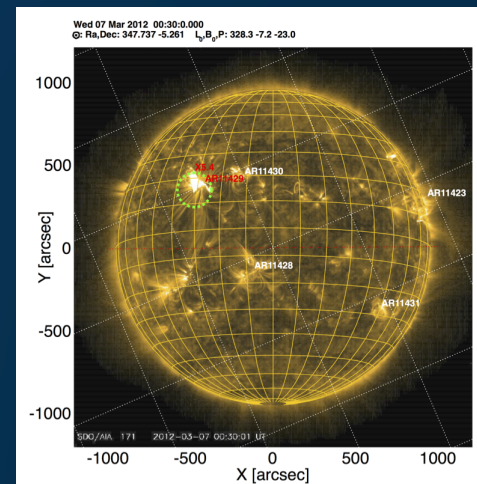
Cosmic-ray acceleration in SNRs
Ackermann et al. 2013



Rapid Flares in
the Crab
Nebula
Buehler et al.
2011

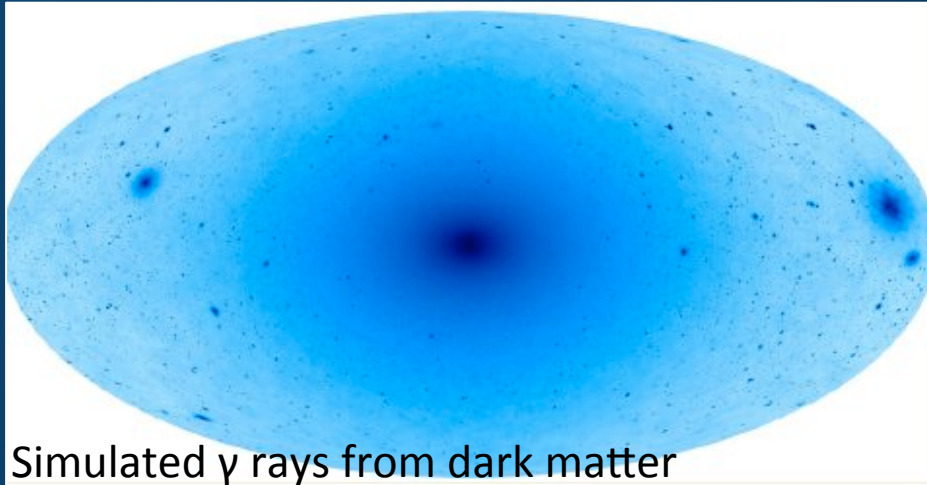


Terrestrial Gamma-ray Flashes

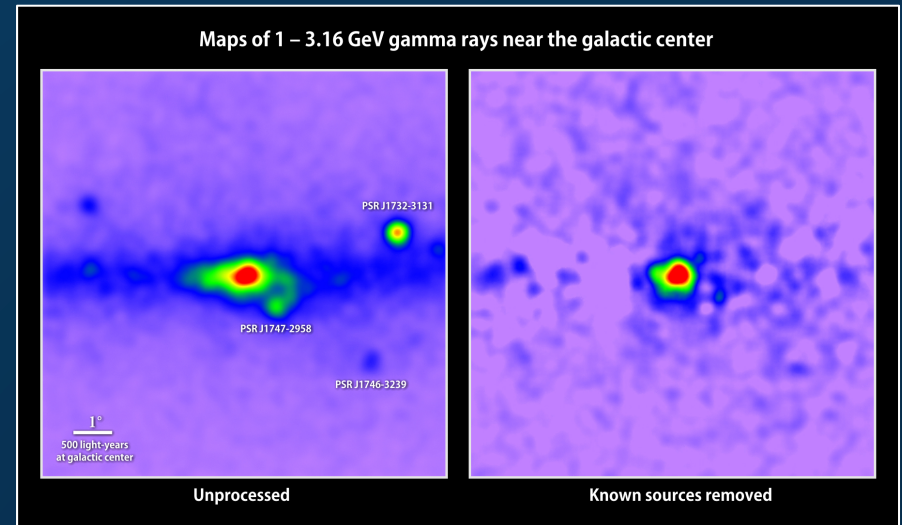


High energy, long
duration solar flares
Ajello et al. 2014

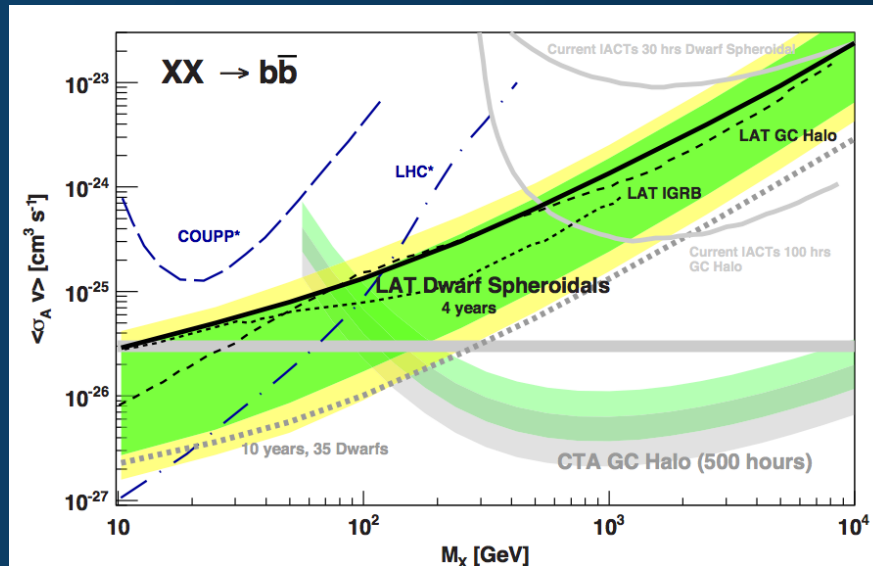
Searches for Dark Matter



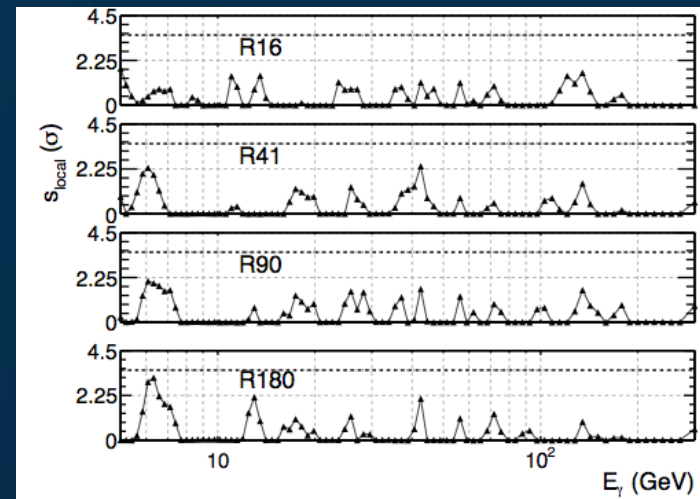
Simulated γ rays from dark matter



Daylan et al. 2014



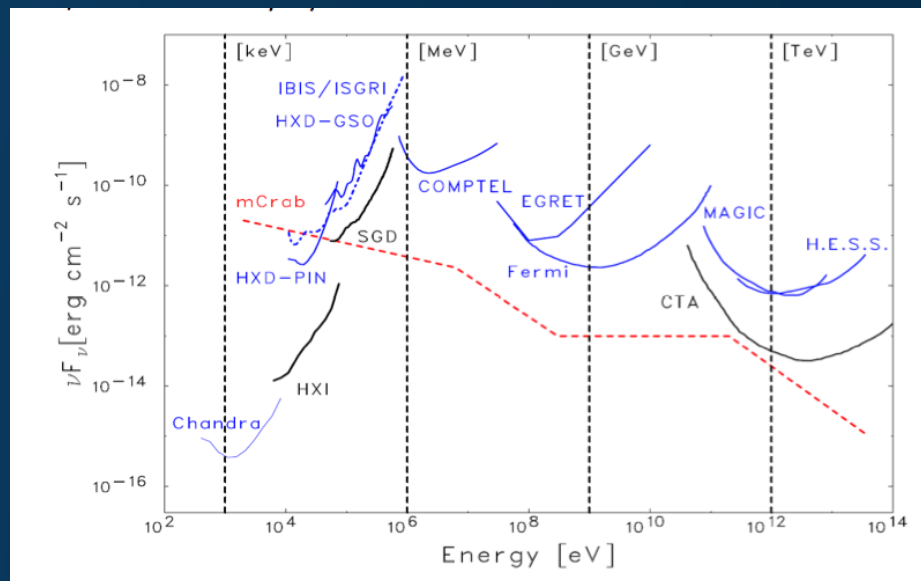
