



UNIVERSITY
OF TRIESTE

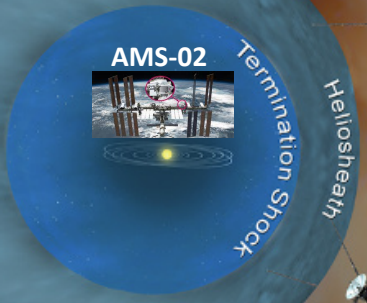
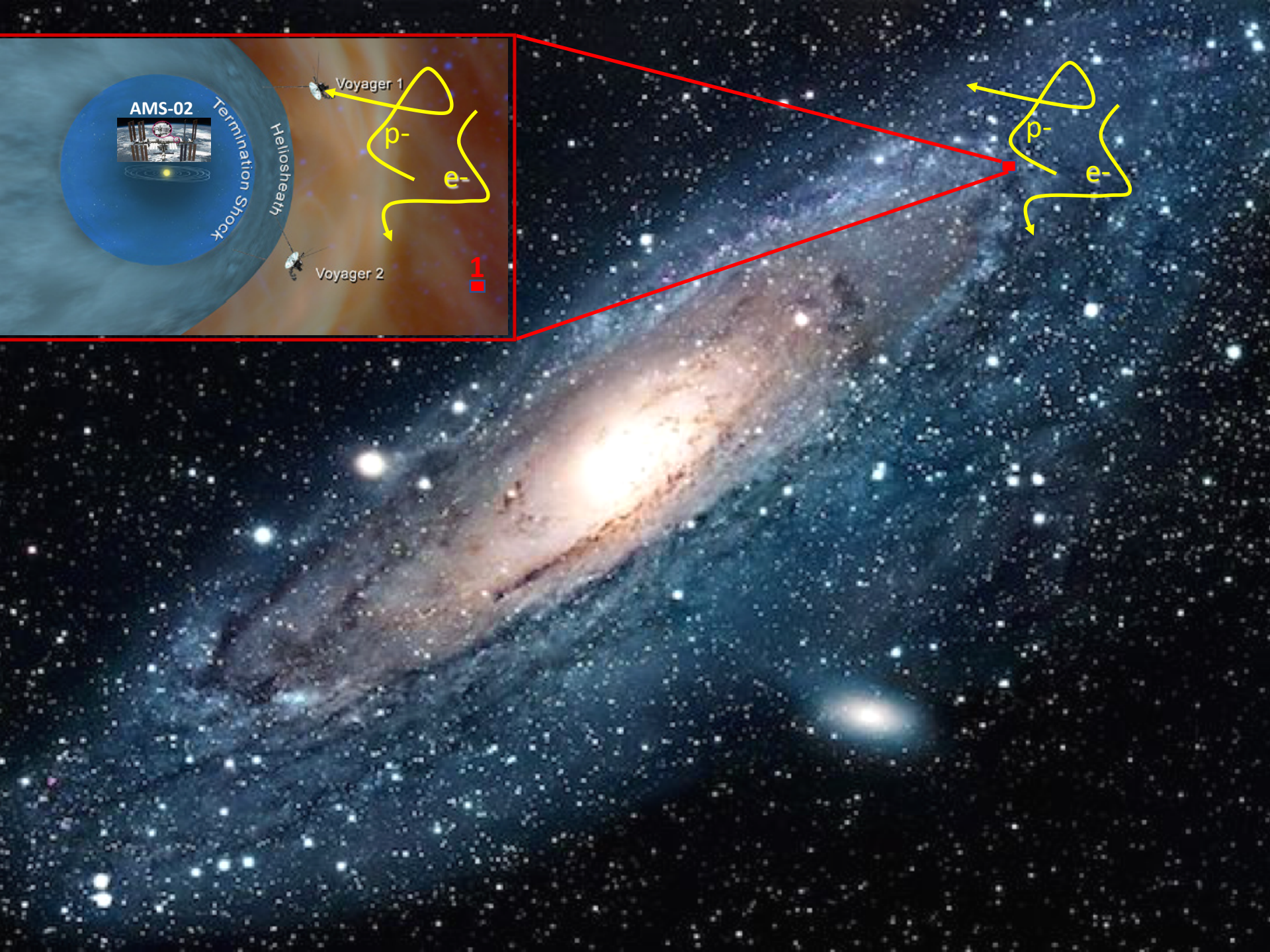


