The Fermi-LAT View of the Inner Galaxy

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National Aeronautics and Space Administration

Fermi Gamma-ray Space Telescope

www.nasa.gov/fermi

Why is this Region Interesting?

Radio (90 cm)

**Optical/Infrared/X-ray**

- **The region surrounding the GC is complicated containing**
  - **Potential signal of particle dark matter**
  - **Intense emission by cosmic rays interacting with the ISM**
  - **Many astrophysical sources**
- **Continuous on-orbit presence of the Fermi-LAT significantly adds to the available data allowing these topics to be addressed**


The Galactic Center
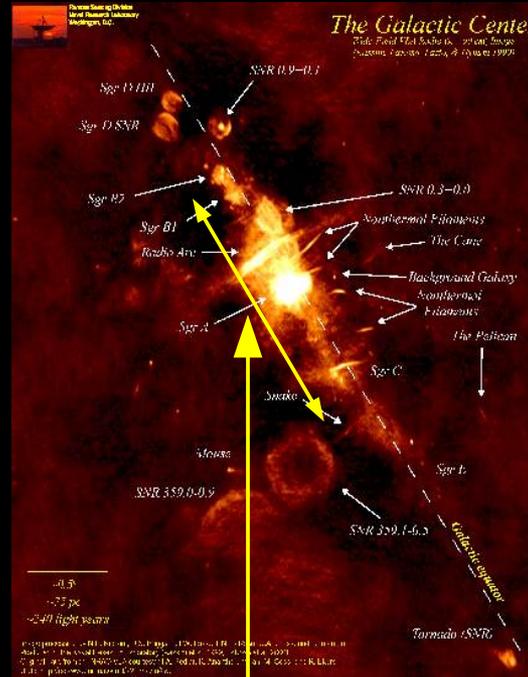
~0.4° effective 68% radius > 1 GeV (front)

~0.3°
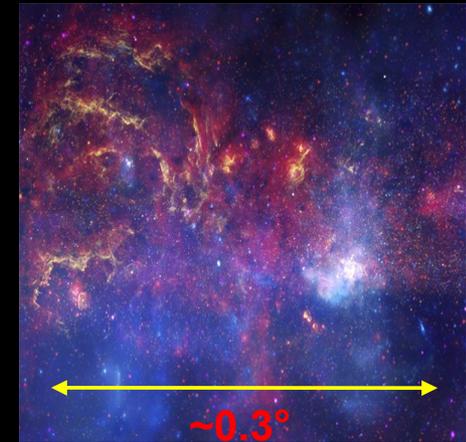
HESS TeV γ-rays
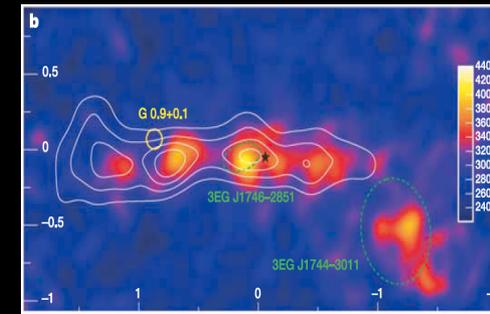
l = ±2°

Disentangling the Many Sources of Gamma-Ray Emission is Challenging ...

The emission from the **inner Galaxy** consists of a number of components:

- **Outer Galaxy**
- **True inner Galaxy**
- **Point or small extended sources**
- **Unresolved sources**
- **Extragalactic emission**
- **Cosmic-ray instrumental background**

