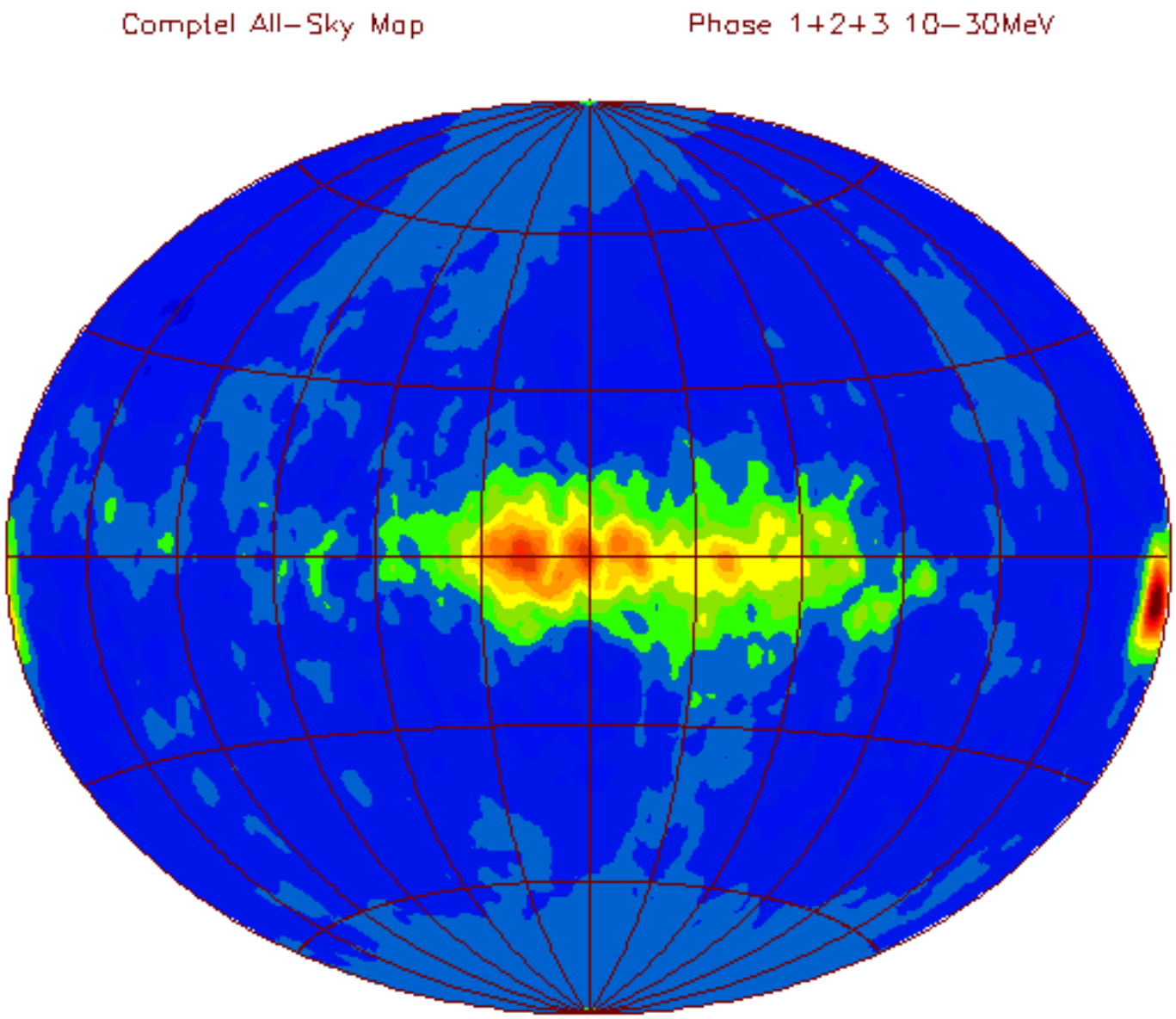
The MeV Sky — A Wealth of Opportunity for High-energy Astrophysics and More

Tonia Venters

Future MeV Workshop

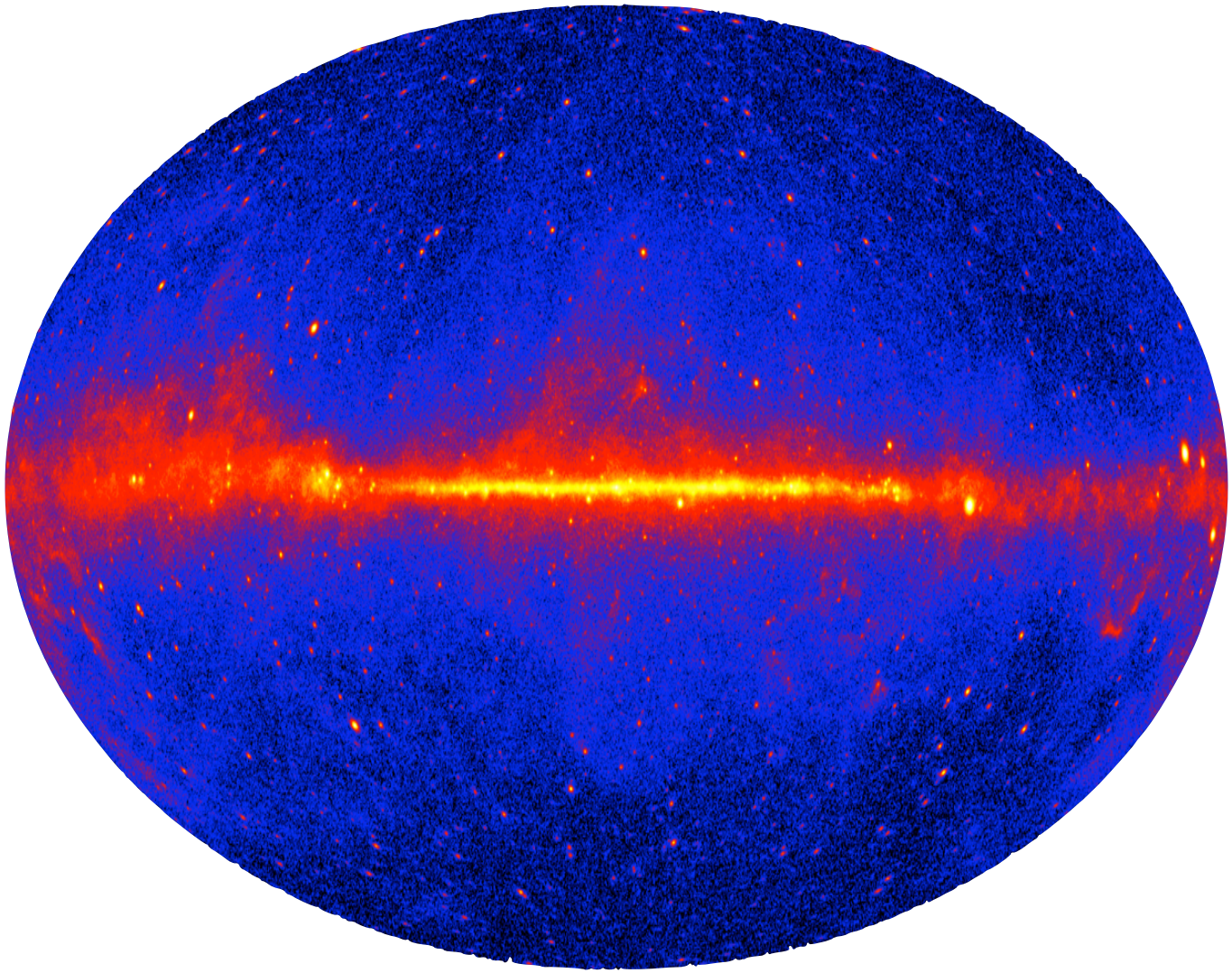
February 5, 2015

Why MeV?



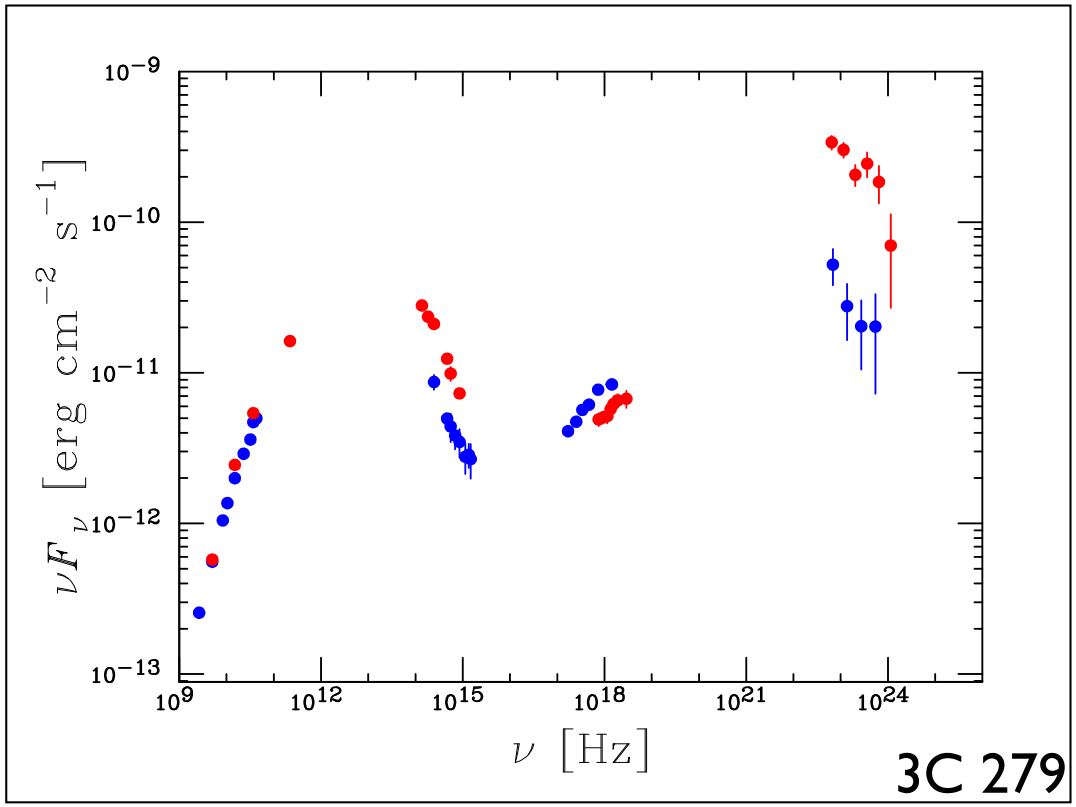
COMPTEL

Why MeV?