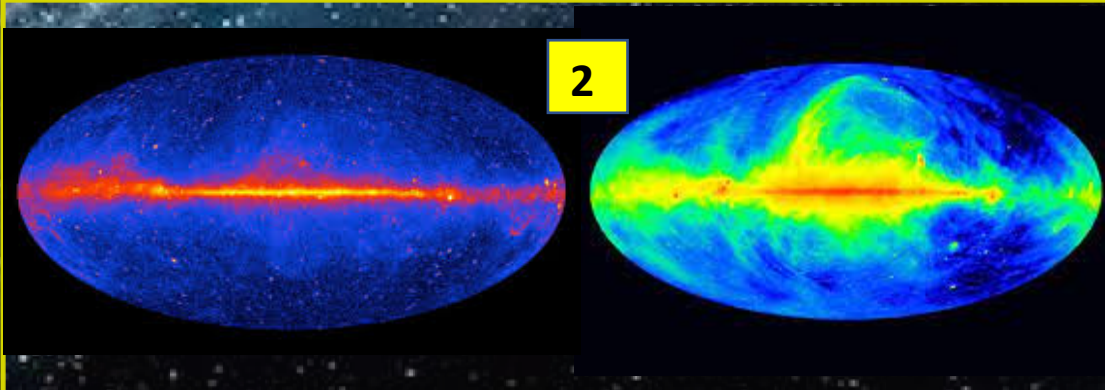
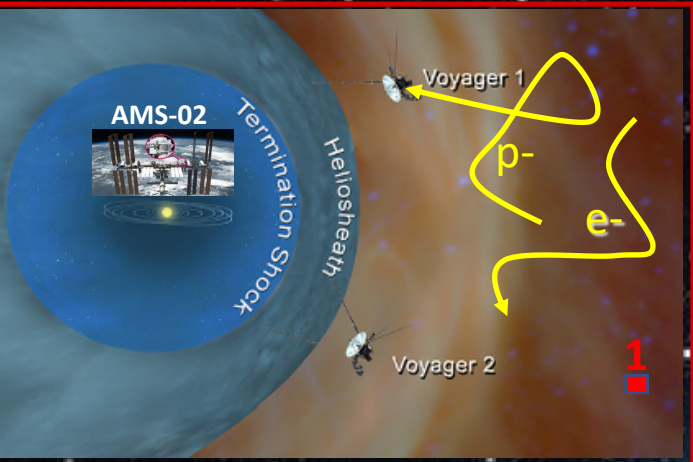
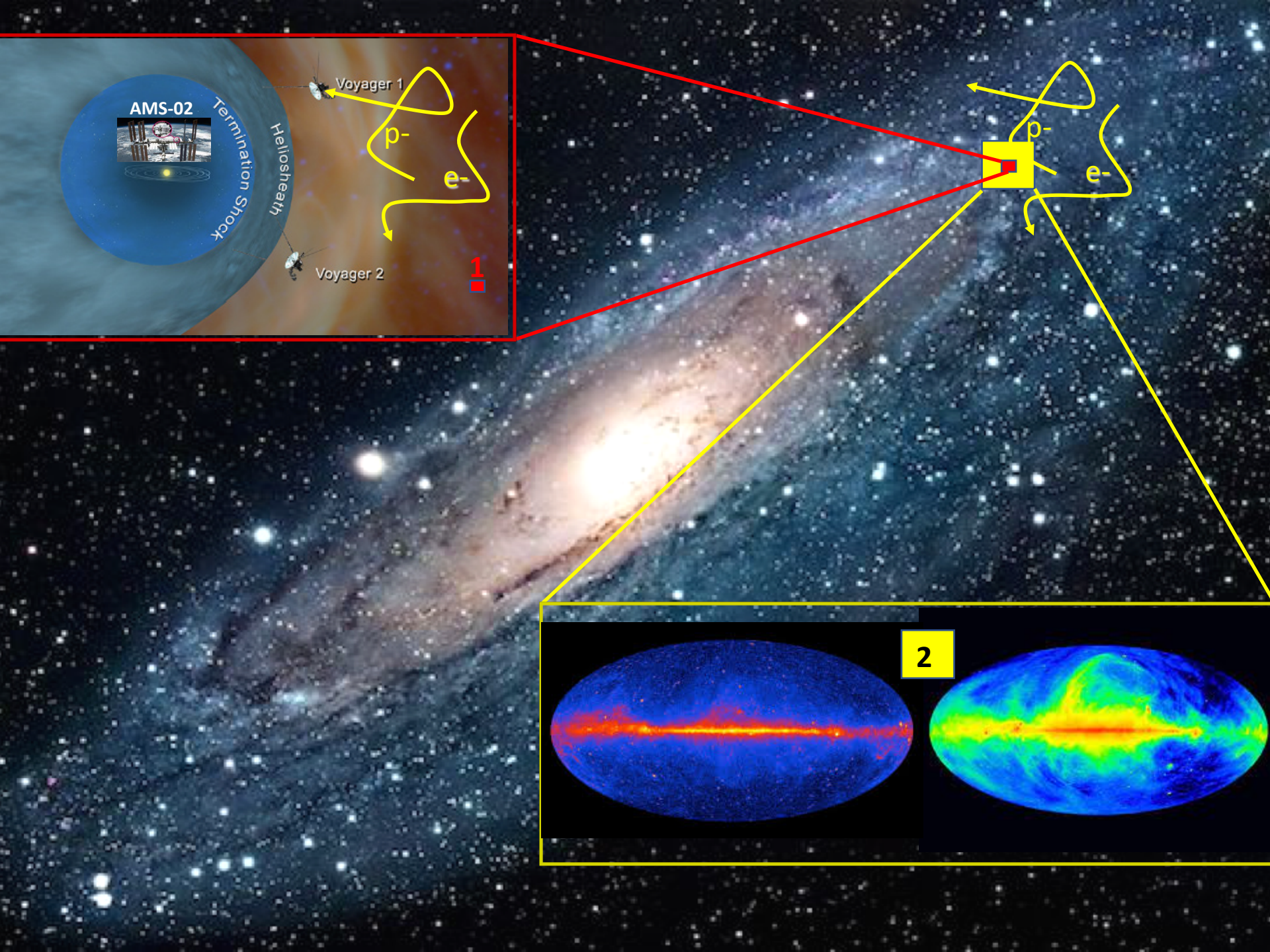
Stanford
University

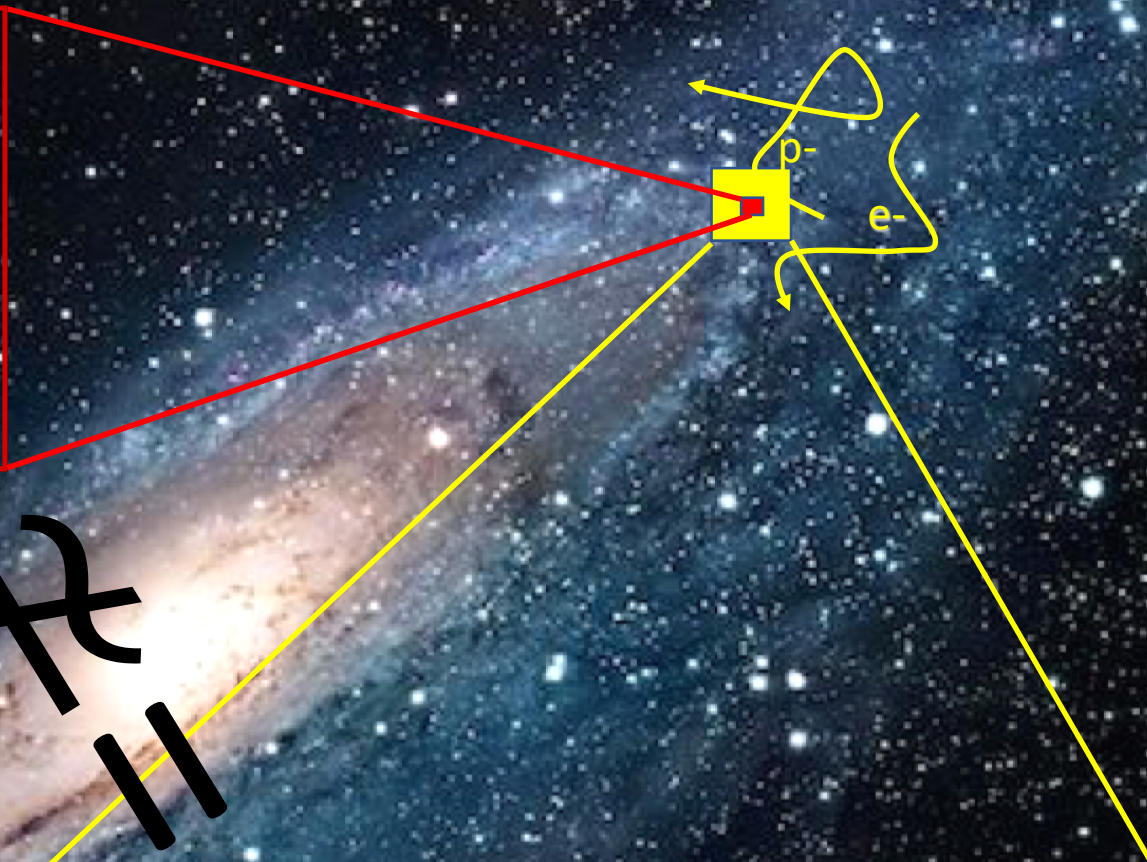
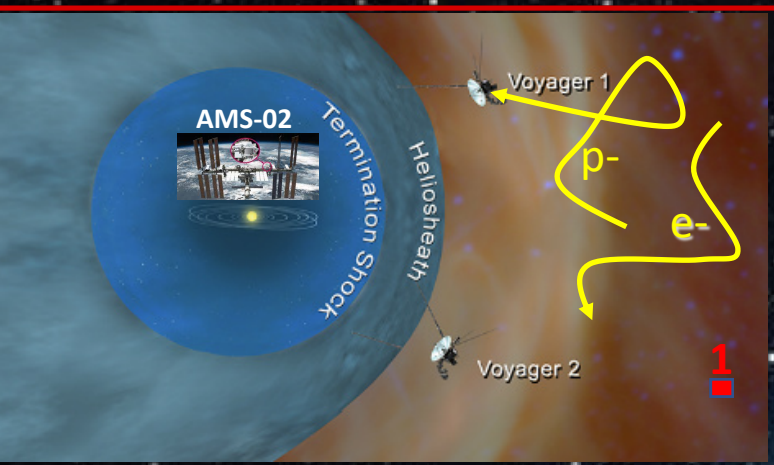
Interstellar cosmic-ray spectra
(1) just outside the heliosphere and
(2) in the local medium:
are they the same?

