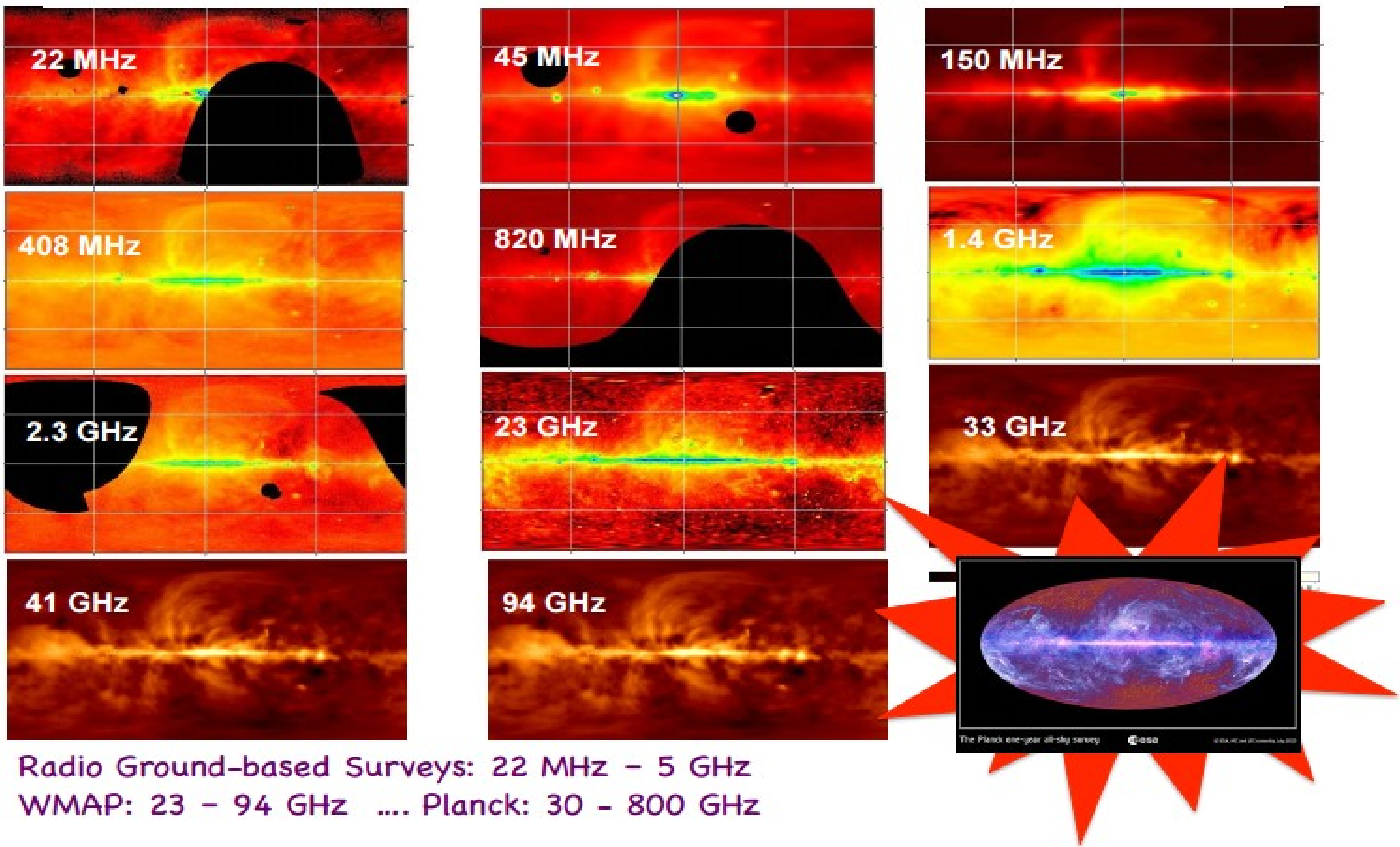
Radio emission of the Galaxy

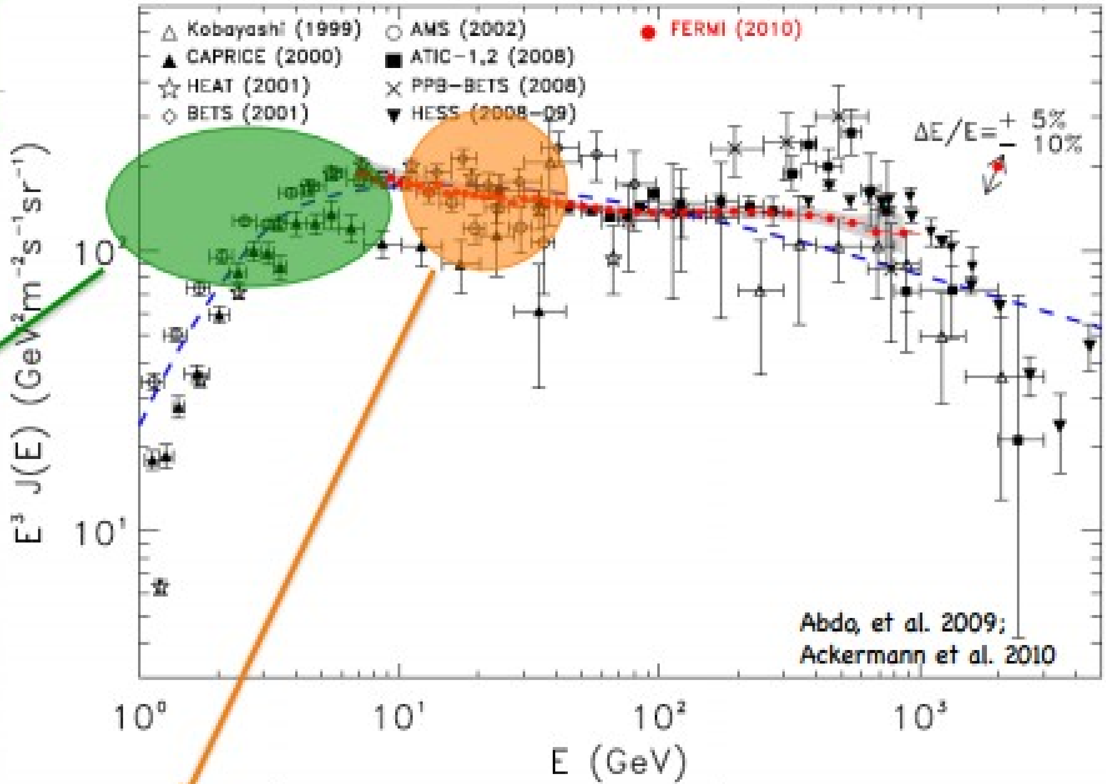
Radio surveys & WMAP

