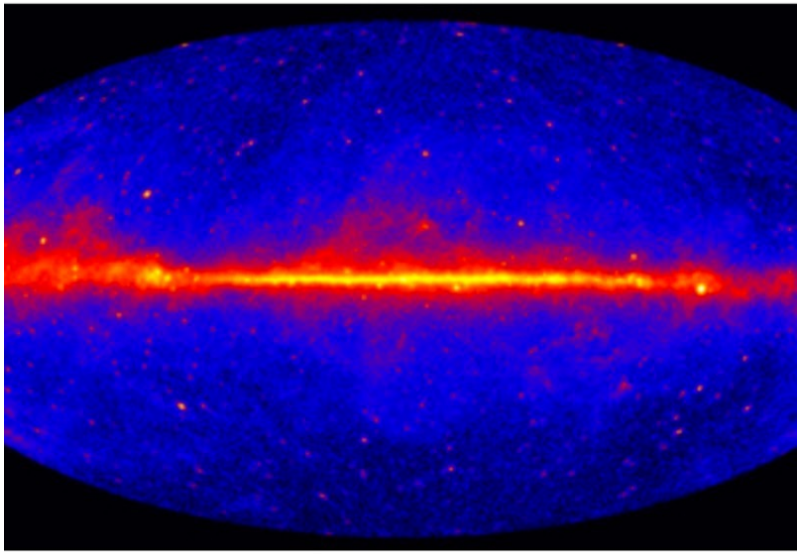
Assessing the signatures imprinted by star-forming galaxies in the cosmic γ-ray background

Ellis R Owen
CICA Fellow

Institute of Astronomy
National Tsing Hua University

erowen@gapp.nthu.edu.tw

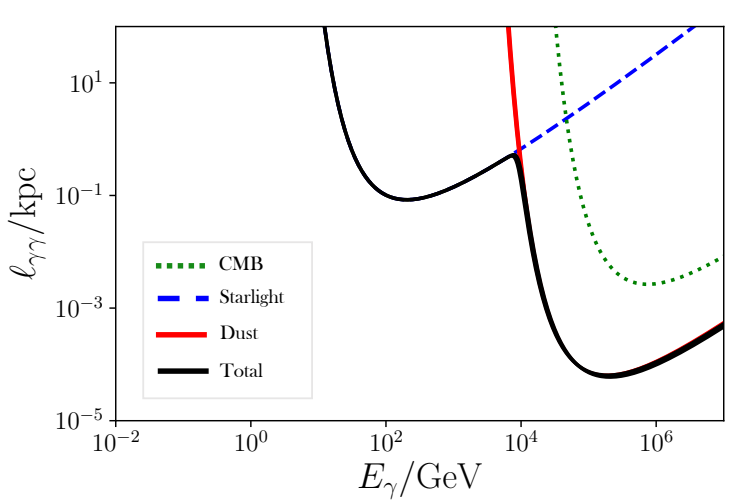
In collaboration with
Khee-Gan Lee (Kavli IPMU, Tokyo)
Albert K H Kong (NTHU)