Funk 2013



Ackermann et al. 2013

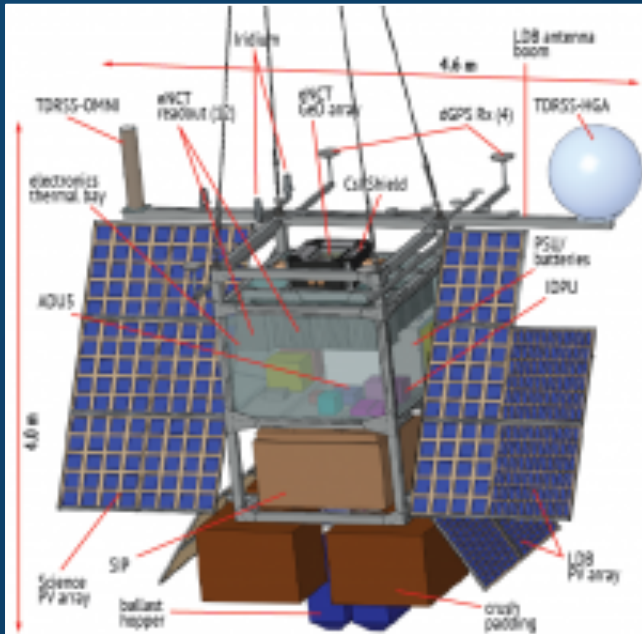
The Next Generation Gamma-ray Sky

- MeV/Compton imagers
- Improving spectroscopic sensitivity
 - Positron annihilation, nuclear line emission (e.g. solar flares, supernovae)
- Gamma-ray polarization
- Focusing soft gamma rays (~ 70 keV – 1 MeV)

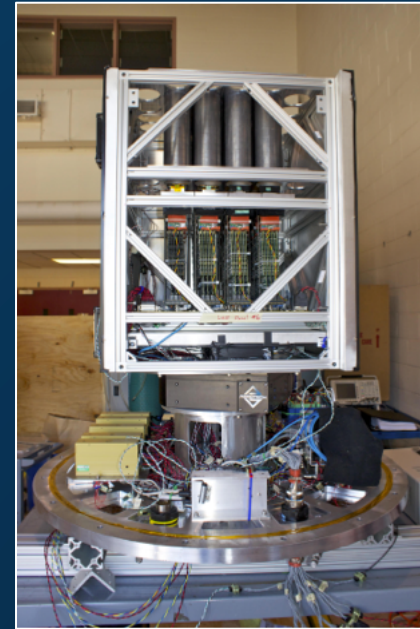


Takahashi et al. 2012

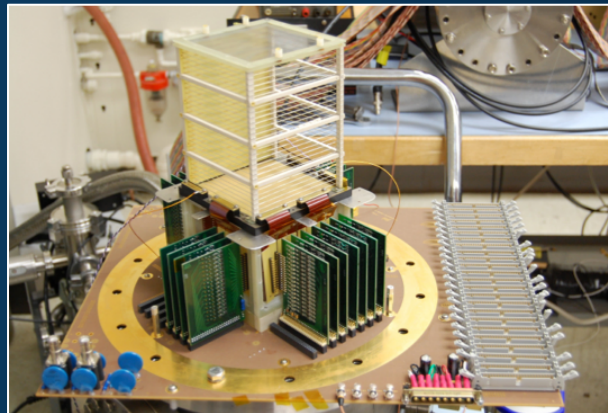
Planned Flights and Development: Examples



Super-COSI
(0.2-10 MeV)
Ultra-long
duration
balloon
payload
2014/15



GRAPE
(50 – 500 keV)
Balloon flight in
2014
McConnell et al.
2013



Development work in
Compton telescopes,
sensors and background,
high resolution imagers,
and polarimetry.

Gamma-ray Science Interest Group

- Visit the GammaSIG website

<http://pcos.gsfc.nasa.gov/sags/gammasag.php>

- Sign up for e-mail notifications
- Join the discussion at future meetings
 - Integral Workshop Sep. 2014, January 2015 AAS, April 2015 APS

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