Fermi 5-yr Map

Blazar Emission Mechanisms

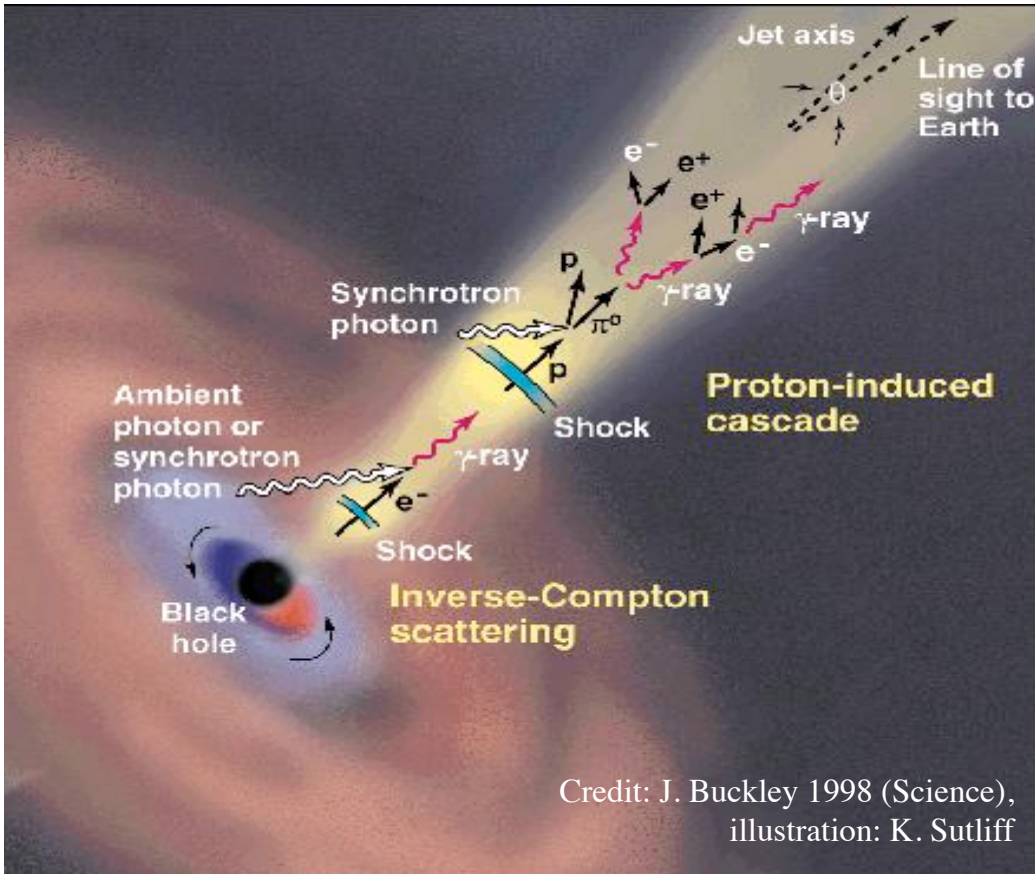


Leptonic - HE hump due to Inverse Compton scattering

- Synchrotron Self-Compton
- External Compton

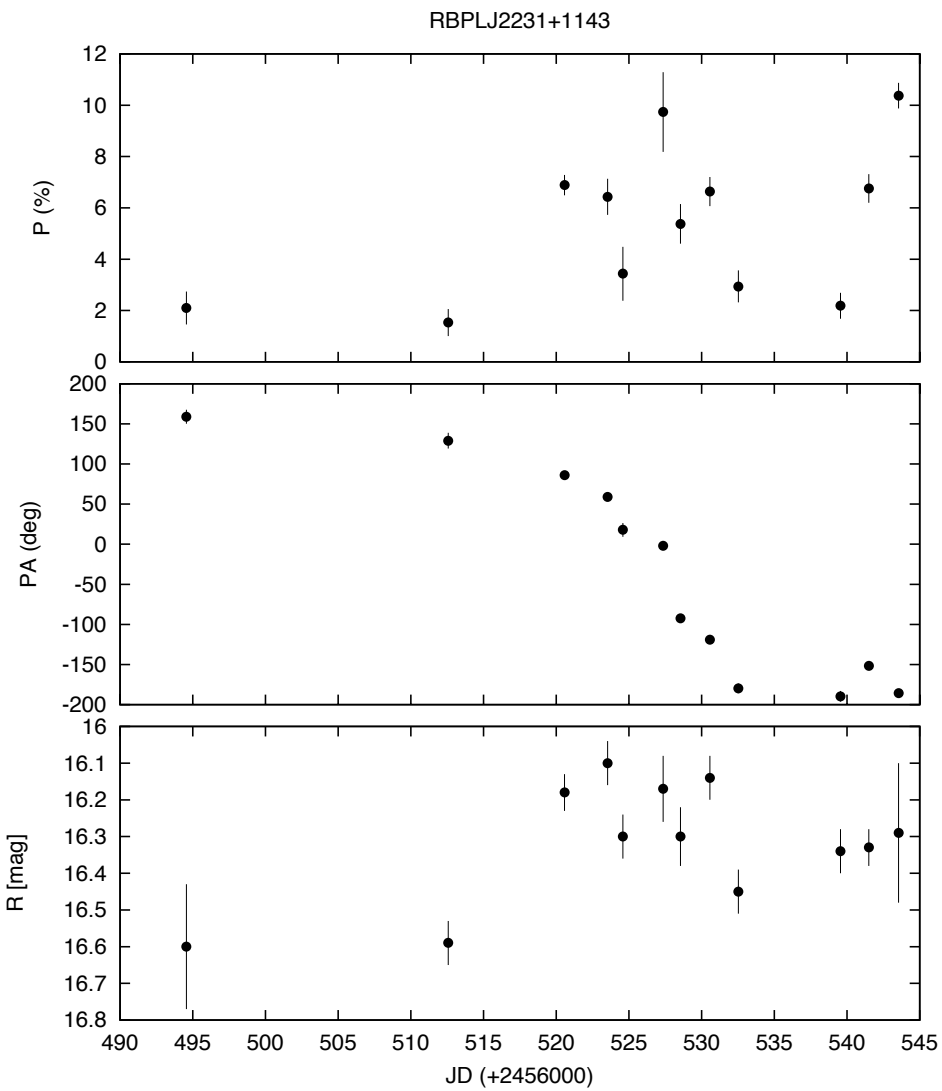
Hadronic - HE hump due to emission from hadronic interactions