Elena Orlando

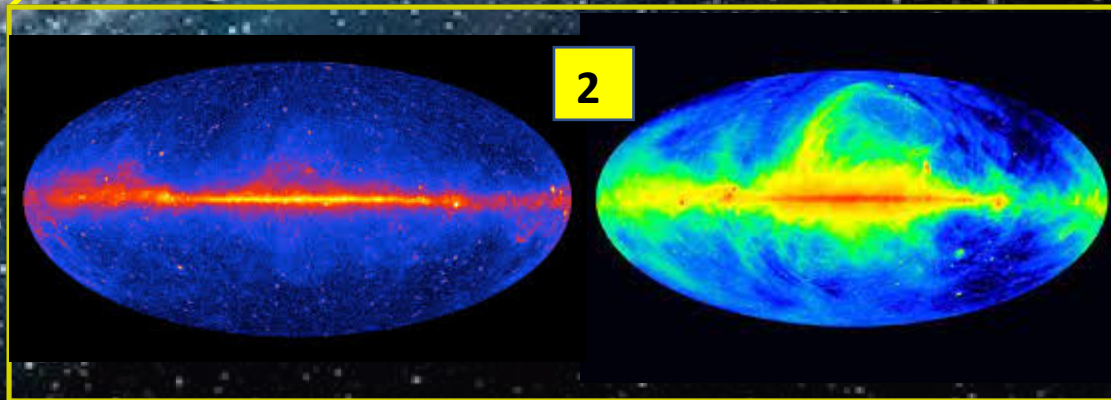
(University of Trieste/INFN & Stanford University)

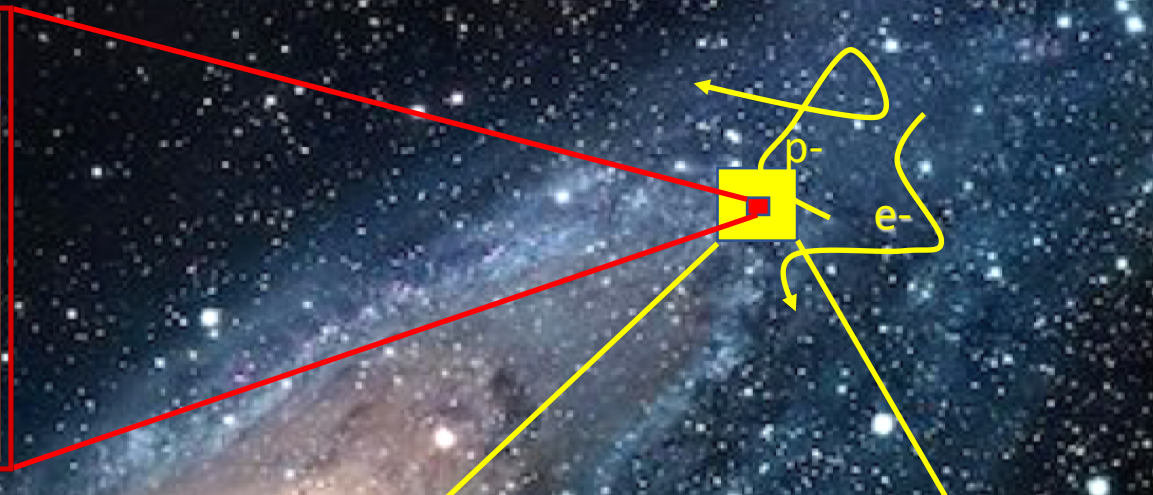
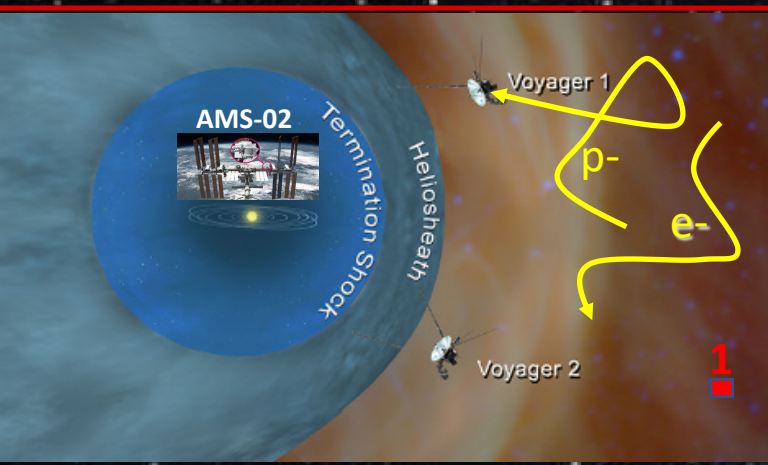




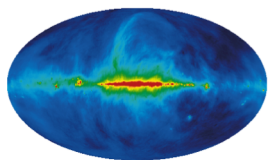


$\chi = 11$



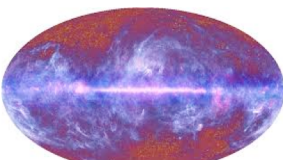


OUR METHOD:



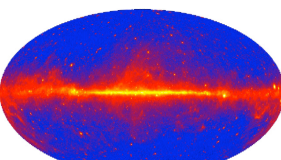
Radio Surveys

+



Microwaves

+



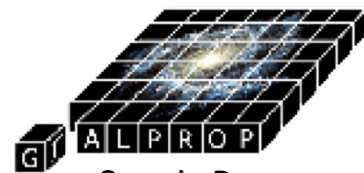
Gamma Rays

+

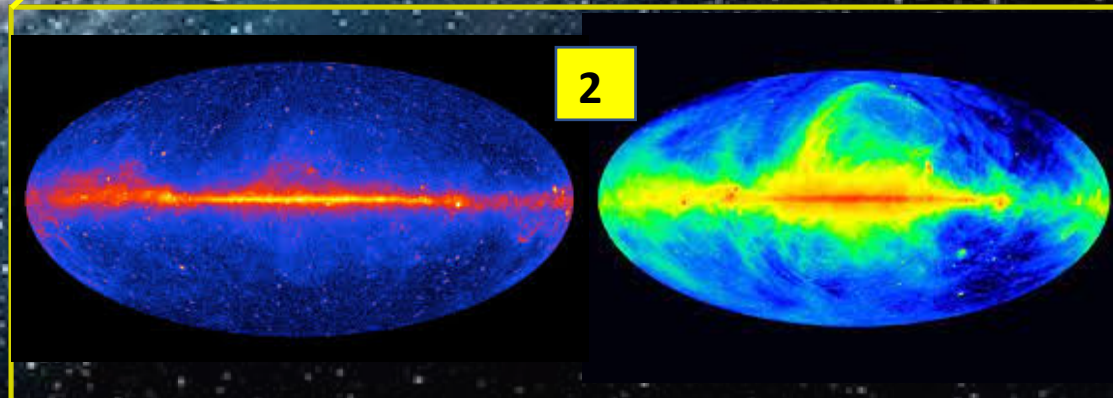


Cosmic Rays Measurements

+

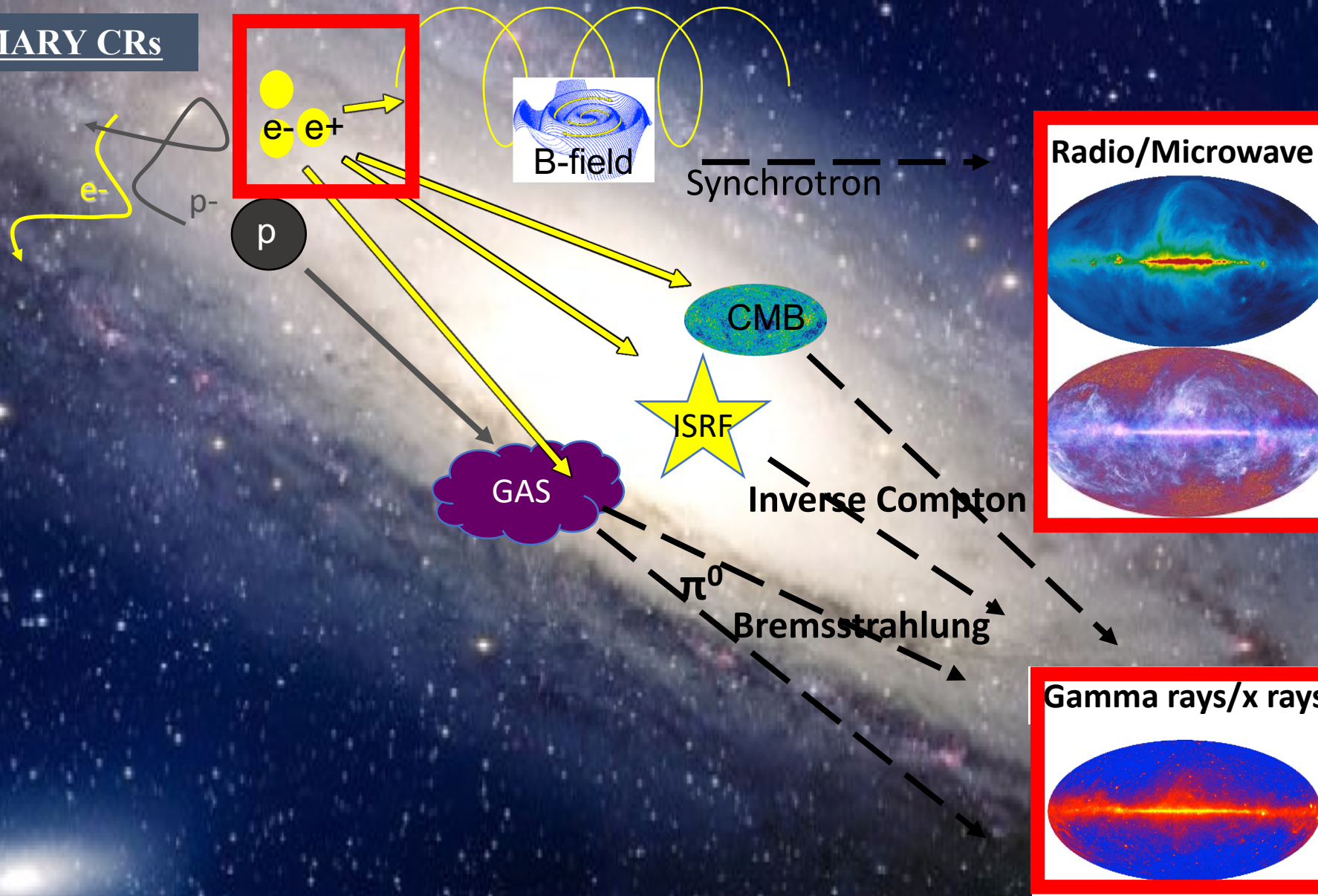


Cosmic-Ray Propagation Models



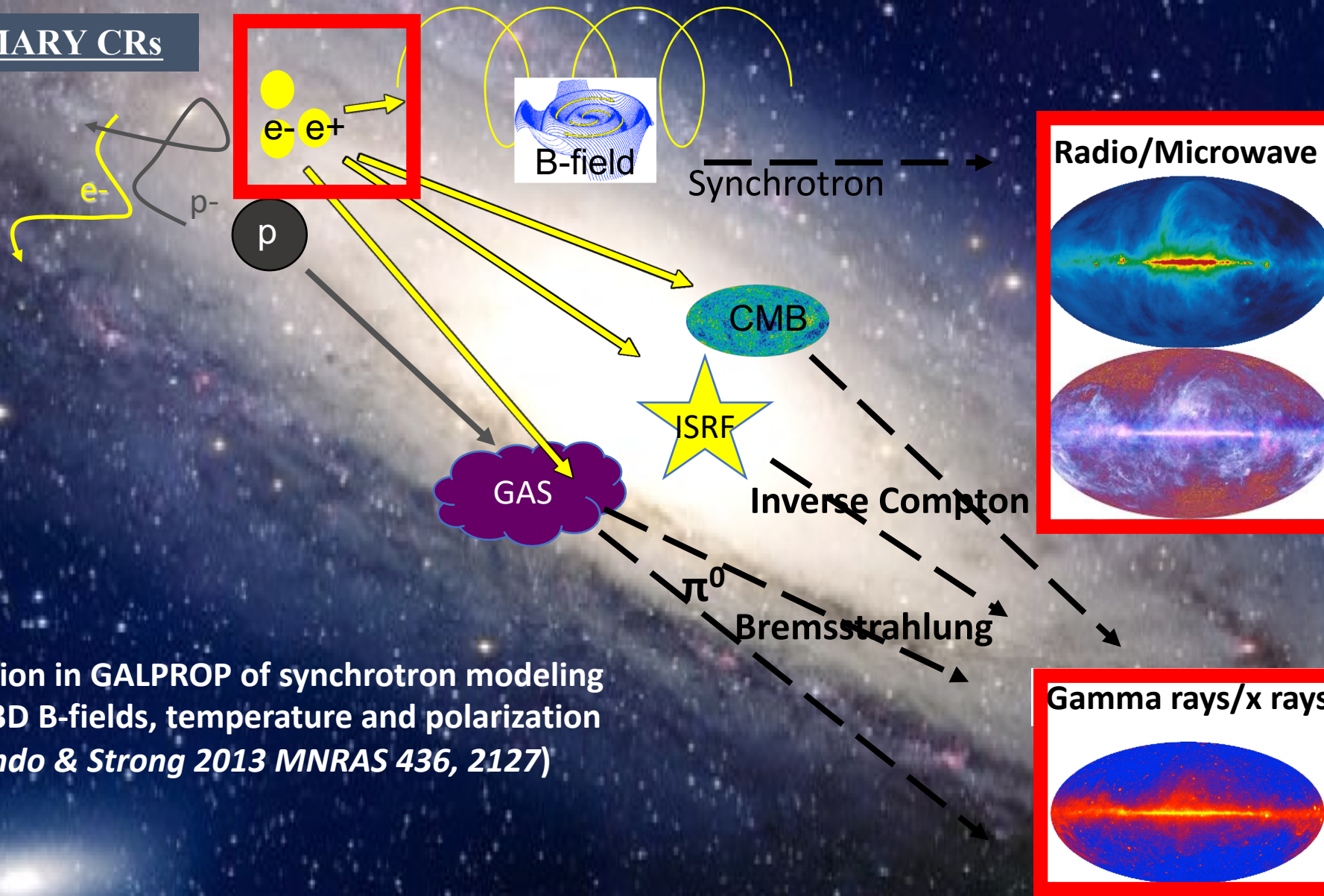
Diffuse Interstellar Emission