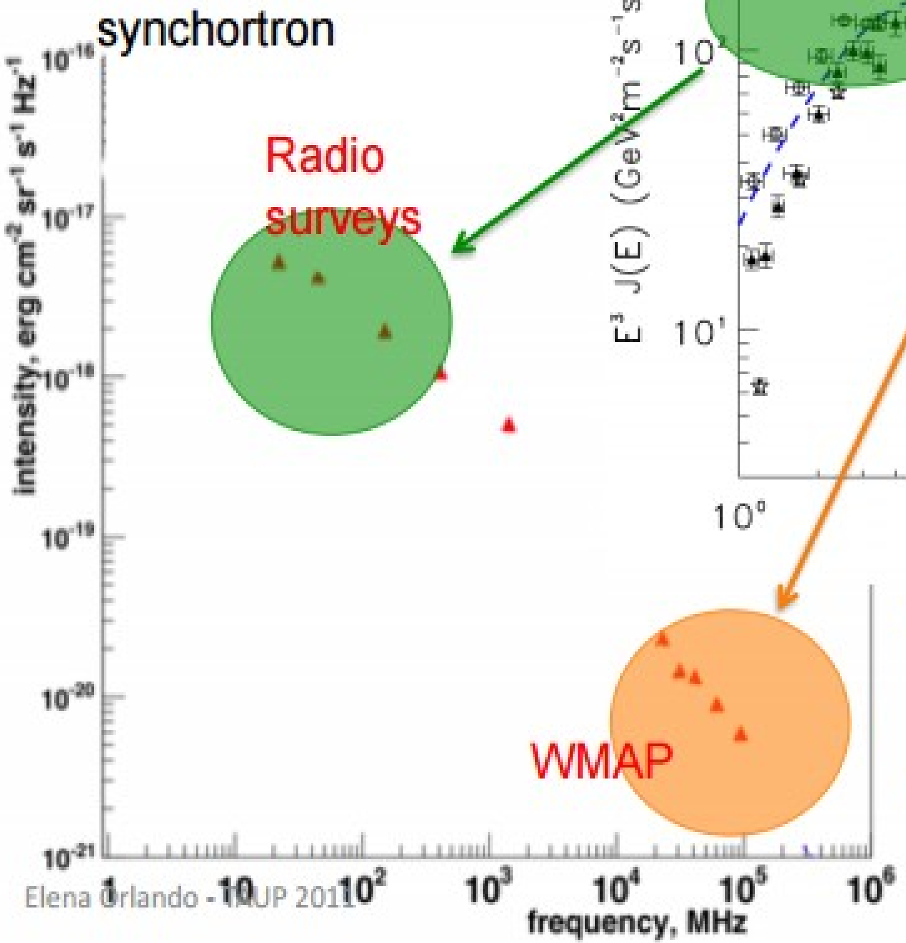


Radio Ground-based Surveys: 22 MHz – 5 GHz
WMAP: 23 – 94 GHz …. Planck: 30 – 800 GHz