- Proton Synchrotron
- Photomeson production
- Muon Synchrotron

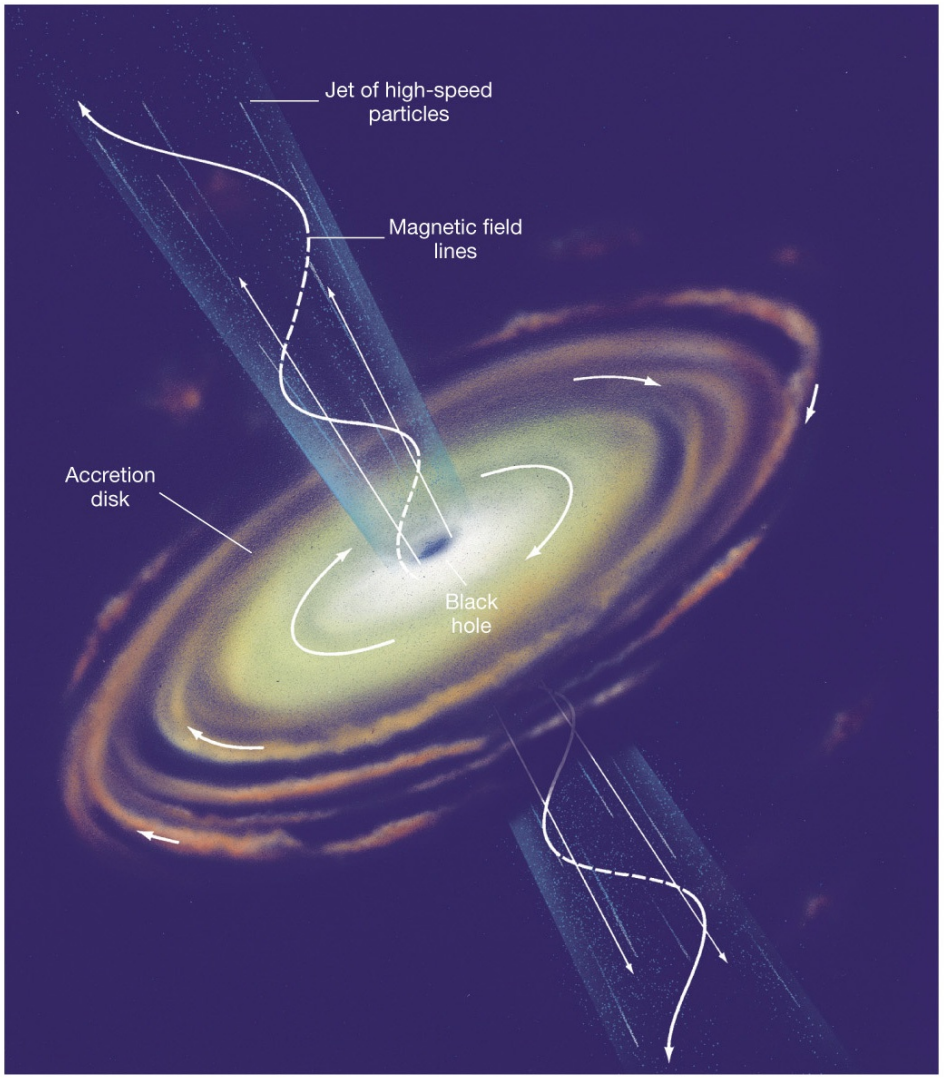


Credit: J. Buckley 1998 (Science), illustration: K. Sutliff

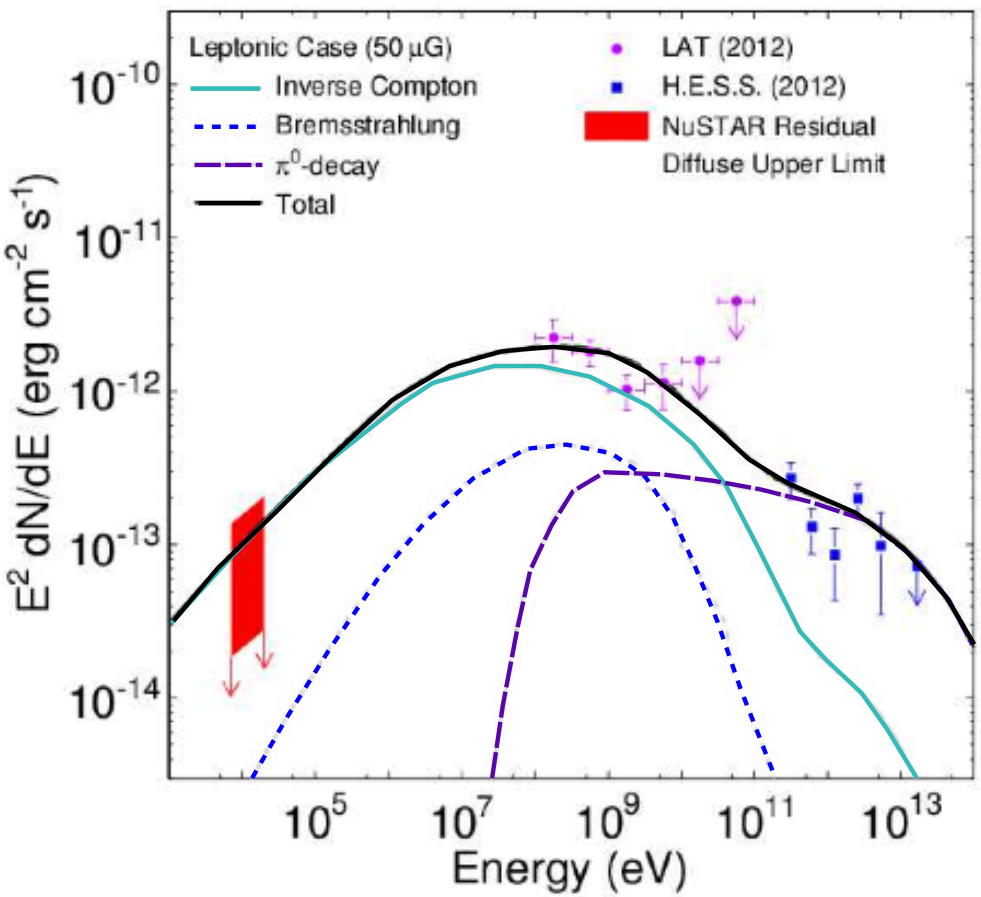
Probing Jets and their B Fields



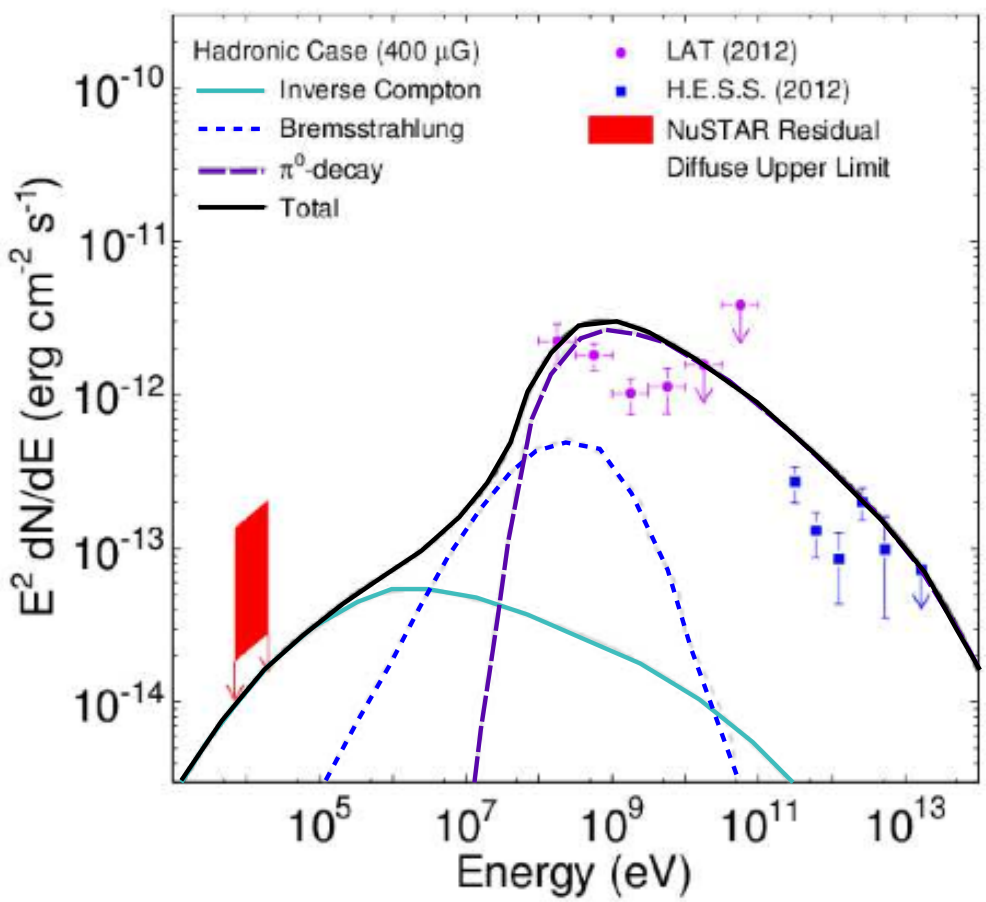
CTA 102



Broadband Diffuse in Starburst Galaxies



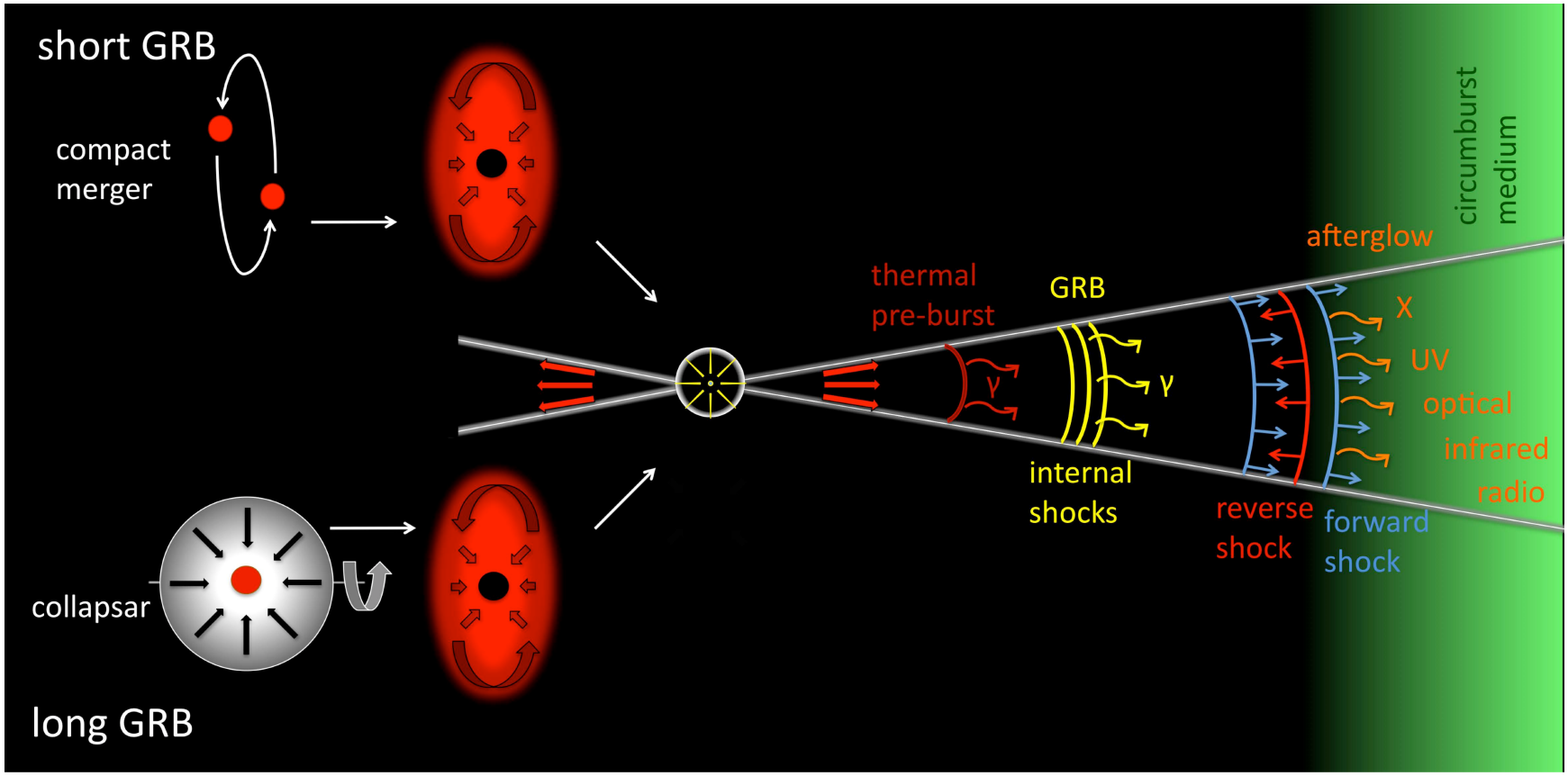
Leptonic Model



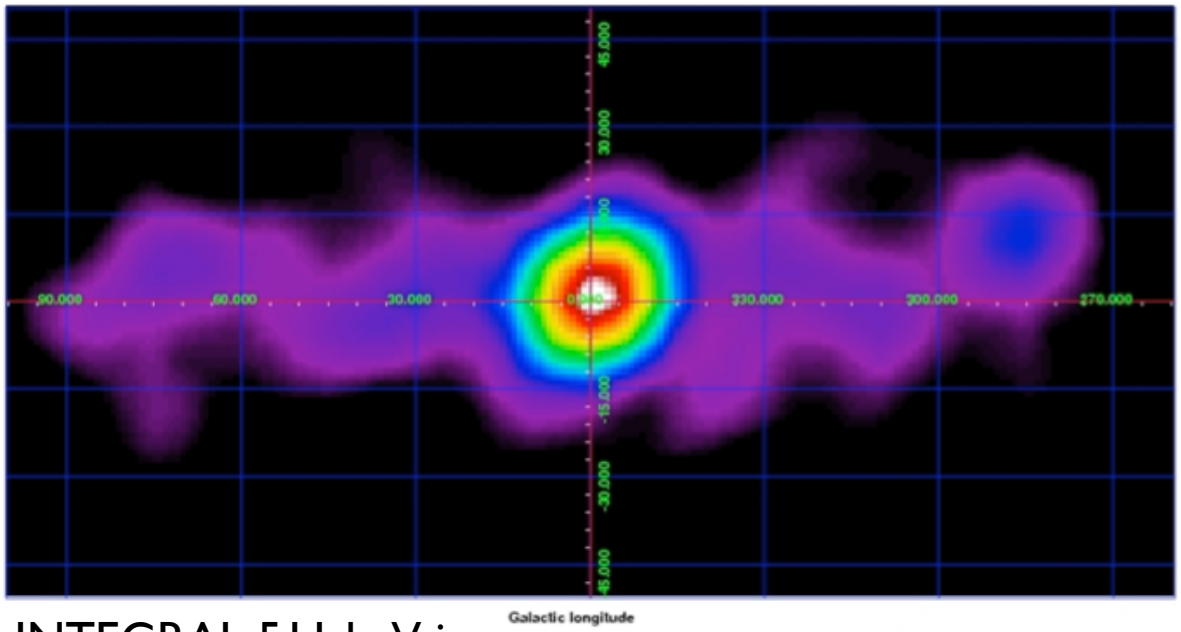
Hadronic Model

Wik et al. 2014

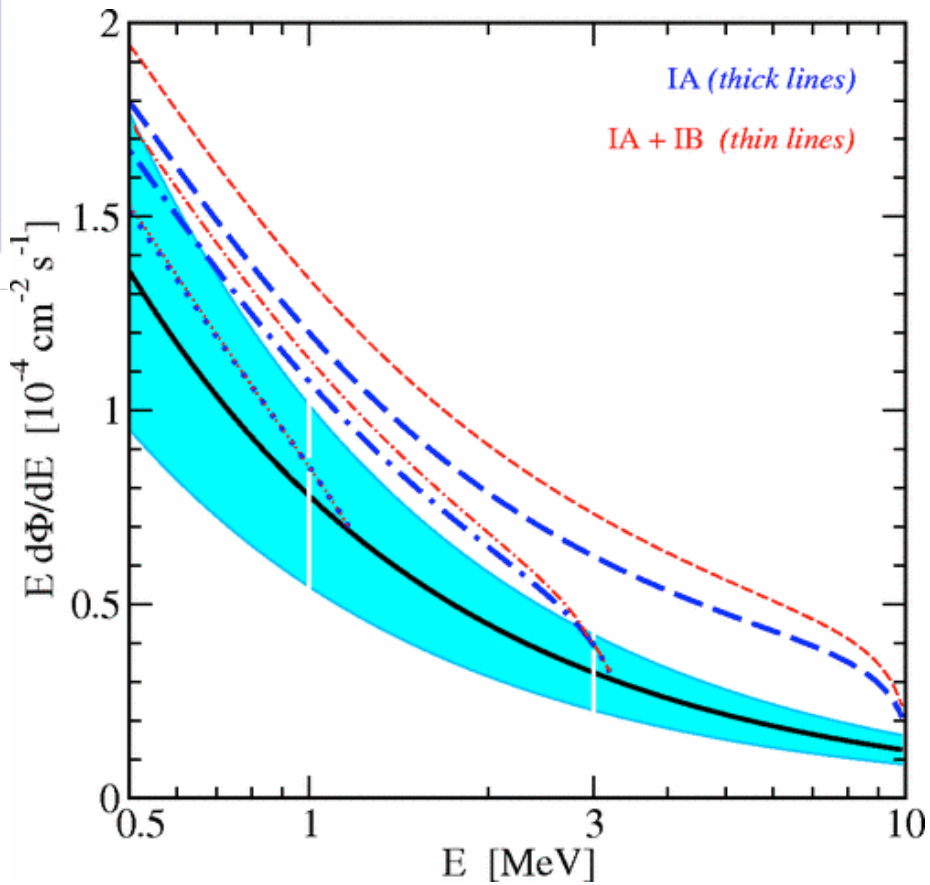
GRB Emission Mechanisms



Lines?!?!?!