**Diffuse gamma rays produced by cosmic rays interacting with the interstellar gas and radiation fields**

Outer

Inner
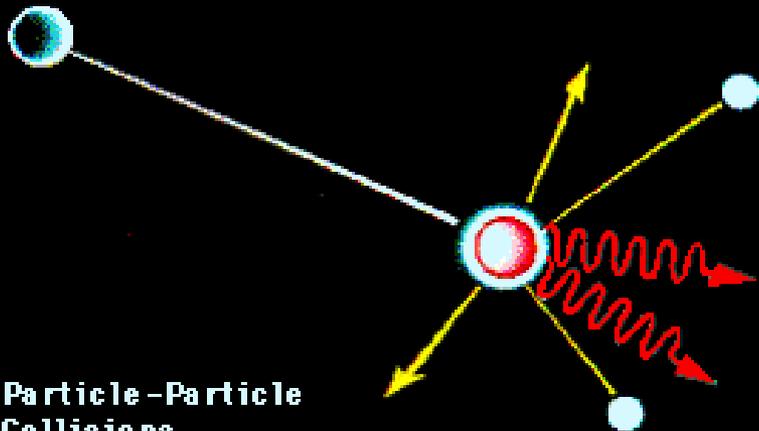
Particle-Particle Collisions
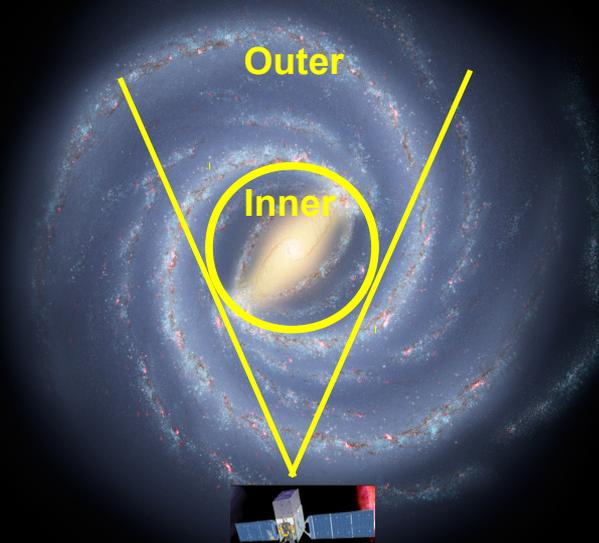
Use GALPROP cosmic ray propagation/diffuse emission code