Radio emission of the Galaxy

Probe of interstellar spectrum before modulation

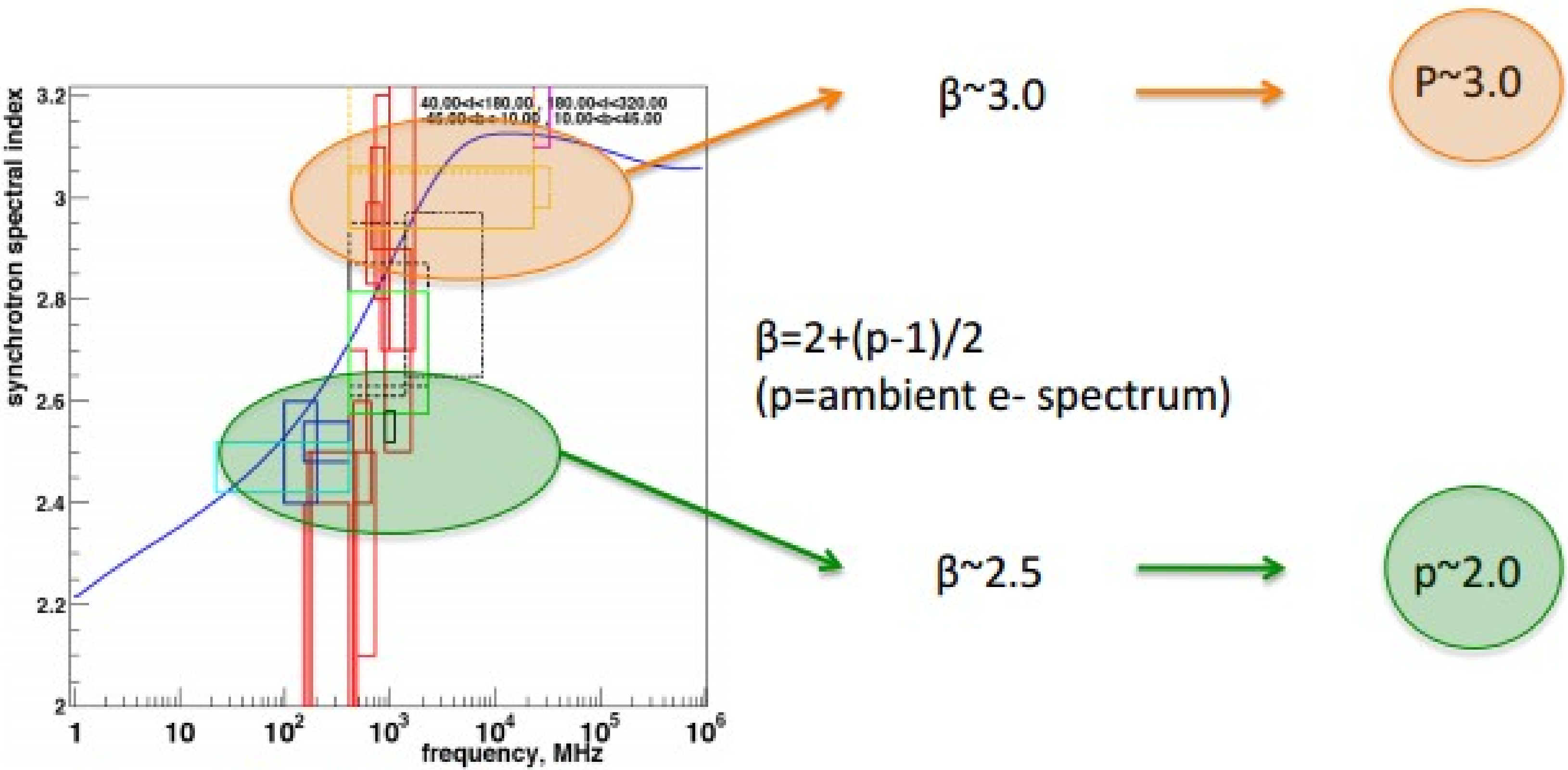




Probe of interstellar spectrum directly measured. Good determination of B field