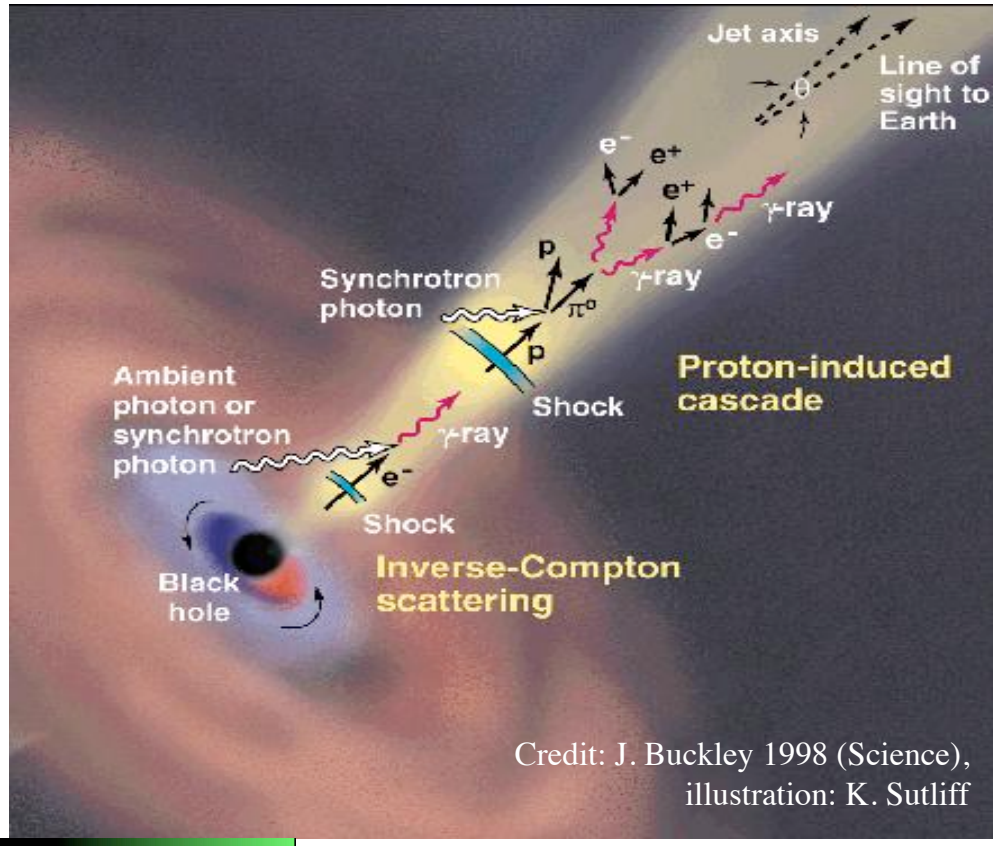


INTEGRAL 511 keV image

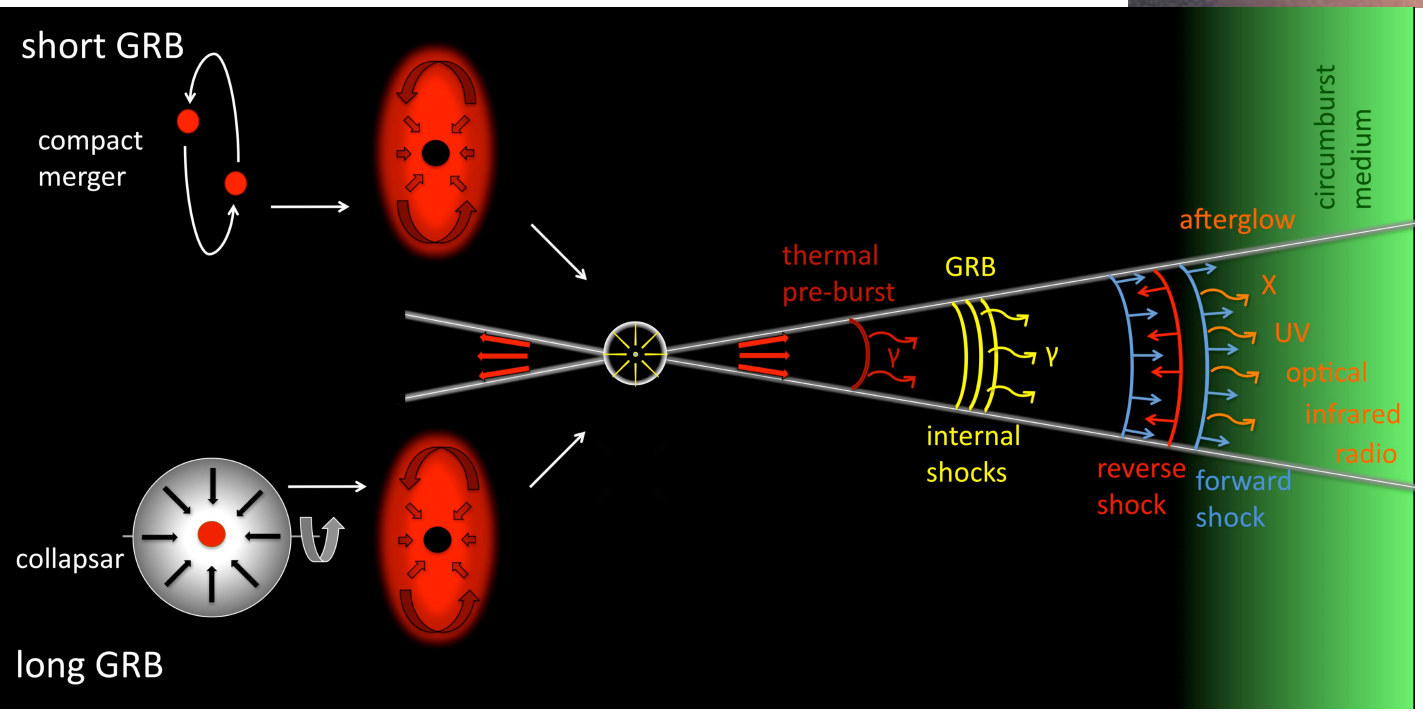


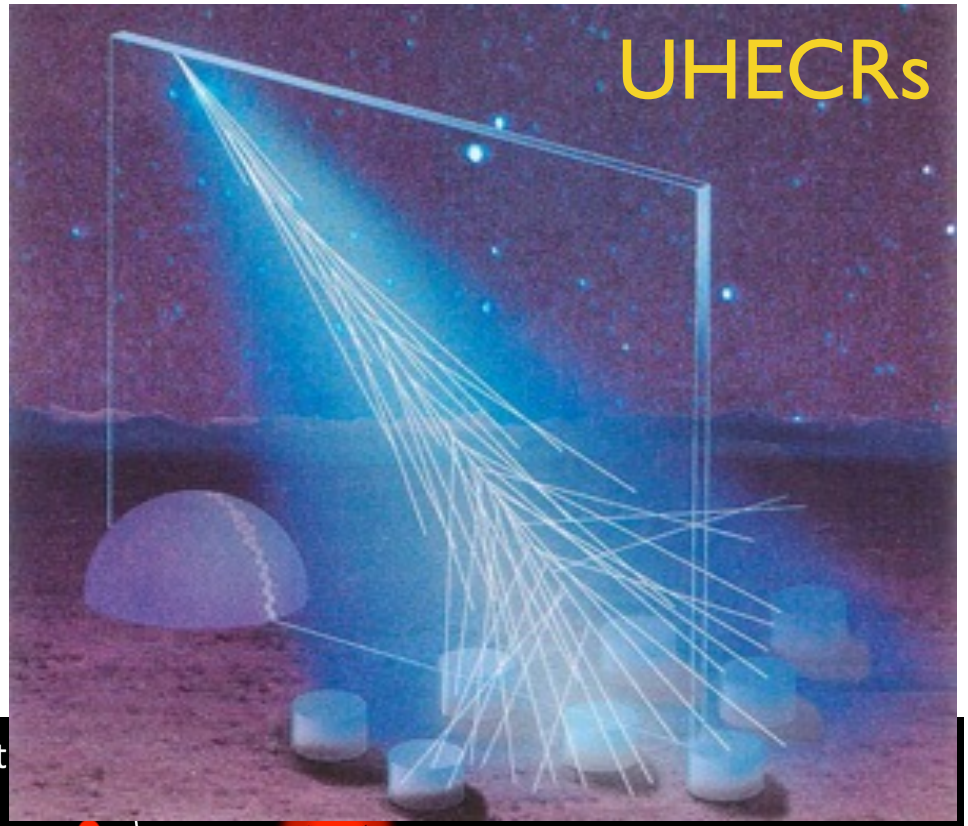
Connections

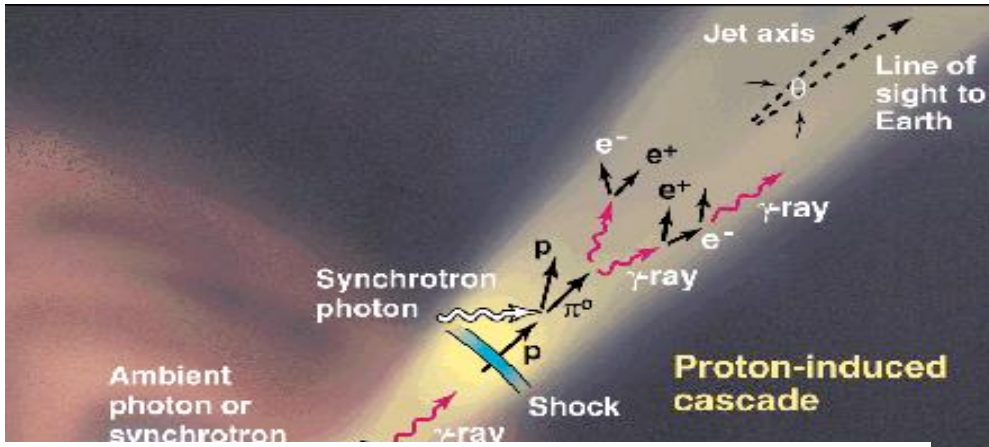
Blazar & GRB Emission Mechanisms

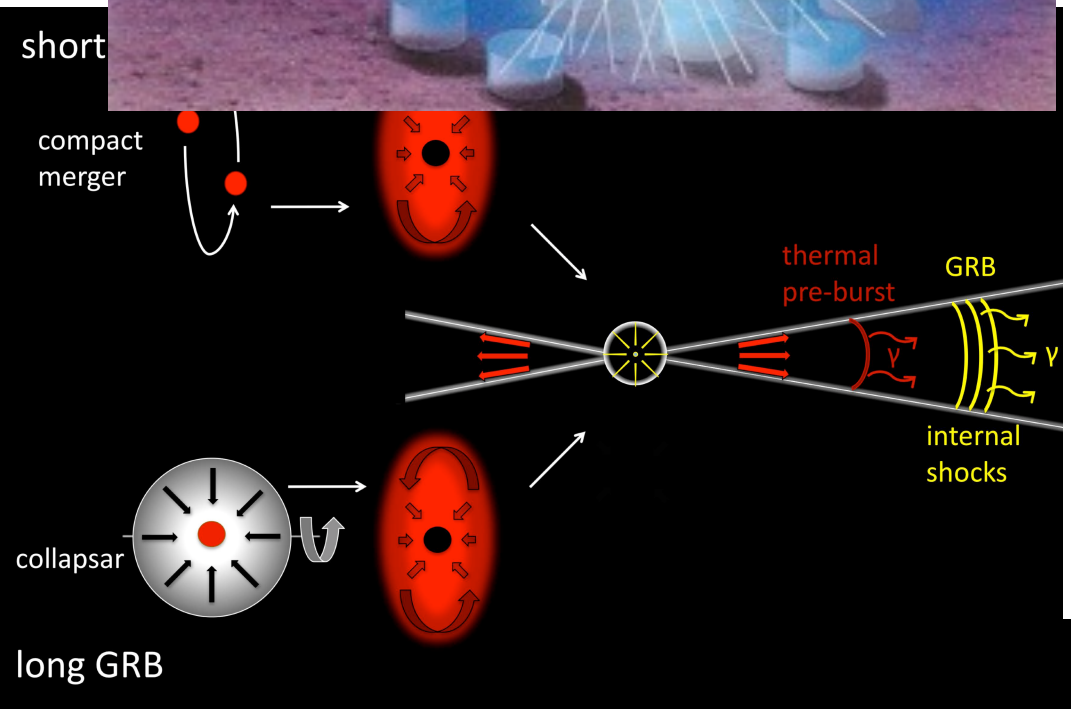


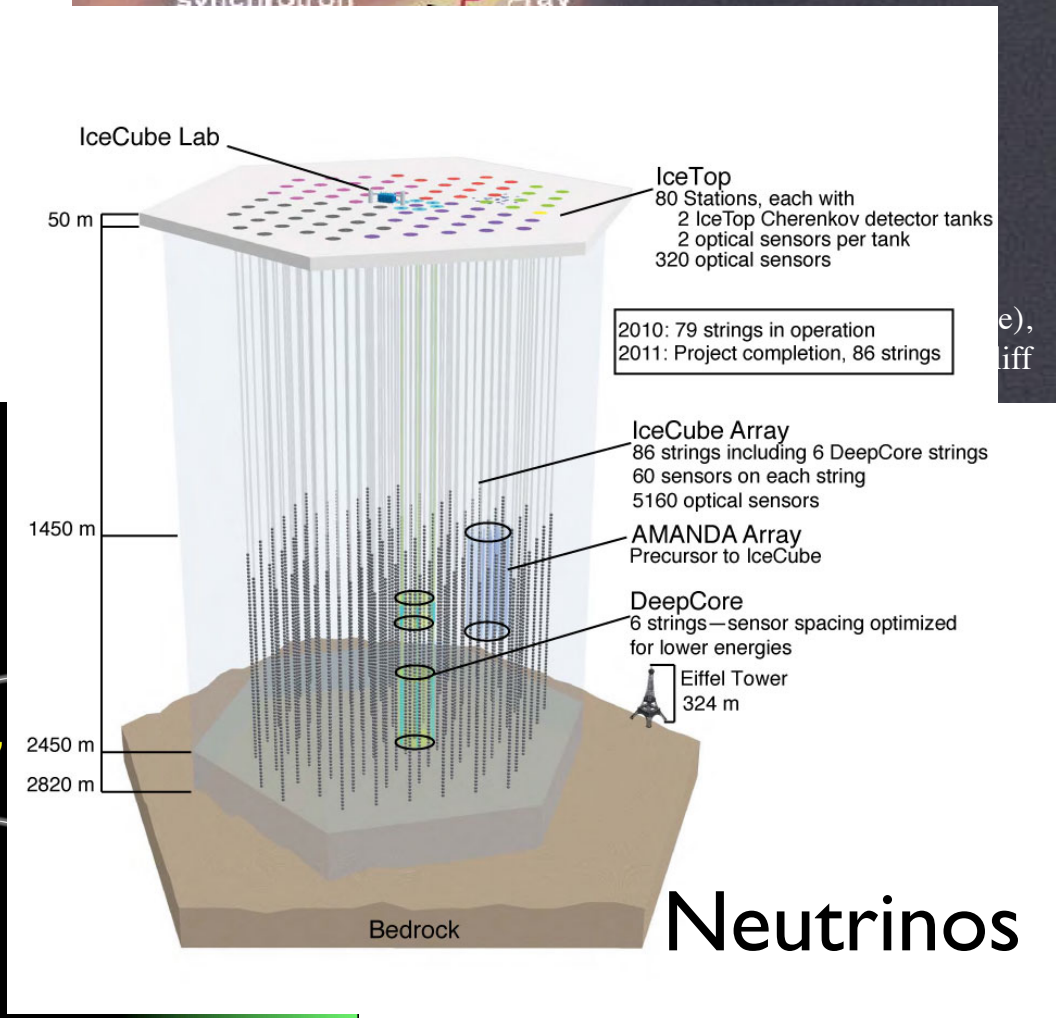
Credit: J. Buckley 1998 (Science), illustration: K. Sutliff




UHECRs

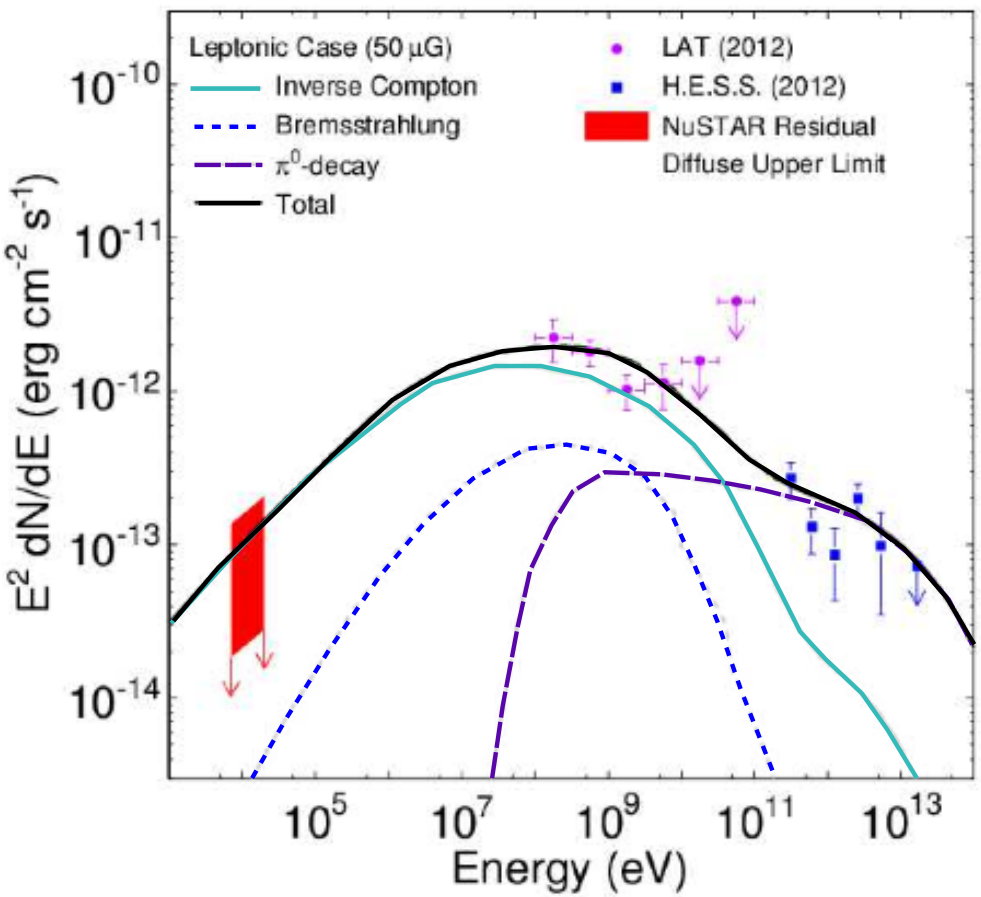

Jet axis
Line of sight to Earth
θ
e⁻
e+
e+
e⁻
γ-ray
γ-ray
p
π⁰
Synchrotron photon
p
Ambient photon or synchrotron
γ-ray
Shock
Proton-induced cascade


short
compact merger
thermal pre-burst
GRB
γ
γ
internal shocks
collapsar
ν
long GRB


IceCube Lab
IceTop
80 Stations, each with
2 IceTop Cherenkov detector tanks
2 optical sensors per tank
320 optical sensors
50 m
2010: 79 strings in operation
2011: Project completion, 86 strings
IceCube Array
86 strings including 6 DeepCore strings
60 sensors on each string
5160 optical sensors
1450 m
AMANDA Array
Precursor to IceCube
DeepCore
6 strings—sensor spacing optimized for lower energies
Eiffel Tower
324 m
2450 m
2820 m
Bedrock