PRIMARY CRs



Diffuse Interstellar Emission

PRIMARY CRs

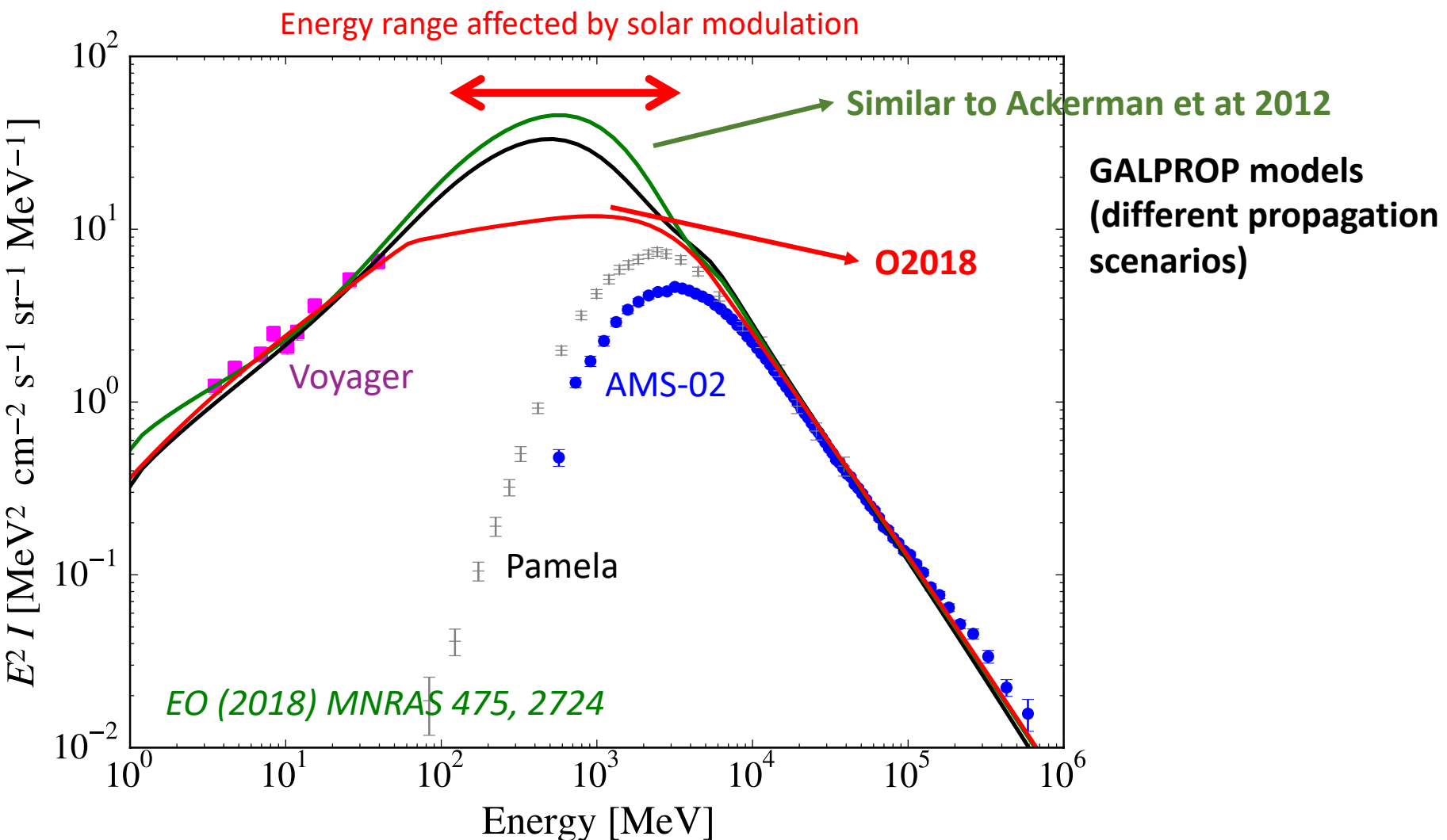


Inclusion in GALPROP of synchrotron modeling with 3D B-fields, temperature and polarization (Orlando & Strong 2013 MNRAS 436, 2127)

Results

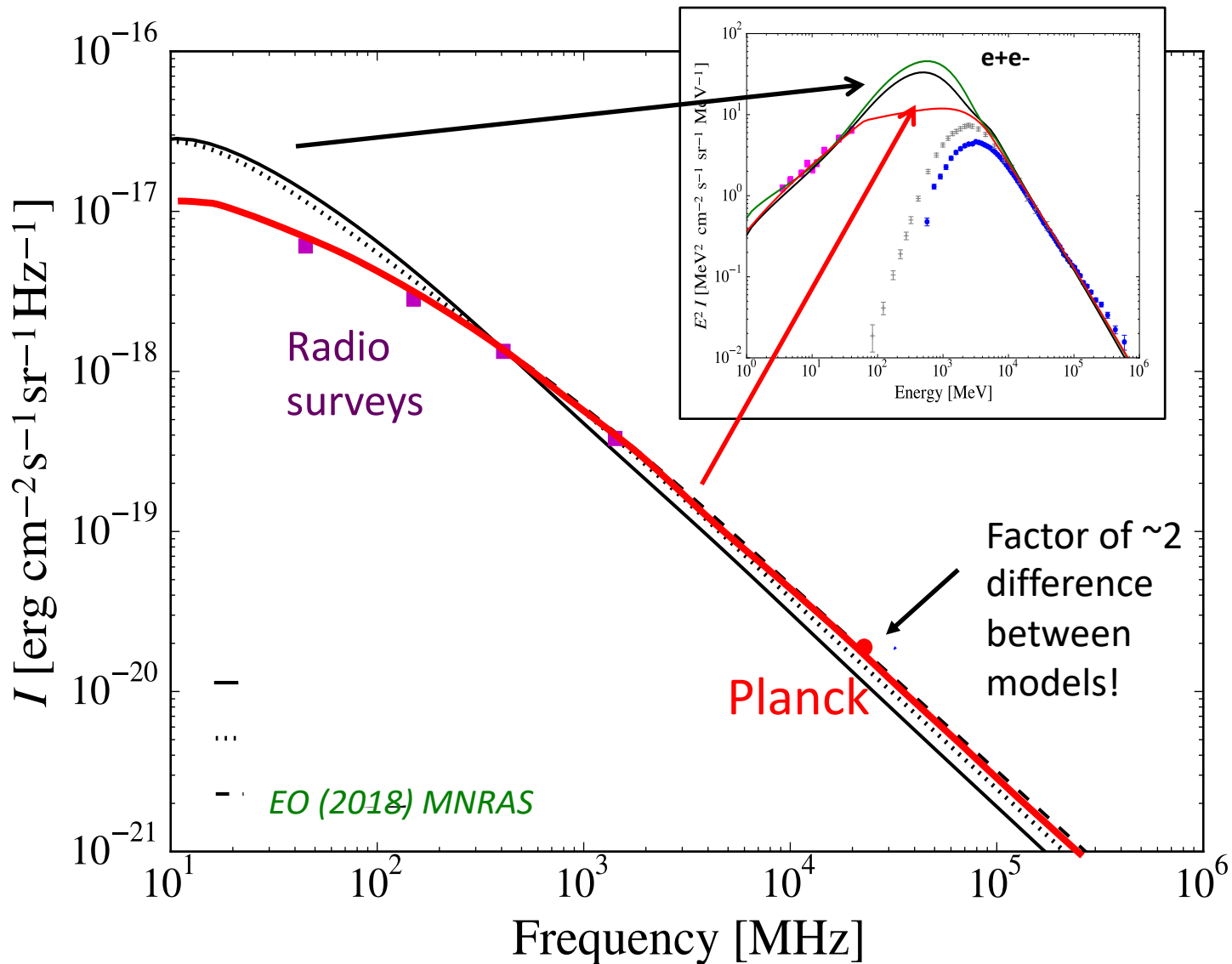
(from Orlando (2018) MNRAS 475, 2724)