Radio emission of the Galaxy

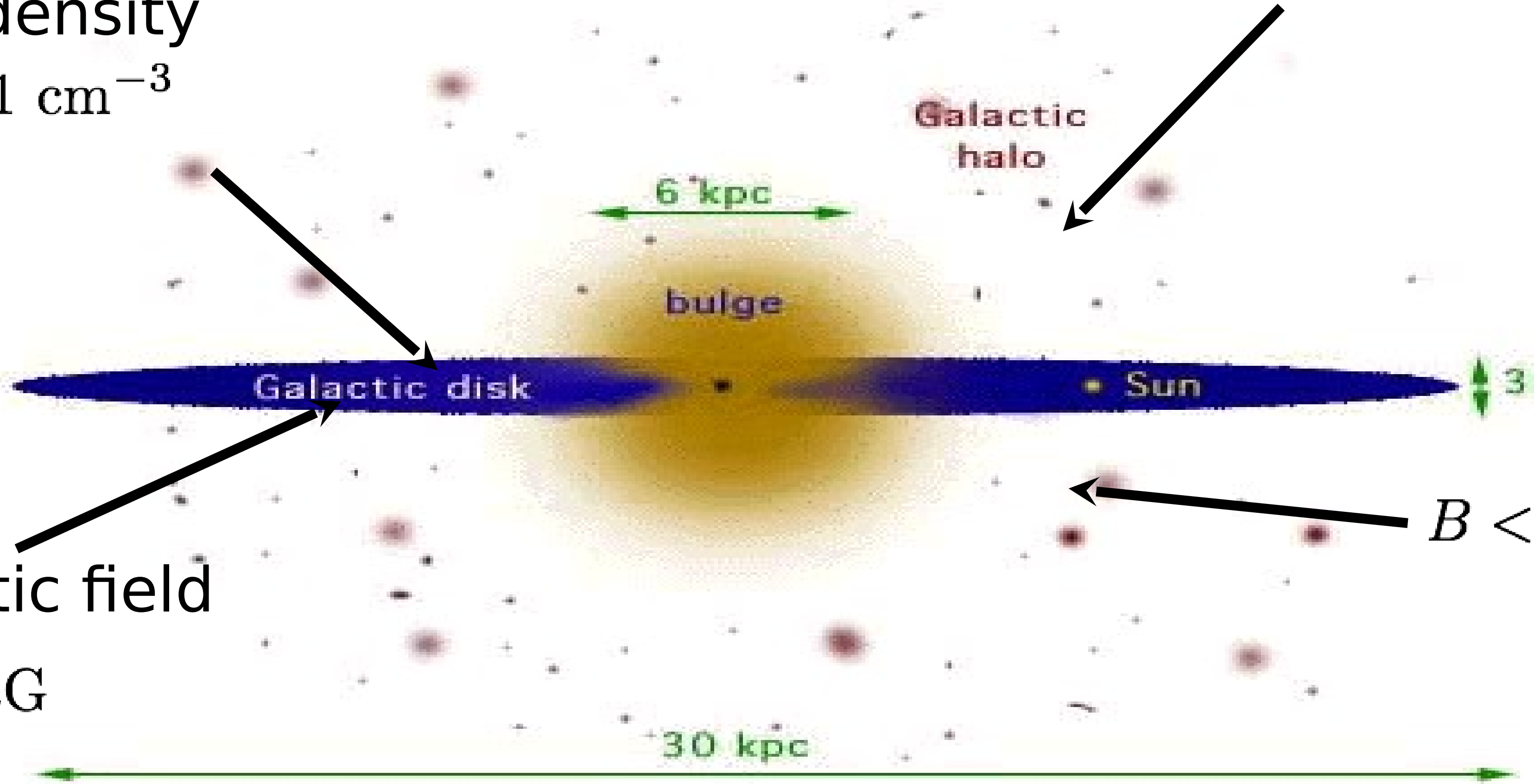
Synchrotron spectral index measurements ...



Strong, Orlando & Jaffe A&A accepted (arXiv:1108.4822)