Neutrinos

Broadband Diffuse in Starburst Galaxies



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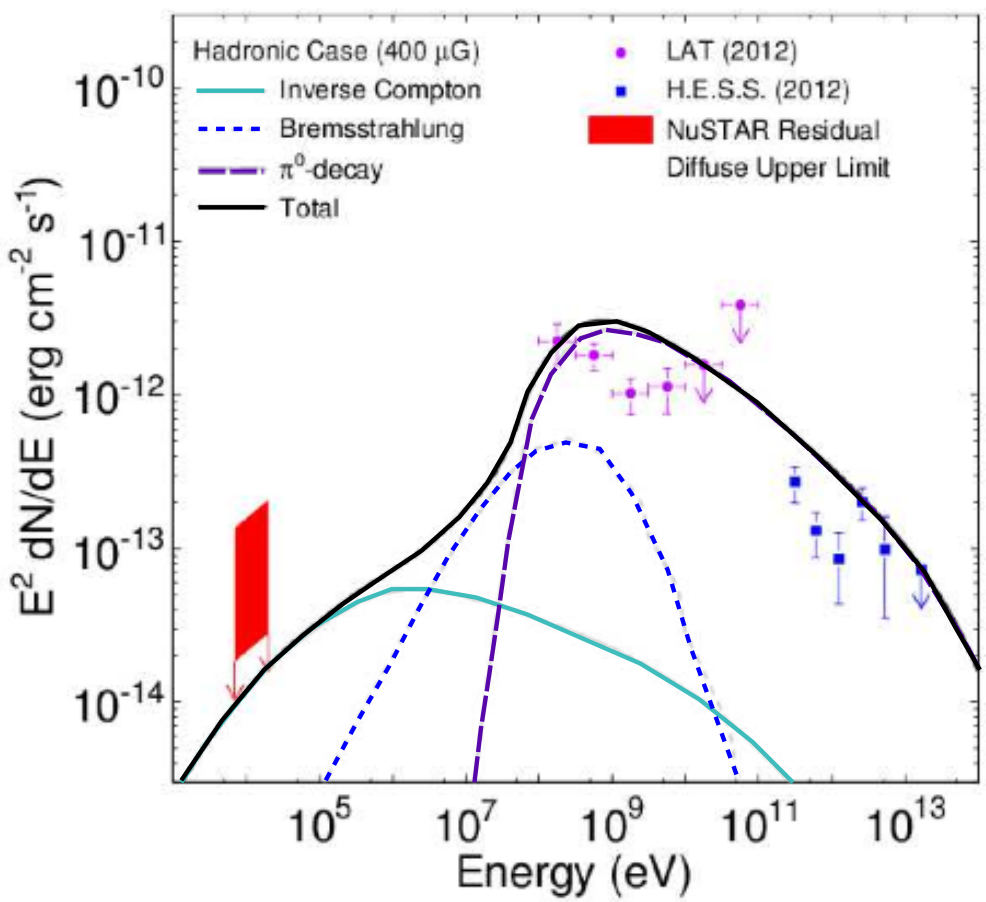

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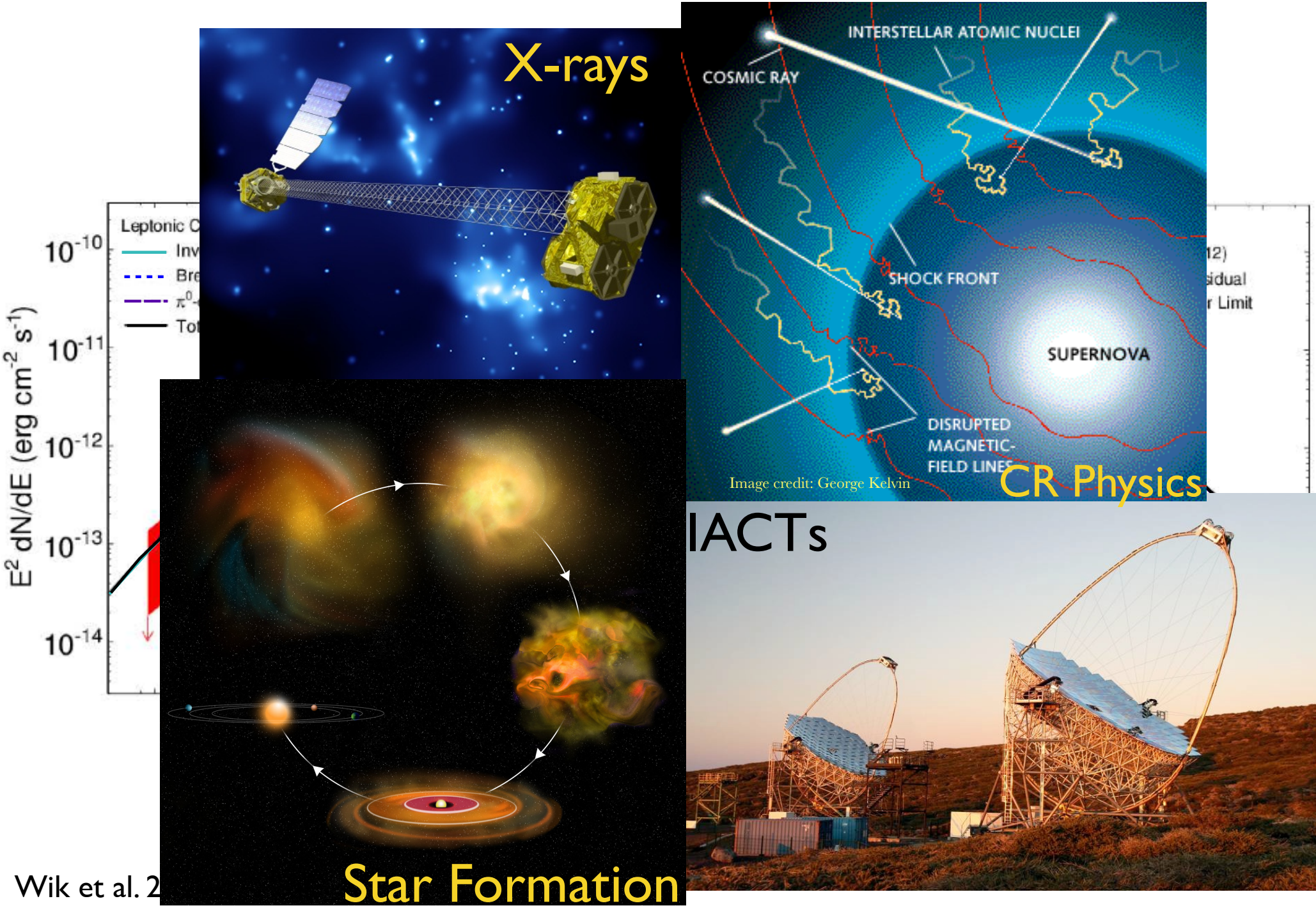
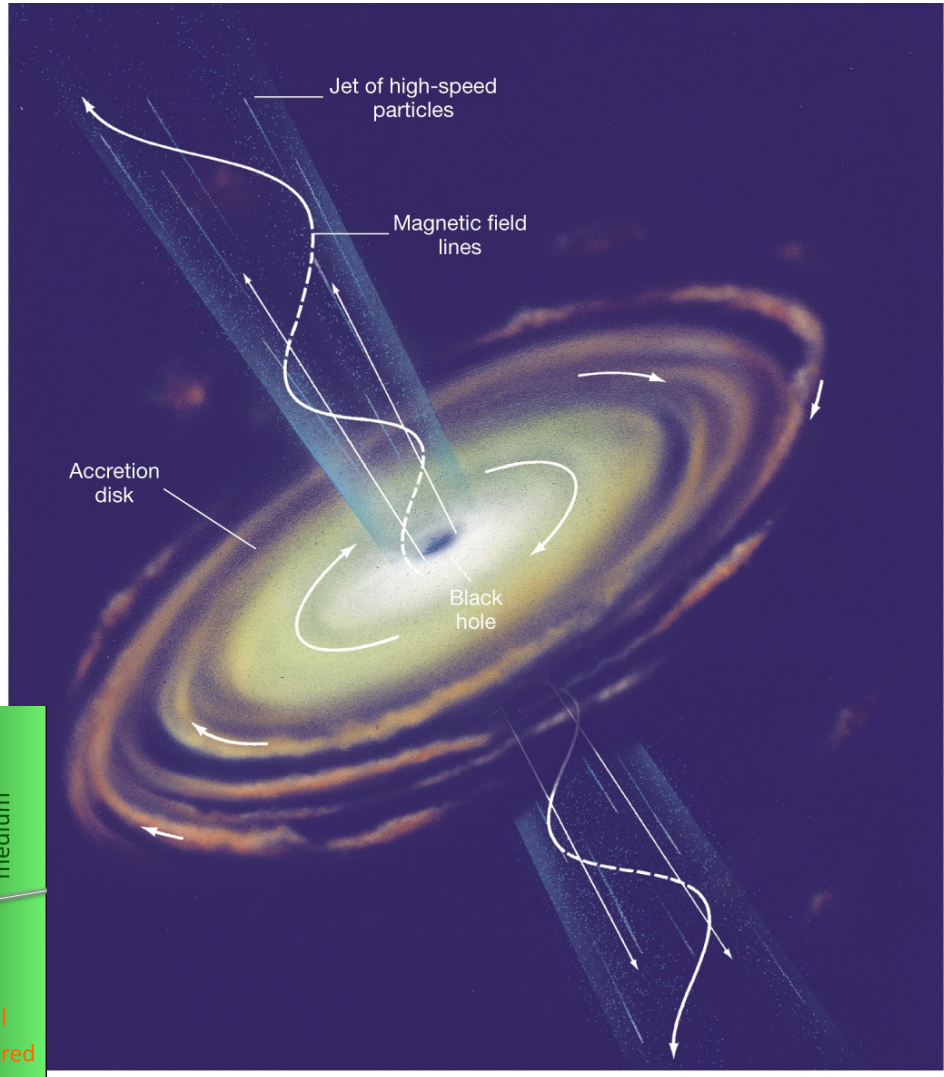
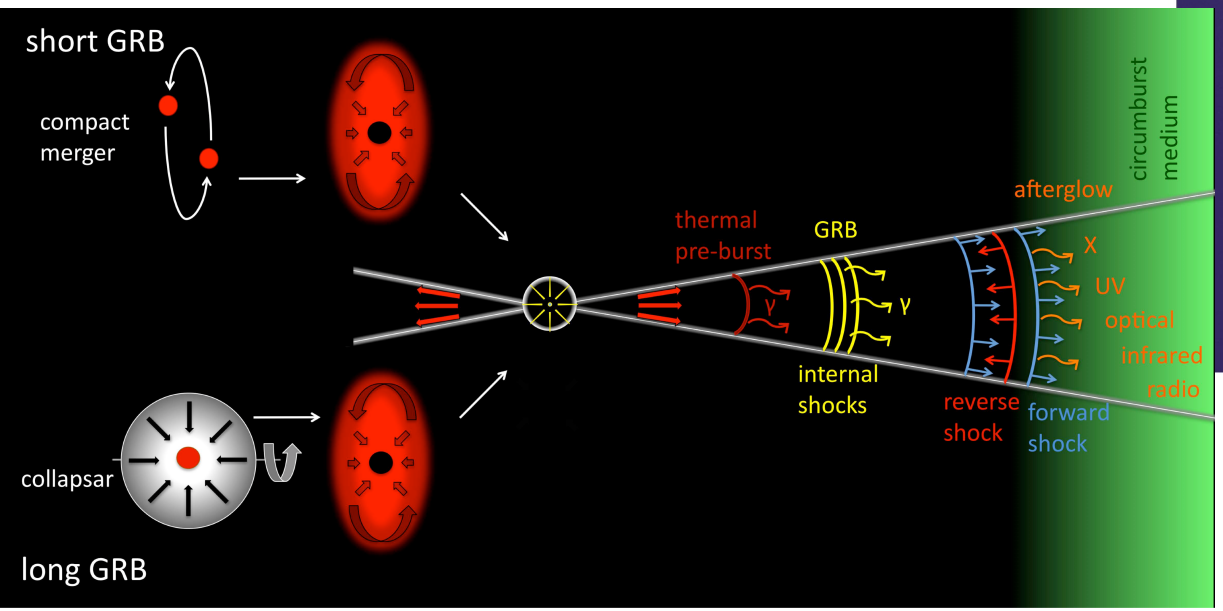
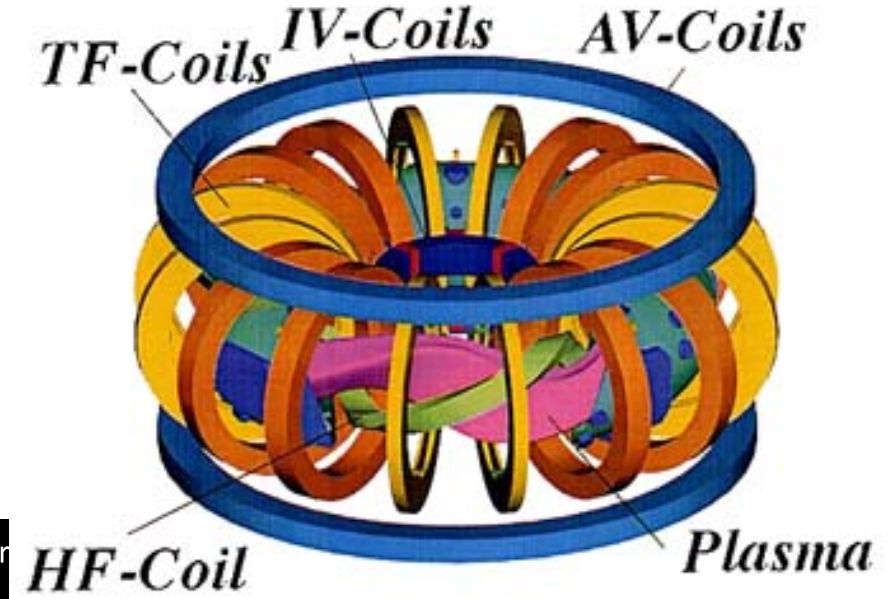
Broadband Diffuse in Starburst