Results: Local Interstellar e^+e^- (indep. from solar modulation) & Propagation Scenarios

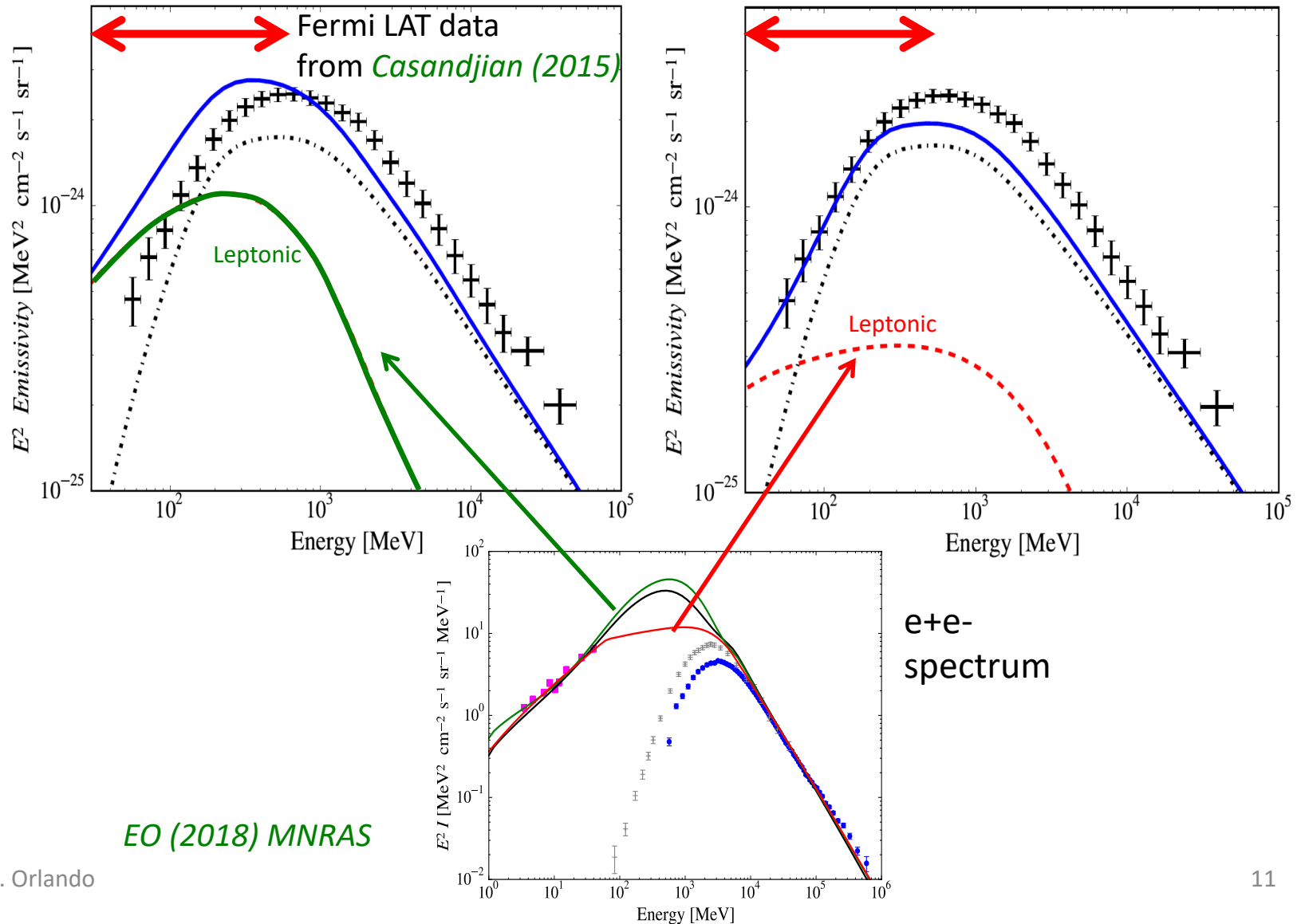


Elena Orlando
 (see also *Strong+ (2011)*, *EO & Strong (2013)*)

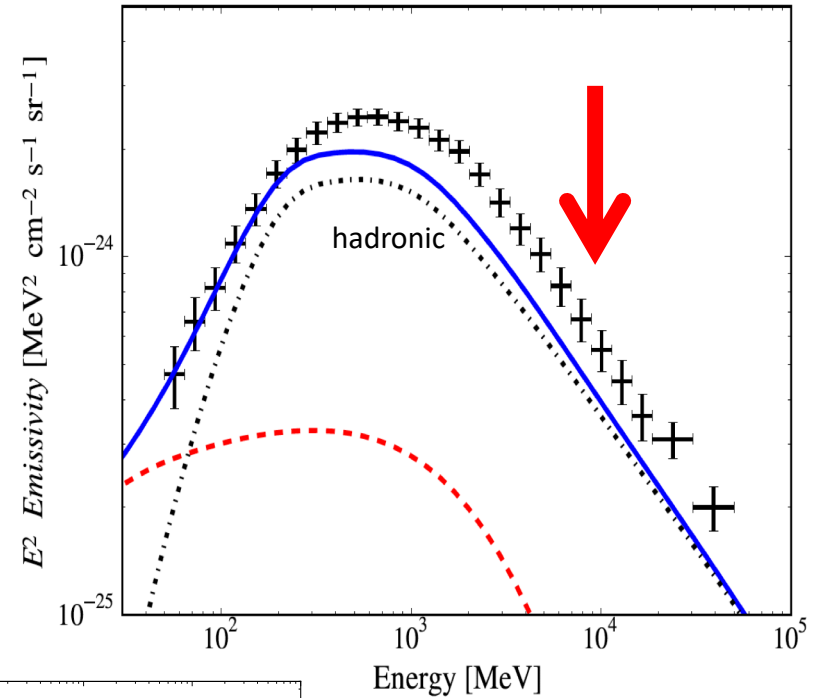
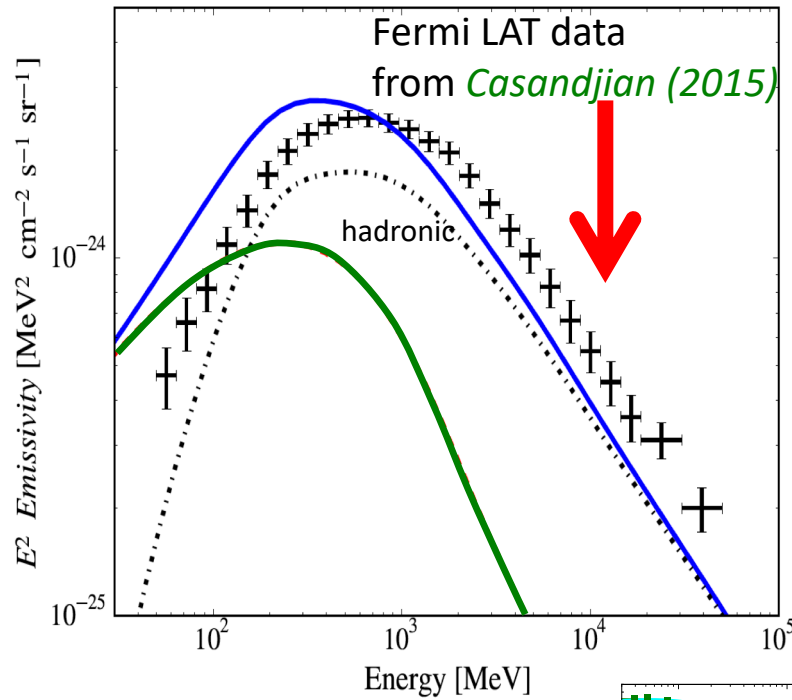
Synchrotron Spectrum