http://galprop.stanford.edu

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Subtraction of the Diffuse Emission
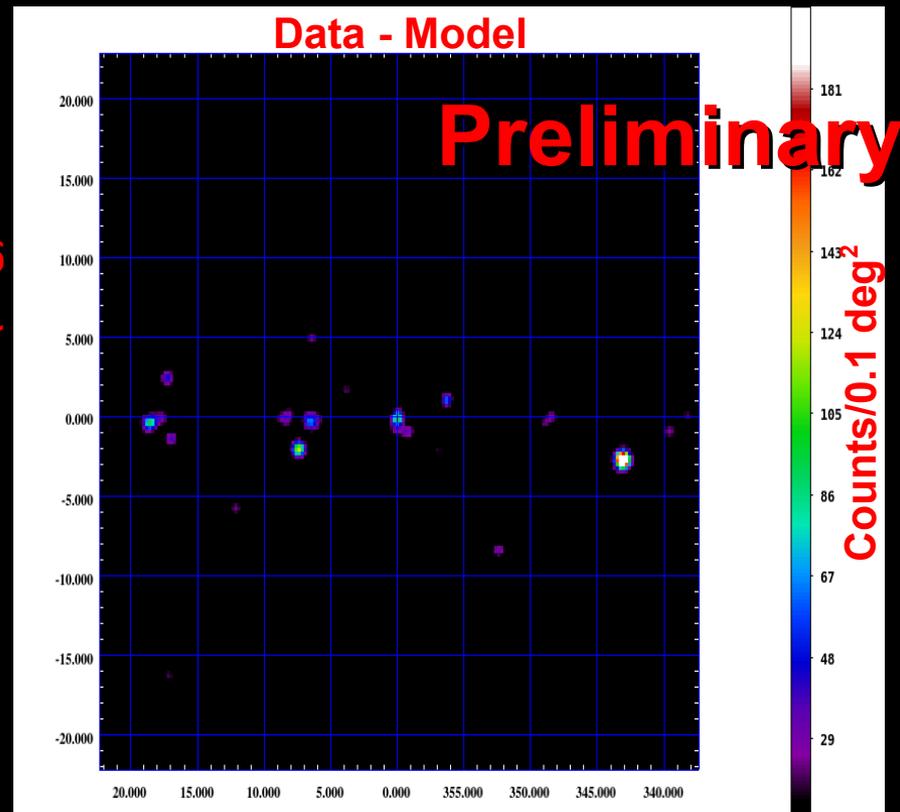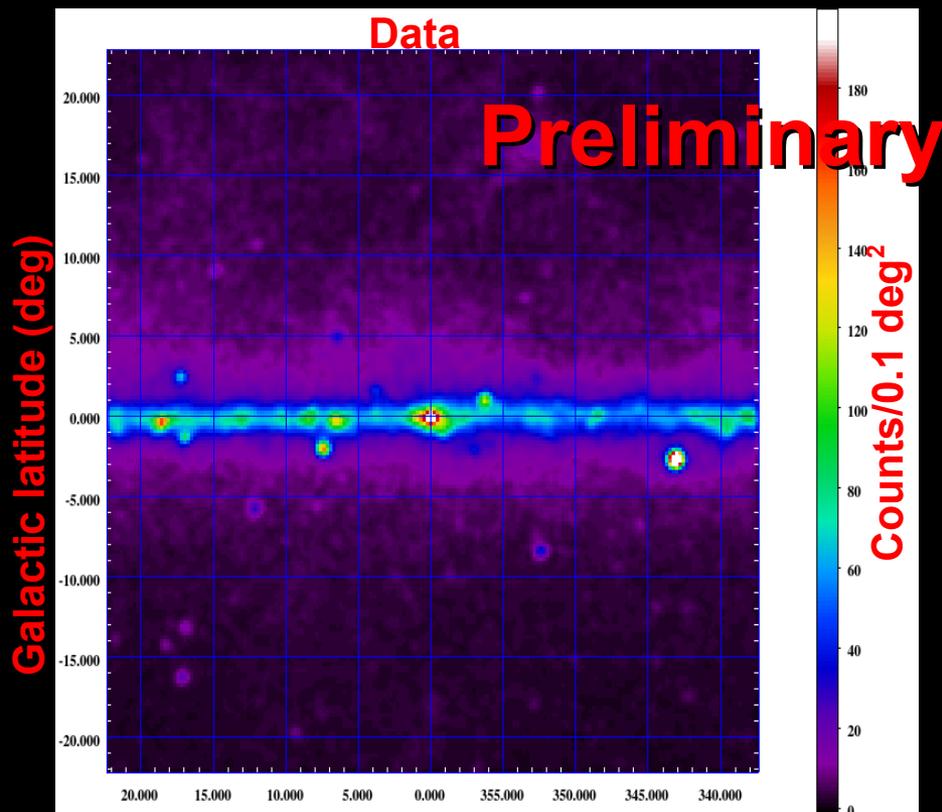
Data

Preliminary

Galactic latitude (deg)

Galactic longitude (deg)

Counts/0.1 deg^2

Data > 1 GeV for 45°x45° region about GC

Data - Model

Preliminary

Galactic latitude (deg)

Galactic longitude (deg)

Counts/0.1 deg^2

Data - Model > 1 GeV for 45°x45° region about GC

32 Months Data (Front)

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Residual Emission for 15°x15° about GC

