The Steady-State Multi-TeV Diffuse Gamma Ray Emission Predicted with GALPROP and Prospects for CTA

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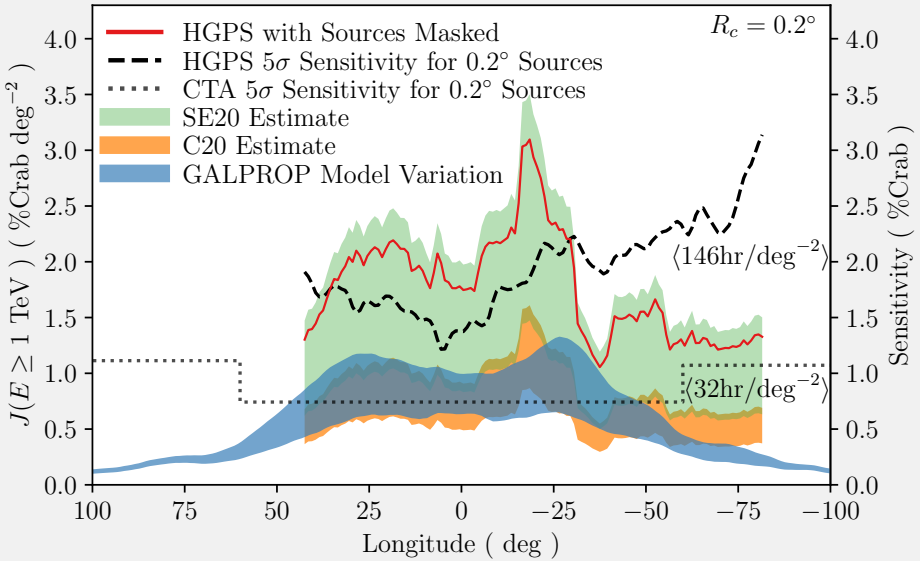
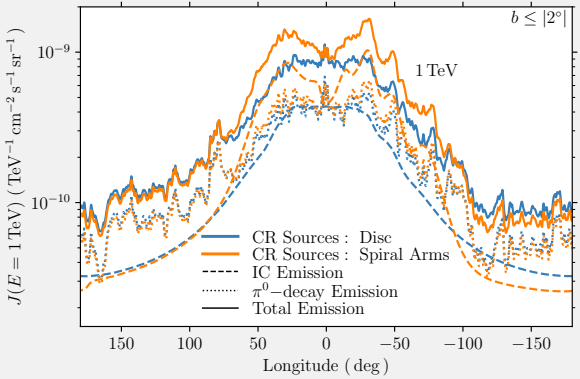
The TeV Diffuse Emission

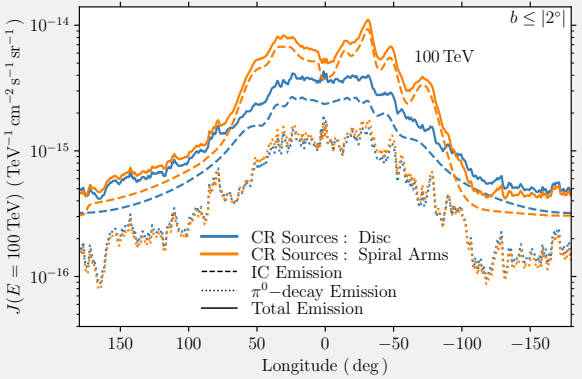
- The H.E.S.S. Galactic Plane Survey (HGPS) comprises 2673 hours of γ-ray observations above 1 TeV, covering $250^\circ \leq l \leq 65^\circ$ and $b \leq |3^\circ|$. They observed a large-scale emission along the Galactic plane.
- GALPROP propagates CRs through the Galaxy and creates γ-ray skymaps (Porter et al. 2020). We create a grid of 20 models to find the model variation
- We compare the HGPS diffuse emission to the GALPROP predictions
- Created a longitudinal profile of both data sets using a sliding averaging window of width 15°, including latitudes $-1.5^\circ < b < +1.0^\circ$

Comparing GALPROP to the HGPS and CTA GPS



Higher Energy Results





- ISRF includes Spiral arms
- GMF includes Spiral arms

For More Details See My Paper!

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The Steady-State Multi-TeV Diffuse Gamma Ray Emission Predicted with GALPROP and Prospects for the Cherenkov Telescope Array

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ABSTRACT

Cosmic Rays (CRs) interact with the diffuse gas, radiation, and magnetic fields in the interstellar medium (ISM) to produce electromagnetic emissions that are a significant component of the all-sky flux across a broad wavelength range. The *Fermi* Large Area Telescope (LAT) has measured these emissions at GeV γ-ray energies with high statistics. Meanwhile, the High-Energy Stereoscopic System (H.E.S.S.) telescope array has observed large-scale Galactic diffuse emission in the TeV γ-ray energy range. The emissions observed at GeV and TeV energies are connected by the common origin of the CR particles injected by the sources, but the energy dependence of the mixture from the general ISM (true 'diffuse'), those emanating from the relatively nearby interstellar space about the sources, and the sources themselves, is not well understood. In this paper, we investigate predictions of the broadband emissions using the GALPROP code over a grid of steady-state 3D models that include variations over CR sources, and other ISM target distributions. We compare, in particular, the model predictions in the VHE ($\gtrsim$100 GeV) γ-ray range with the H.E.S.S. Galactic plane survey (HGPS) after carefully subtracting emission from catalogued γ-ray sources. Accounting for the unresolved source contribution, and the systematic uncertainty of the HGPS, we find that the GALPROP model predictions agree with lower estimates for the HGPS source-subtracted diffuse flux. We discuss the implications of the modelling results for interpretation of data from the next generation Cherenkov Telescope Array (CTA).