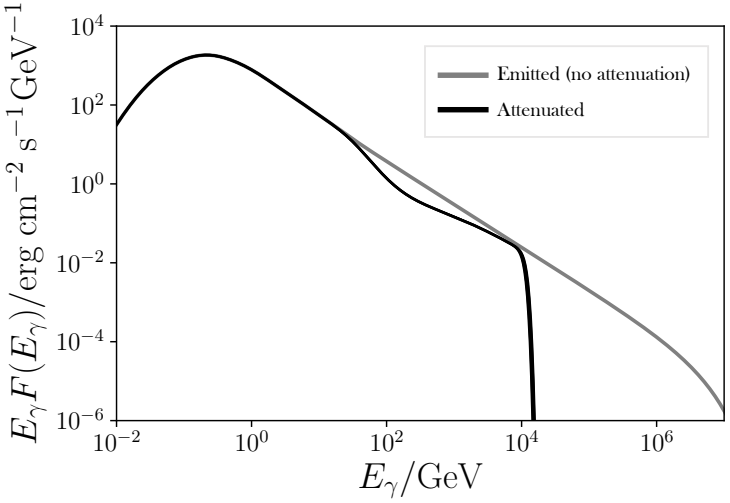


The Gamma-ray sky – Fermi LAT collaboration

ICRC 2021, Berlin, Germany (Virtual) – July 2021

γ-rays from star-forming galaxies

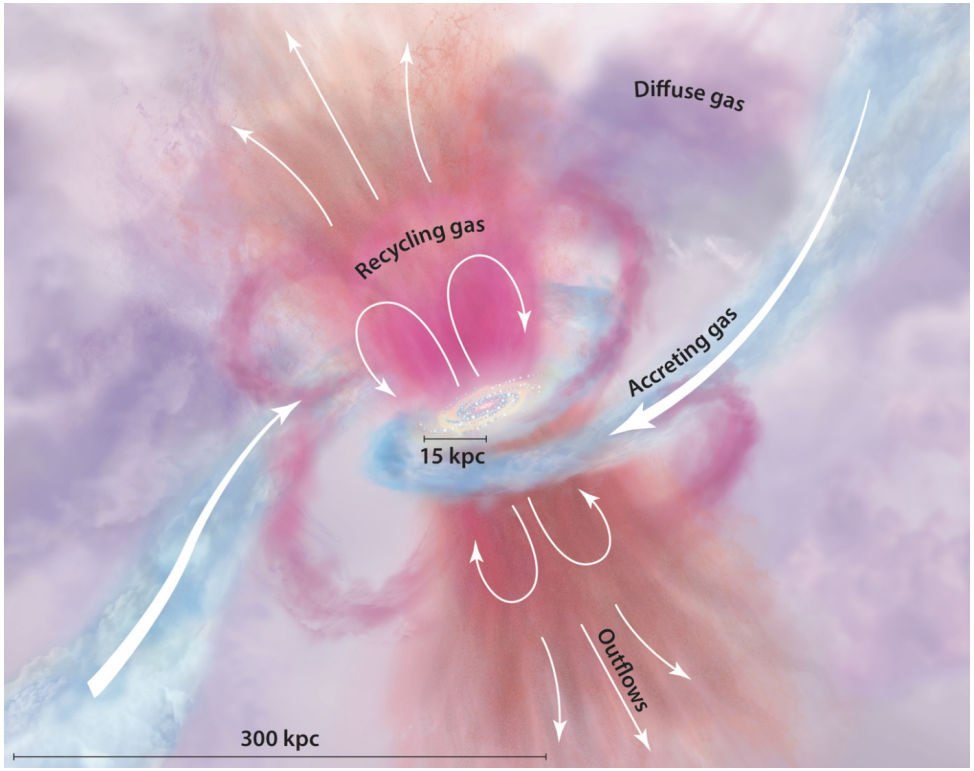




Owen+ 2021a

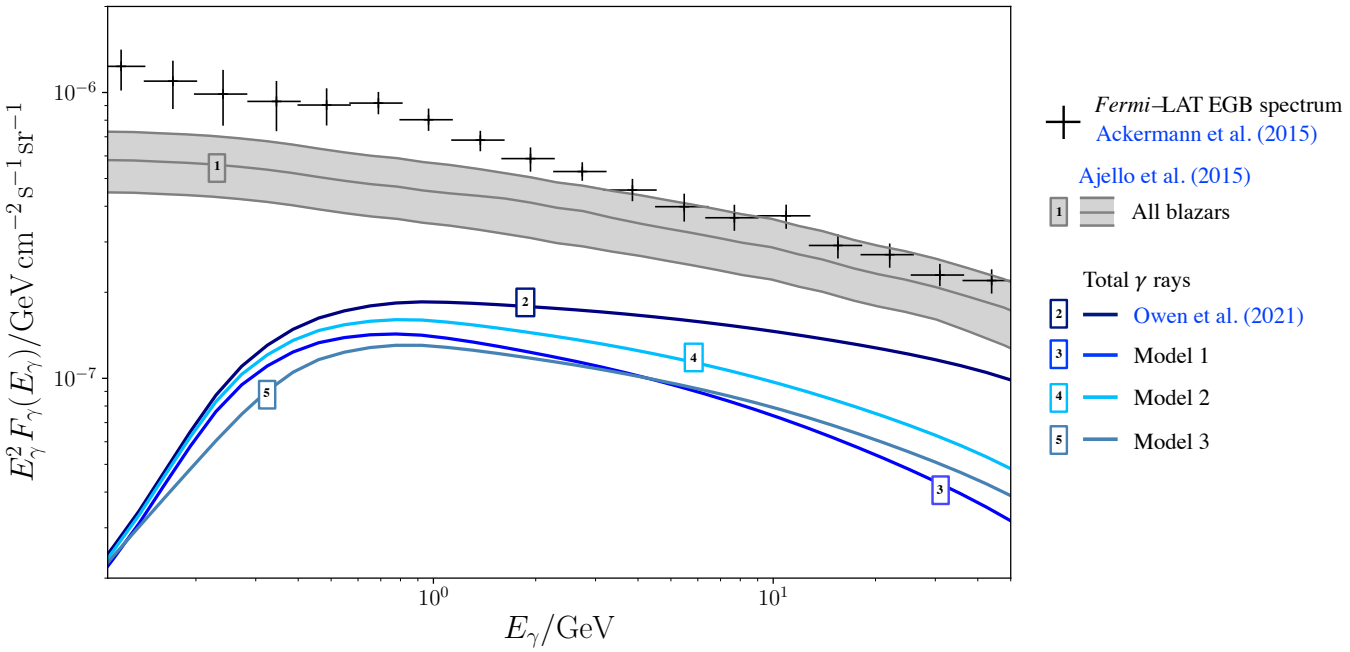
$$\frac{\mathrm{d}\mathcal{I}_\gamma}{\mathrm{d}z} = (1+z)\left[-\alpha_{\gamma\gamma}\mathcal{I}_\gamma + \frac{j_\gamma}{\nu^3}\right]\frac{\mathrm{d}s}{\mathrm{d}z}$$

Cosmic ray propagation

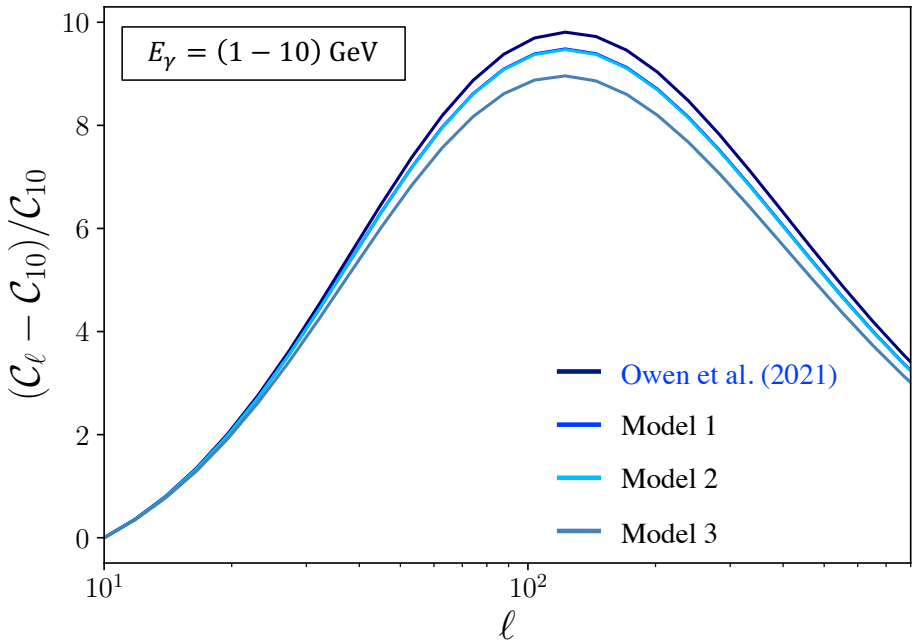


Tumlinson+ 2017

γ-ray background spectrum



γ-ray background anisotropy



Key points

1. Star-forming galaxies can make a non-negligible contribition to the extragalactic γ-ray background
2. Their γ emission spectrum can be characterised using a simple physically-motivated template model
3. CR propagation and transport in host galaxies is important
4. Properties and evolution of source populations can be accessed through γ-ray background anisotropies

For details see full paper:
***Owen, Lee & Kong MNRAS** advanced access (2021) arXiv: 2106.07308*