... need of a break in interstellar e-

the Milky Way



gas density

$n \approx 1\ \mathrm{cm}^{-3}$

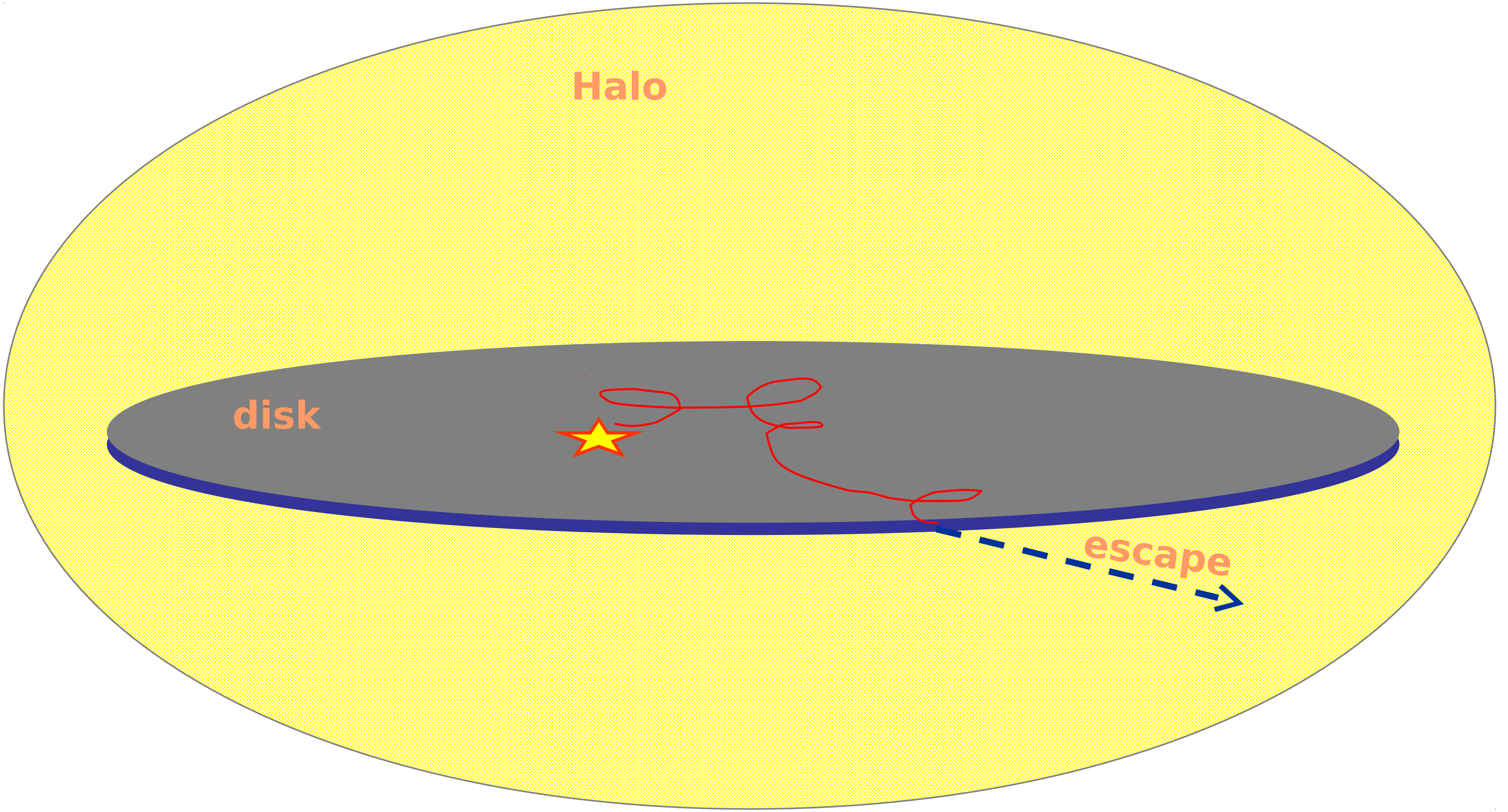
$n \approx 0.01\ \mathrm{cm}^{-3}$

magnetic field

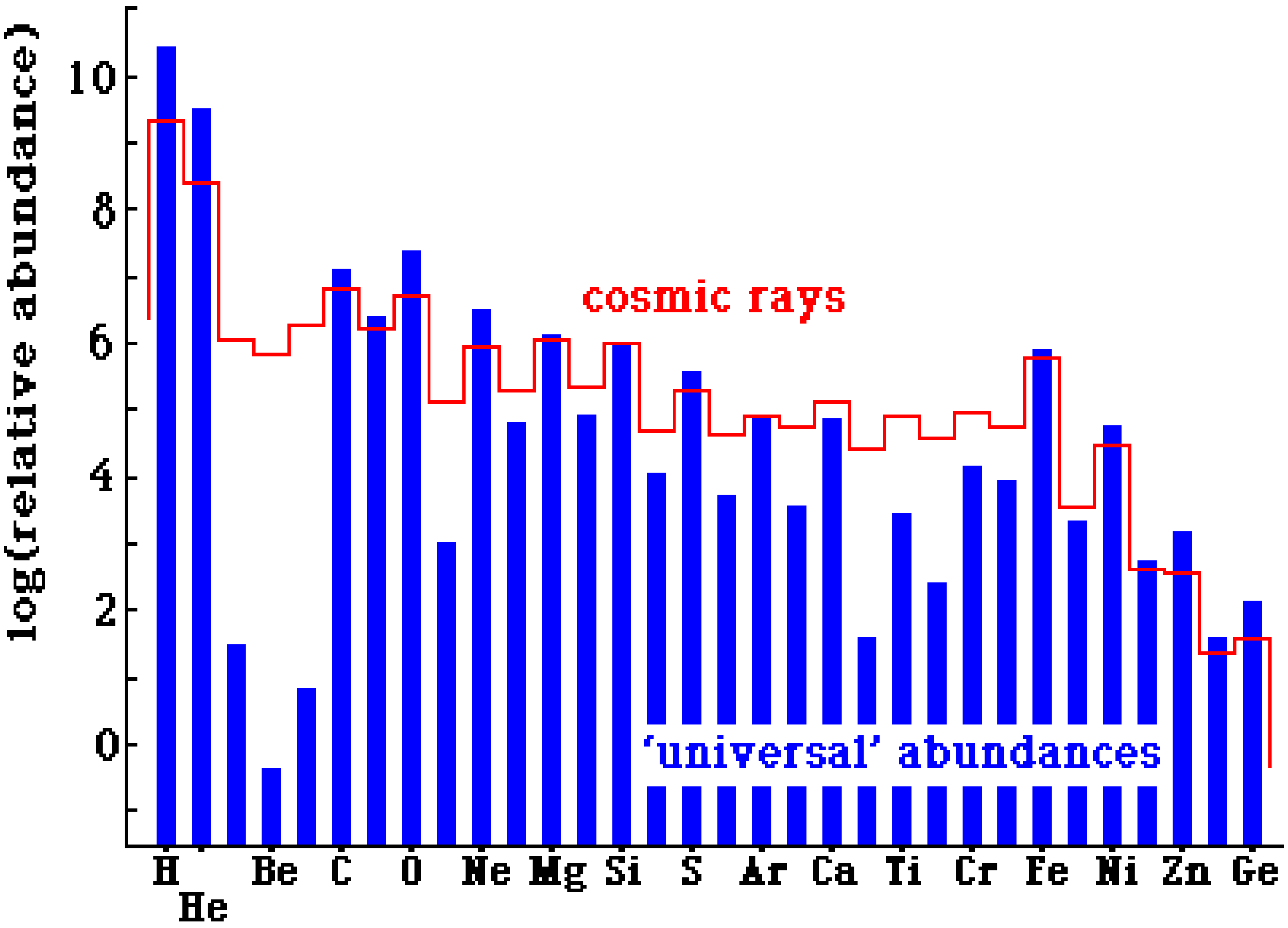
$B \approx 3\ \mu\mathrm{G}$

$B < 10\ \mu\mathrm{G}$

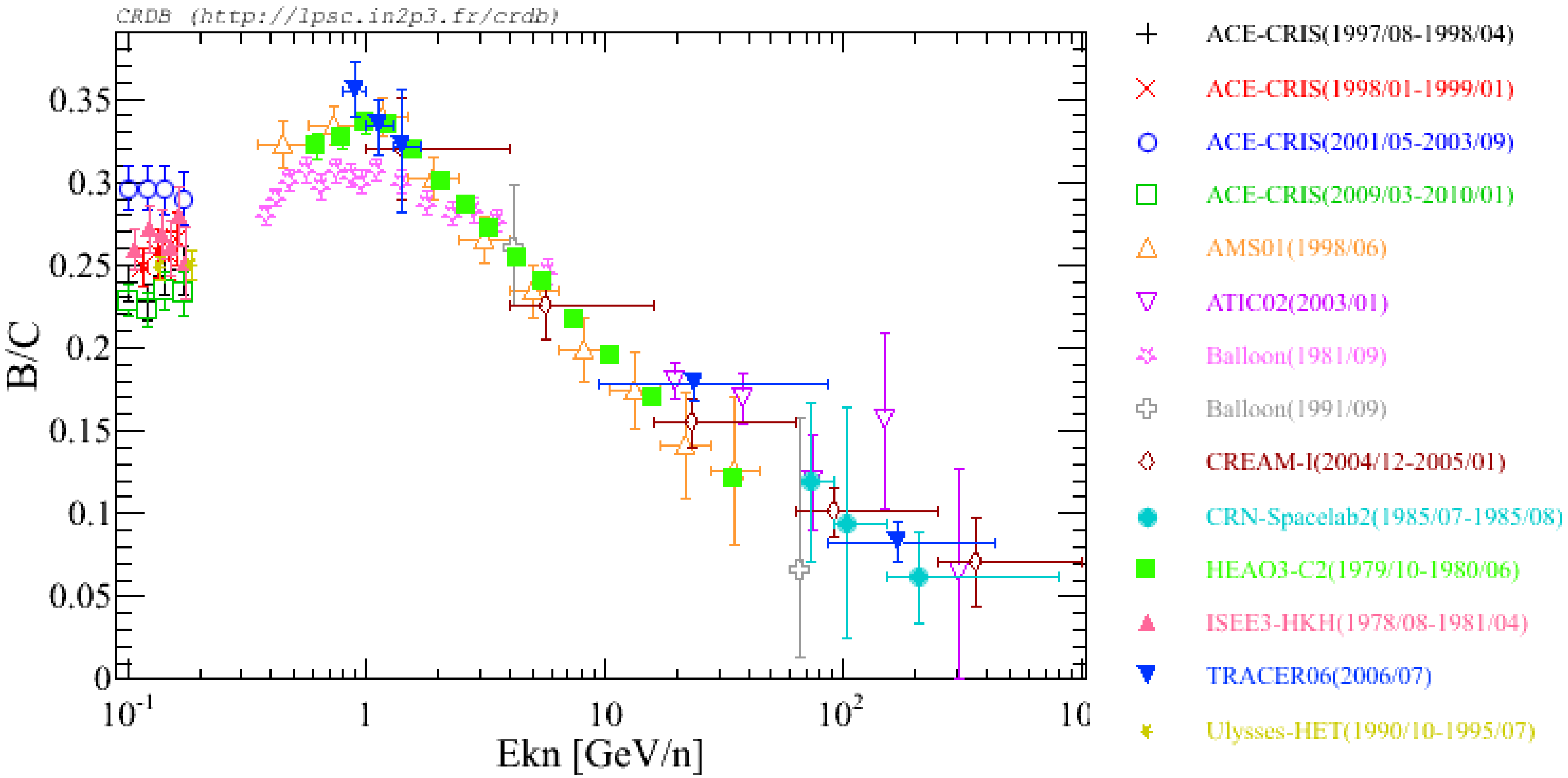
CR Propagation