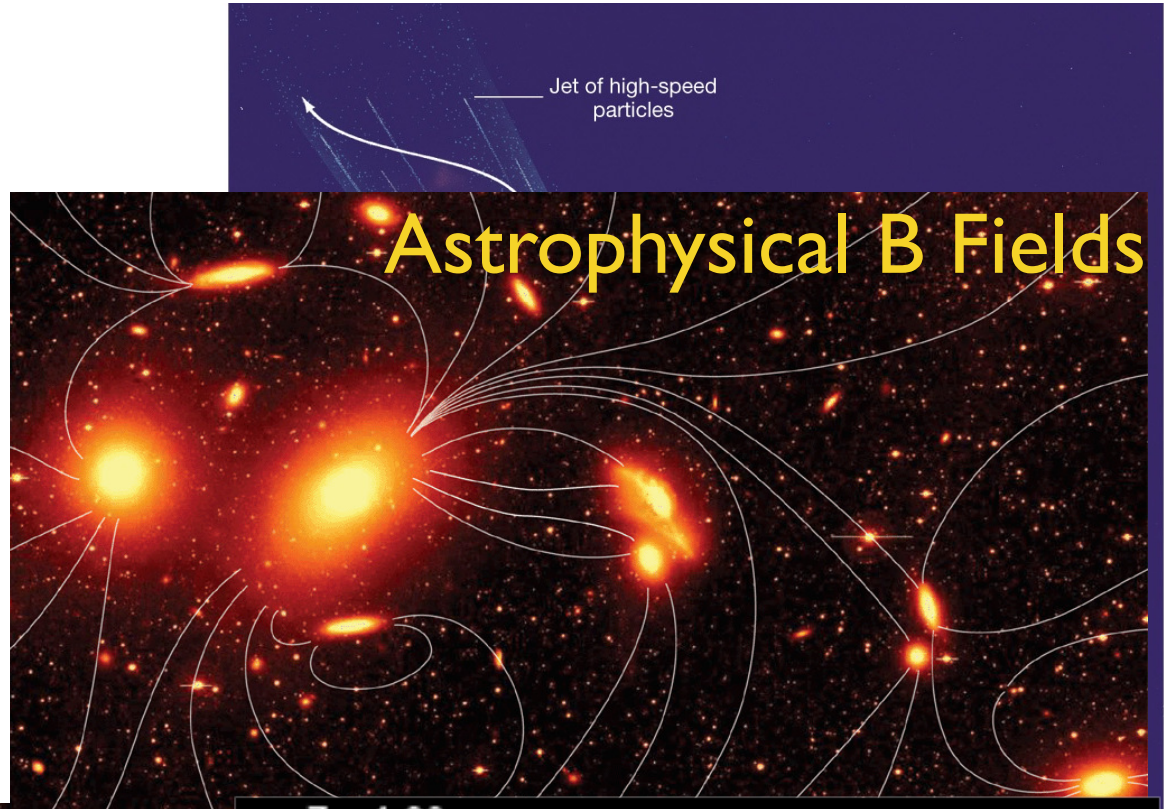
Probing Magnetic Fields

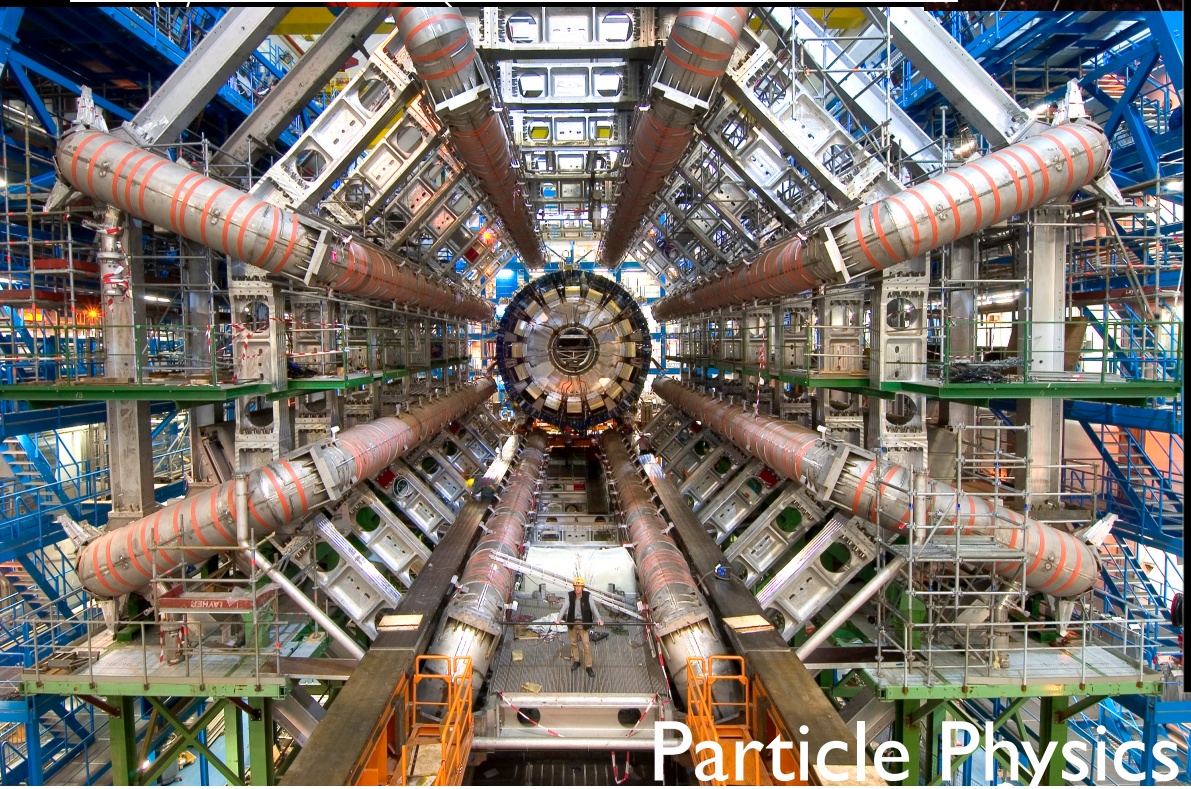




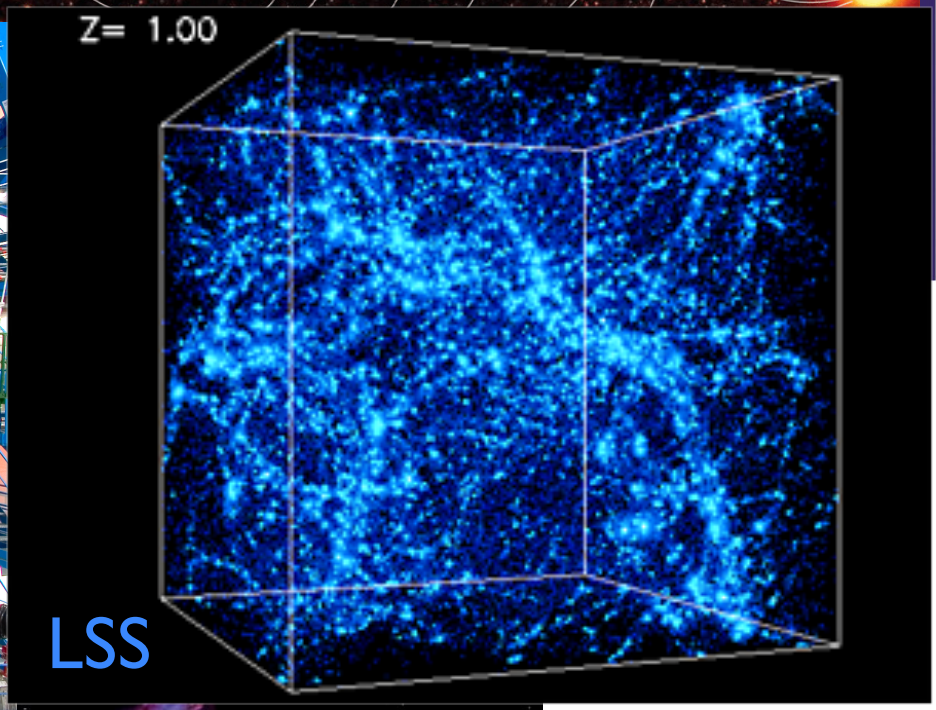


Plasma Physics

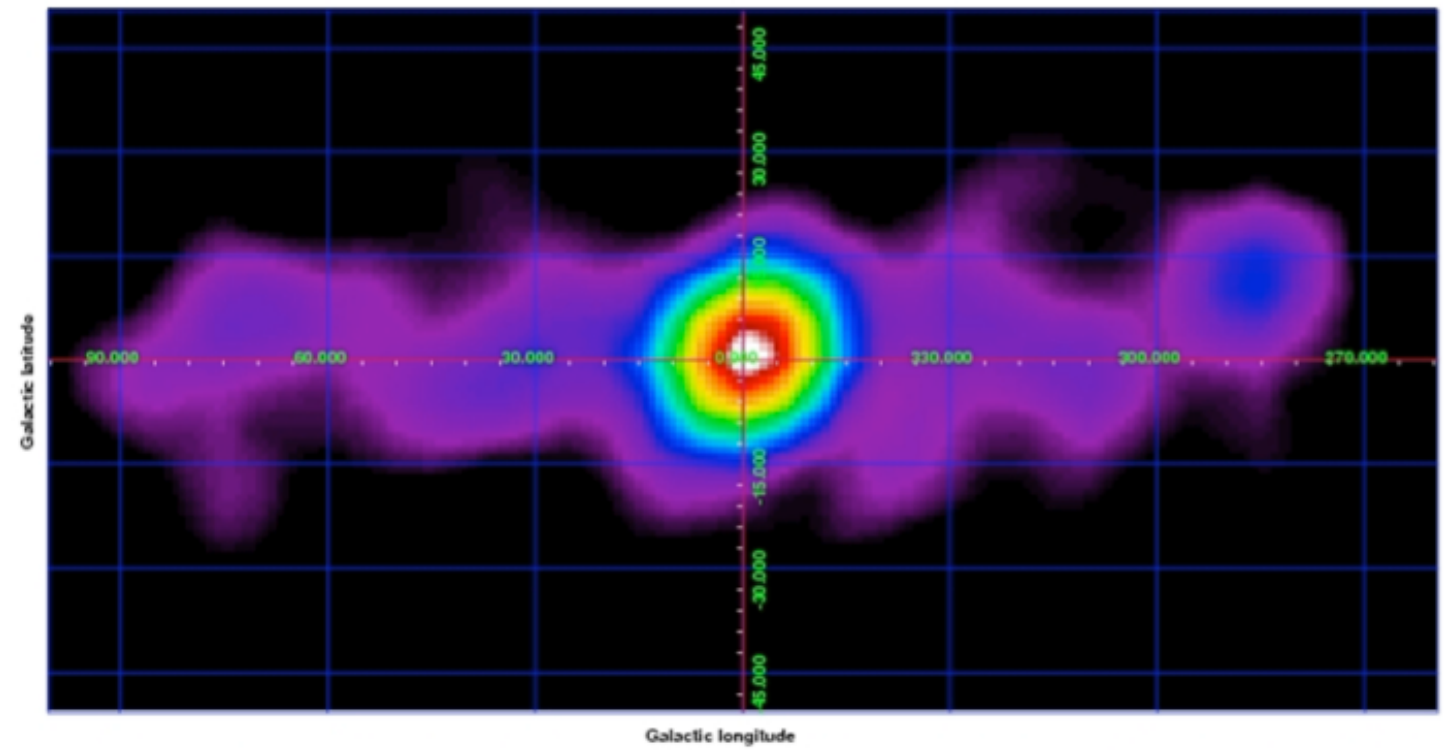




Particle Physics



Lines?!?!?!