Preliminary
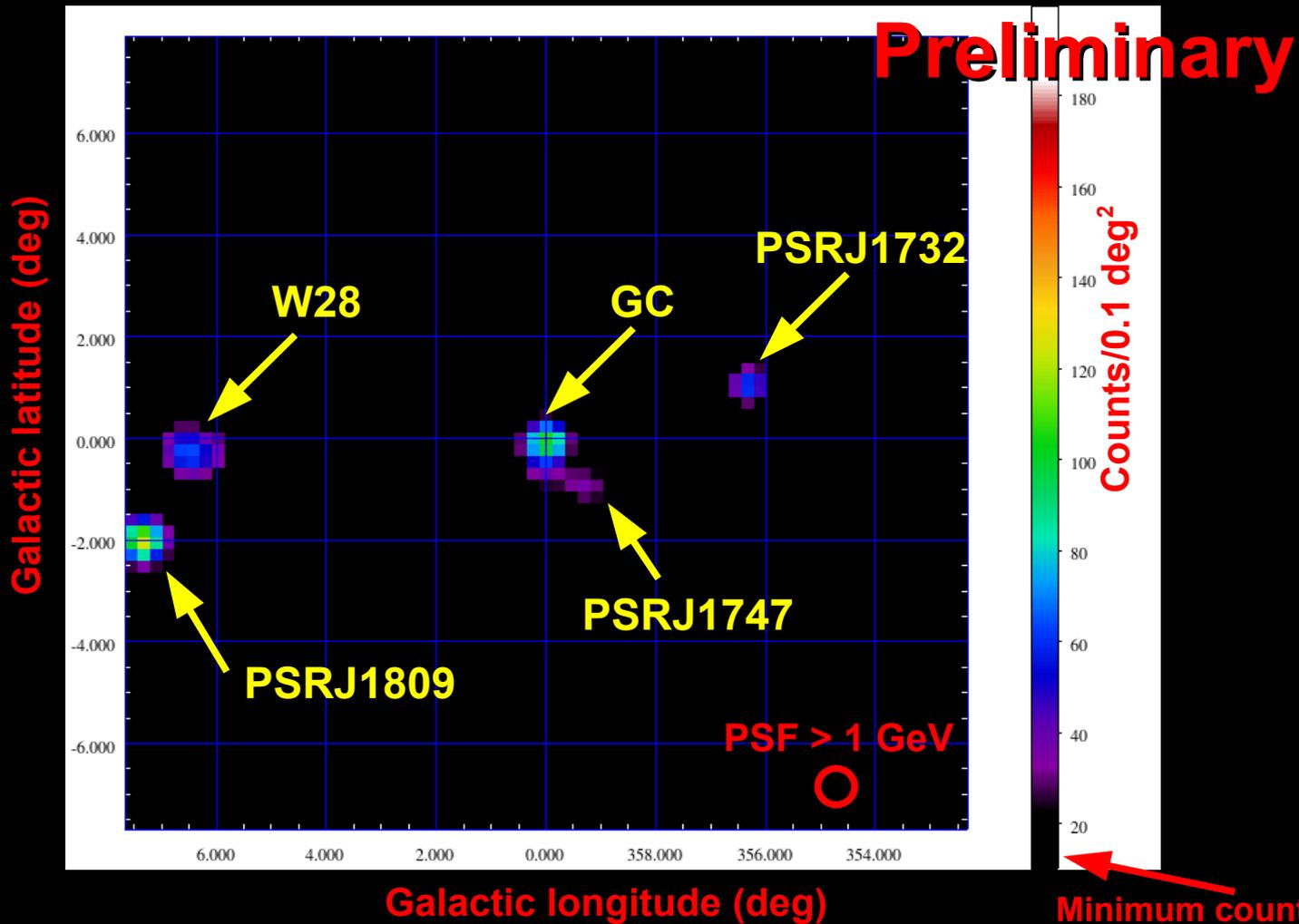
Bright excesses remain after model subtraction

Summary

- The gamma-ray emission from the inner Galaxy, and Galactic Centre in particular, sits on top of the large-scale diffuse emission from cosmic rays interacting with the diffuse ISM

- There are many details required to evaluate the large-scale diffuse emission and the diffuse emission and point sources surrounding the Galactic Centre

- The majority of the gamma-ray emission from the 15°x15° region about the GC is diffuse

- In this region there are ~30 high significance point sources

- Low-level residuals remain, the interpretation of these is work in-progress