Nuclei Spallation

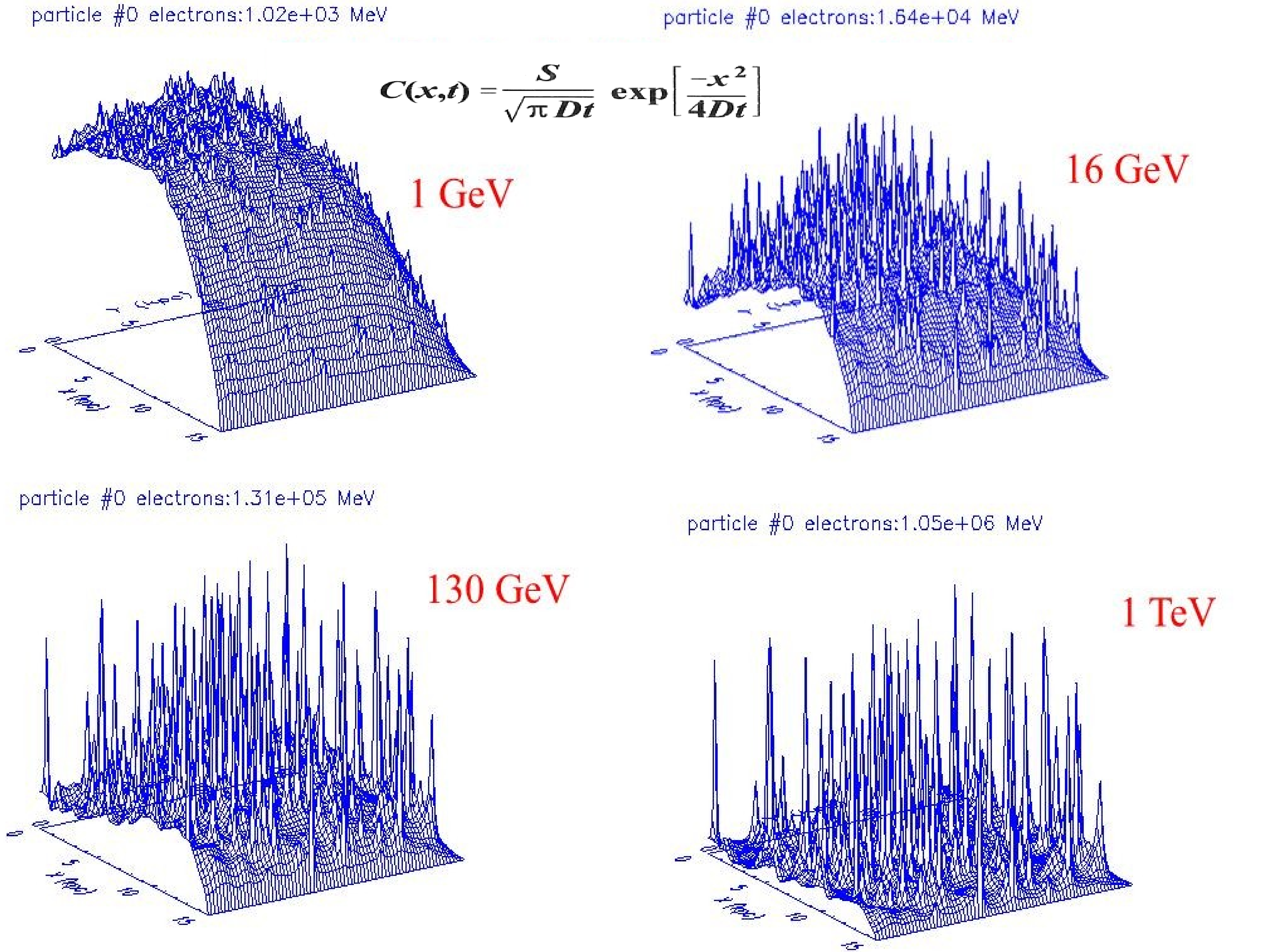


B/C Ratio



CRDB (http://lpsc.in2p3.fr/crdb)
B/C
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Ekn [GeV/n]
1
10
ACE-CRIS(1997/08-1998/04)
ACE-CRIS(1998/01-1999/01)
ACE-CRIS(2001/05-2003/09)
ACE-CRIS(2009/03-2010/01)
AMS01(1998/06)
ATIC02(2003/01)
Balloon(1981/09)
Balloon(1991/09)
CREAM-I(2004/12-2005/01)