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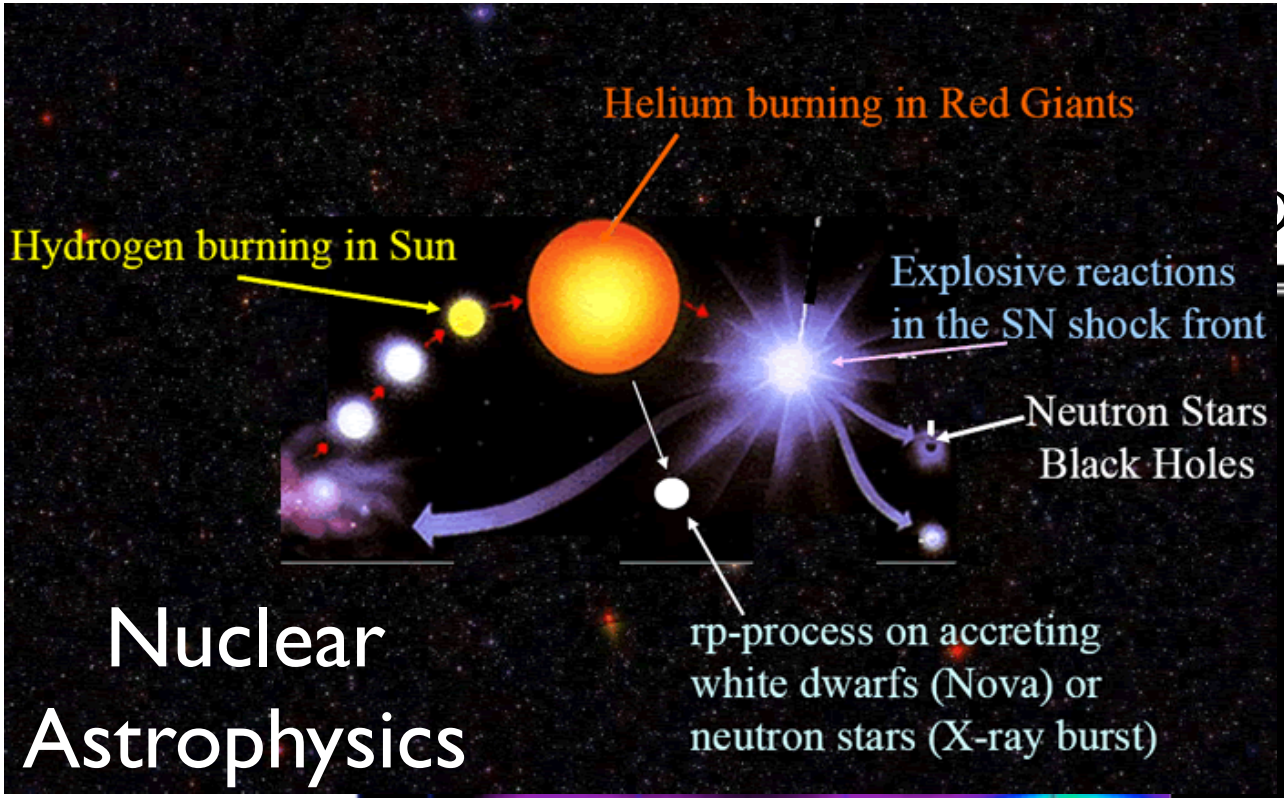
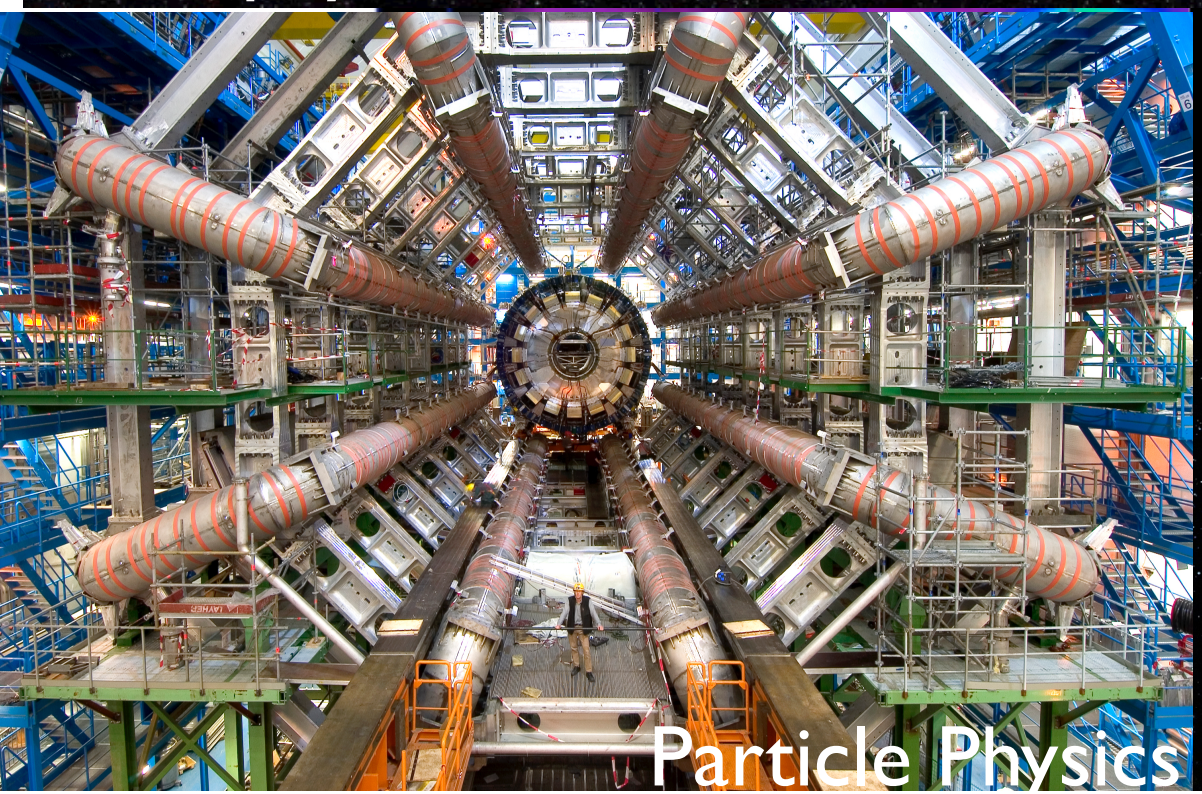


Nuclear Astrophysics



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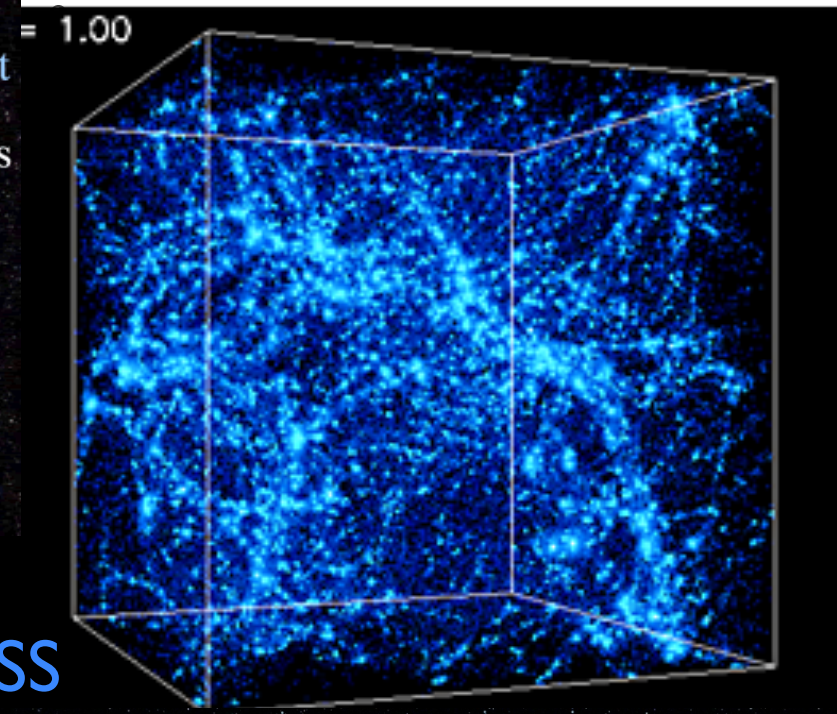
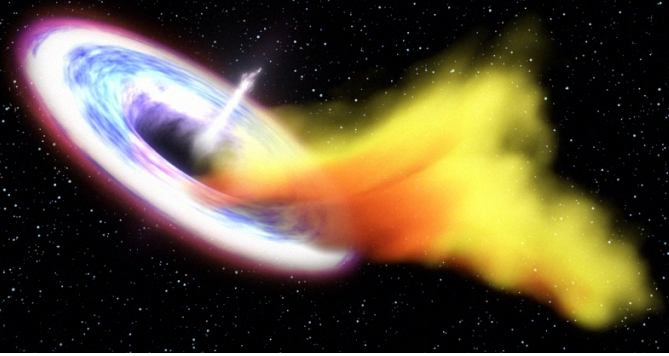
LSS