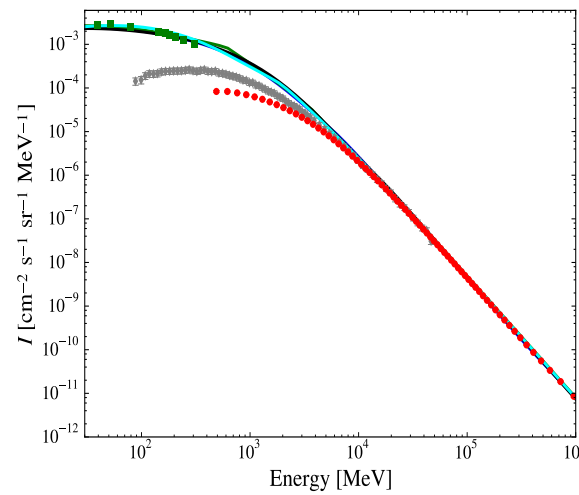
Local HI Gamma-Ray Emissivity (Bremsstrahlung + Pion decay)



Local HI Gamma-Ray Emissivity (Bremsstrahlung + Pion decay)



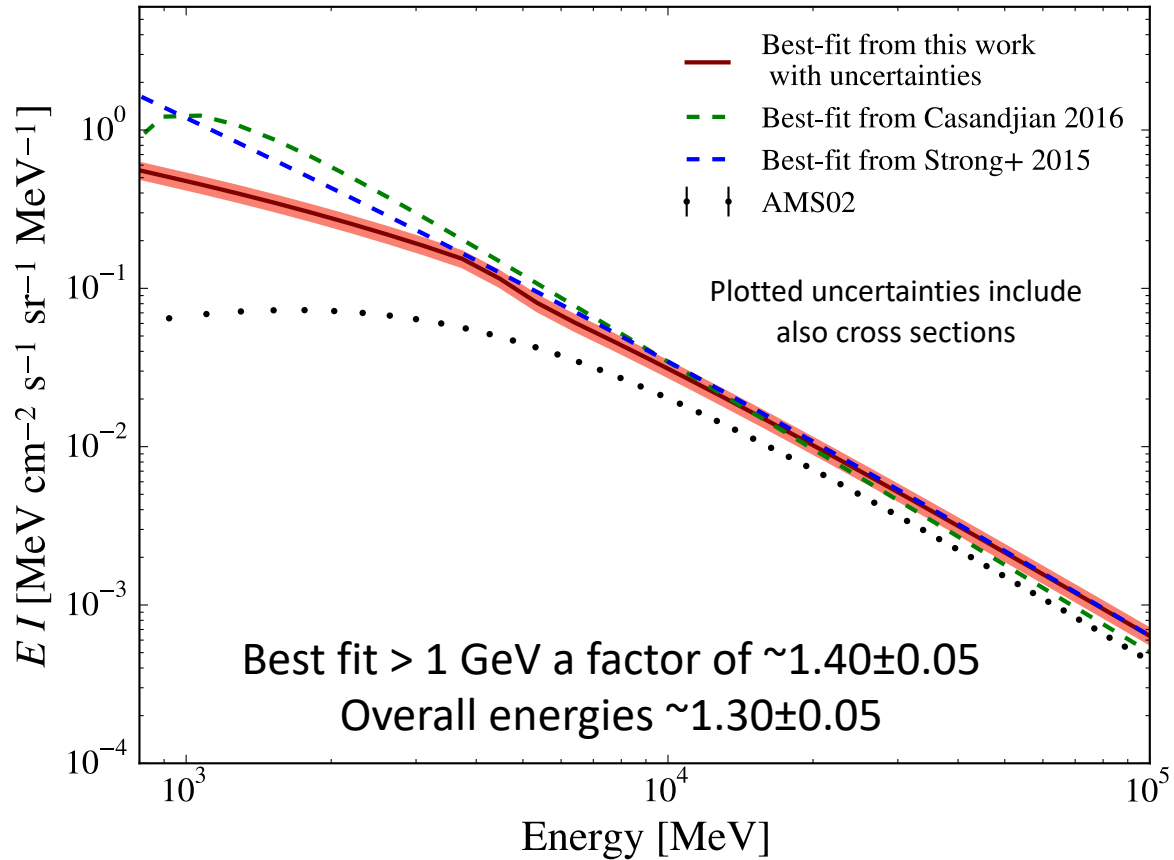
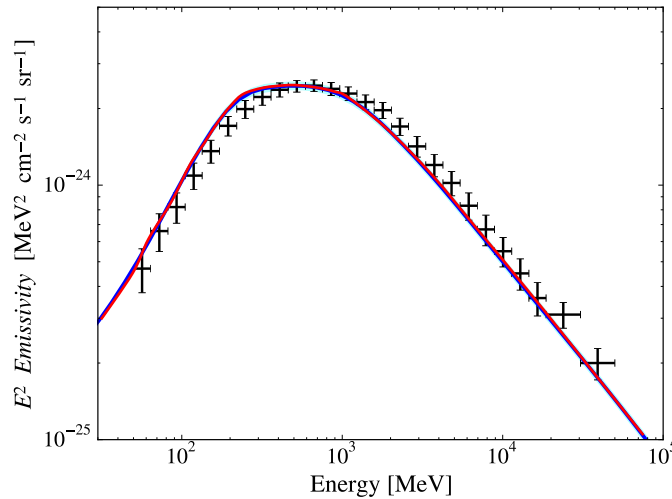
EO (2018) MNRAS



Proton and heavier nuclei spectra
consistent with *Cummings+ (2016) ApJ*
and *Boschini+ (2017) ApJ*