CRN-Spacelab2(1985/07-1985/08)
HEAO3-C2(1979/10-1980/06)
ISEE3-HKH(1978/08-1981/04)
TRACER06(2006/07)
Ulysses-HET(1990/10-1995/07)

$$C(x,t) = \frac{S}{\sqrt{\pi D t}} \exp\left[\frac{-x^2}{4Dt}\right]$$



Diffusion of CR in the ISM

$$\frac{dn(E,r)}{dt} = D(E)\nabla^2 n(E,r) - \frac{\partial}{\partial E} n(E,r) b(E) + Q(E,r)$$

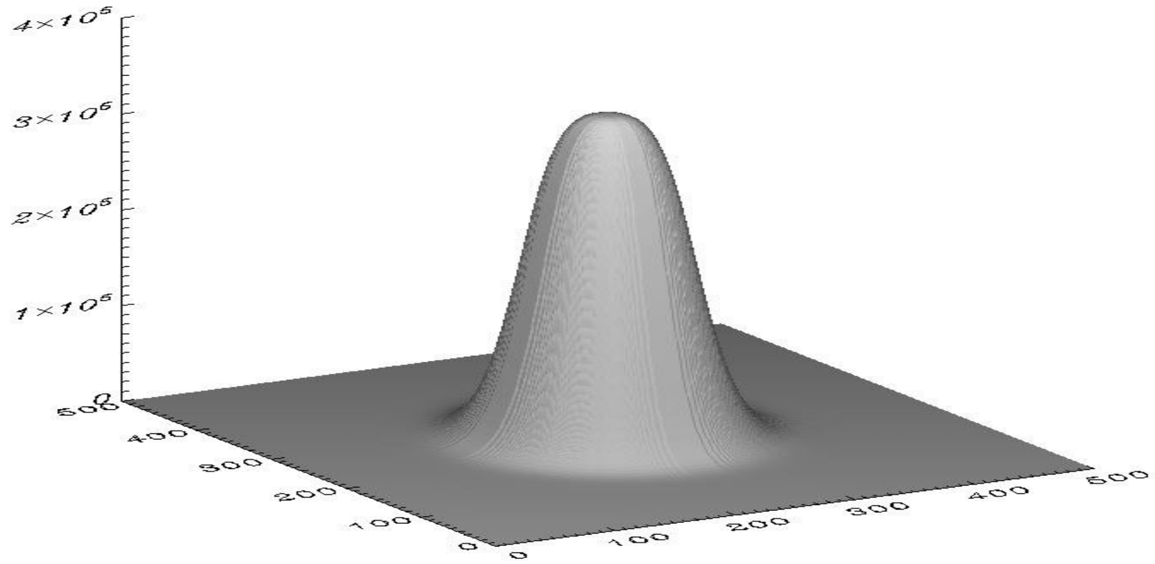
Diff. in physical space

Energy losses

Source

Diffusion of CR in the ISM

$$\frac{dn(E,r)}{dt} = D(E)\nabla^2 n(E,r) - \frac{\partial}{\partial E} n(E,r) b(E) + Q(E,r)$$



For an impulsive source
and ignoring E losses :

$$n(E,r) = \frac{S}{\sqrt{\pi D t}} \exp\left[\frac{-x^2}{4Dt}\right]$$

$$R_{diff}(E,t) = 2\sqrt{D(E)t}$$