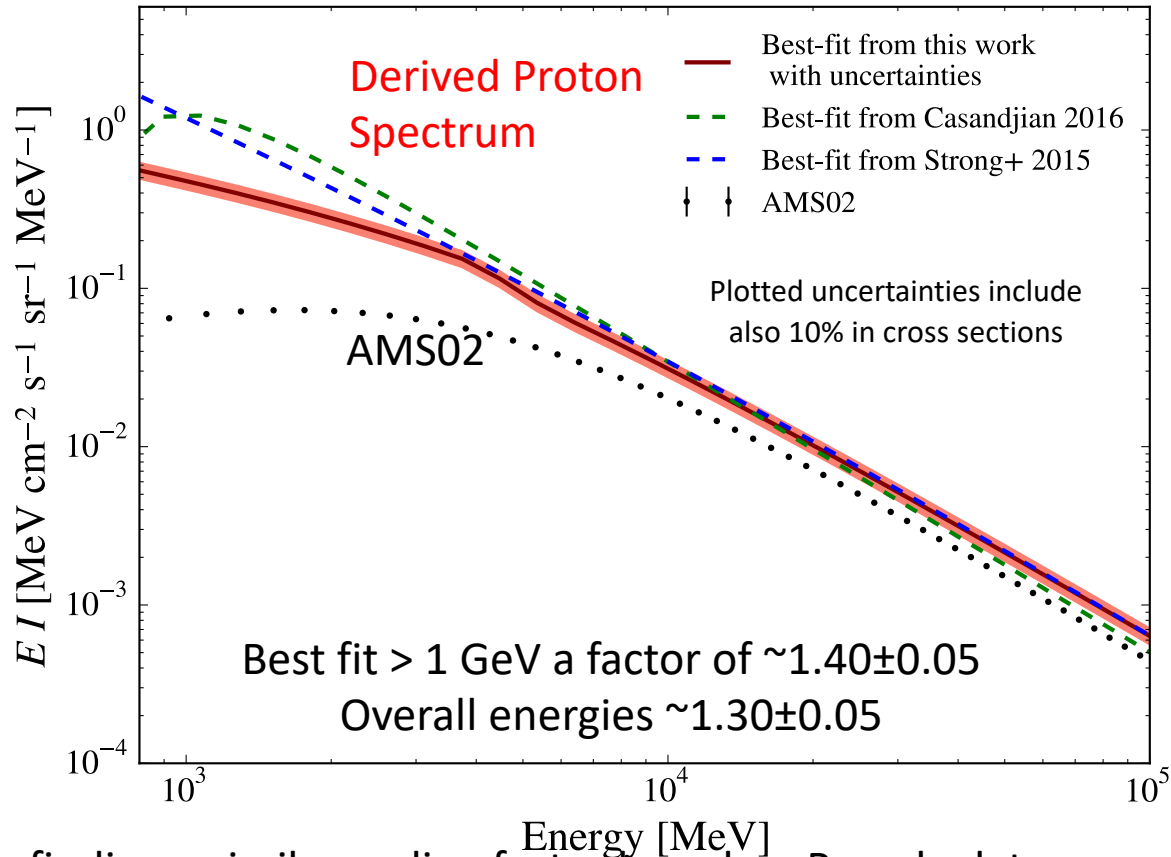
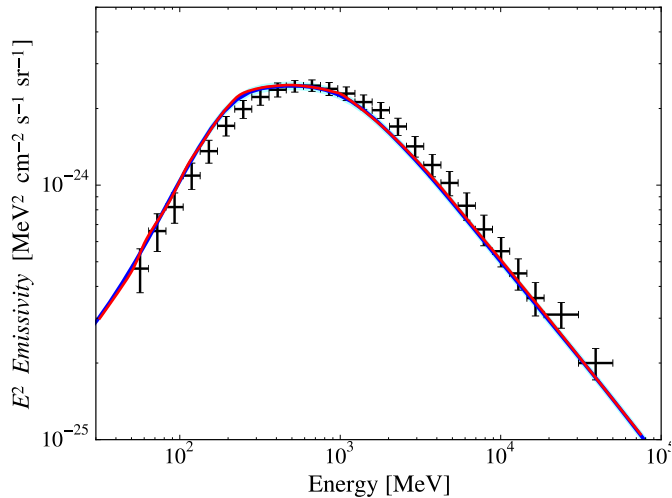
Local HI Gamma-Ray Emissivity & Derived Proton Spectrum

EO (2018)



Local HI Gamma-Ray Emissivity & Derived Proton Spectrum

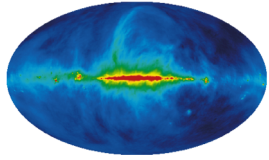
EO (2018)



With respect to previous works finding a similar scaling factor based on Pamela data (*Strong+ 2015, Dermer+ 2015*) AMS02 data are more precise obtaining a more clear discrepancy between measured AMS spectrum and local interstellar proton spectrum obtained by gamma ray data

Summary

OUR METHOD:



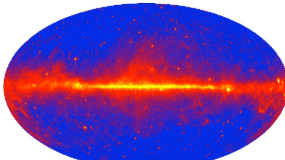
Radio Surveys

+



Microwaves

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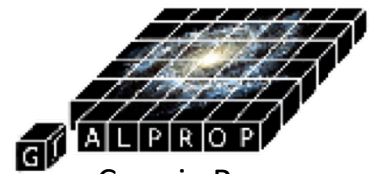
Gamma Rays

+



Cosmic Rays Measurements

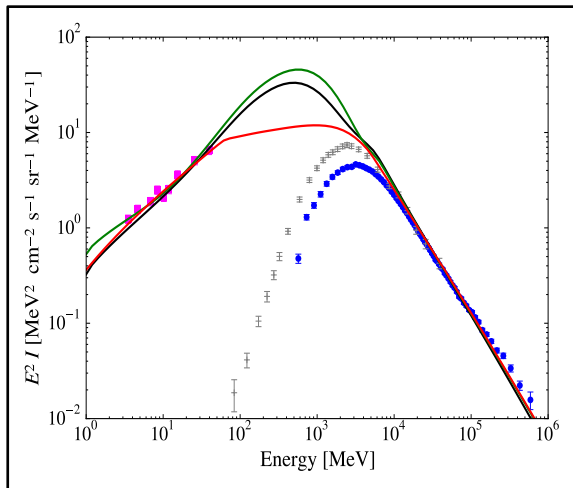
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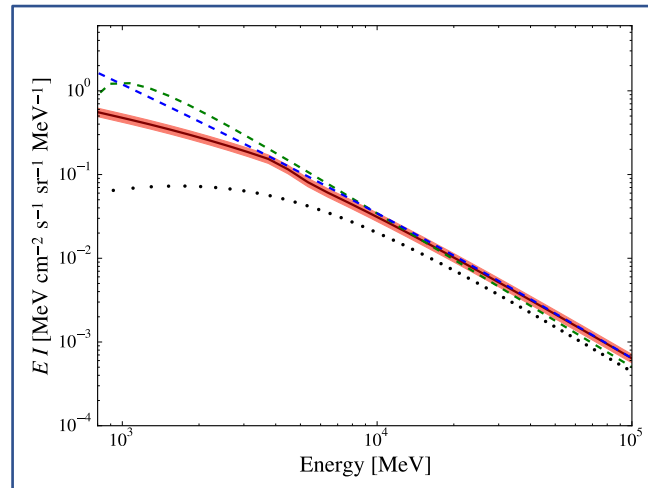
Cosmic-Ray Propagation Models



RESULTS:



Best local **e+e-** spectrum that fits direct CR measurements, synchrotron, and gamma rays, independent from solar modulation assumptions



Best local **proton** spectrum that fits local gamma rays

If the local emissivity data are correct \rightarrow the measured proton spectrum is not representative for the spectrum in the ~ 1 kpc region