

Fine Structure in Cosmic Ray Spectra

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Fine Structure

- + There must be some: the finite number of sources and the irregularities in the ISM demand it.
- + The knee and the ankle are first order effects.
- + The sharpness in each case is crucial.

The Knee

- + Evidence for a discrete source poking through (EW, 1997 etc.)
- + Still there and perhaps later* ones due to various nuclei.
(*at higher energies)

The Ankle

- + Very sharp, and suggests transition from Galactic to Extragalactic particles.
- + However, still argument, and problems with the mass composition (Chi et al. 1994 etc.)
- + Let us concentrate on 'low energy CR': $E \lesssim 1000 \text{ GeV}$

The role of discrete sources

Analogy : Particle Scattering

- + Single scattering (e.g. Rutherford)
- + Plural (a few scatters)
- + Multiple (very many scatters)

Discrete Sources

- + Single source (knee at 3PV)
- + Plural sources (Local bubble: an excess of past SN)
- + Multiple sources ('Background')

Single sources

A. The Knee

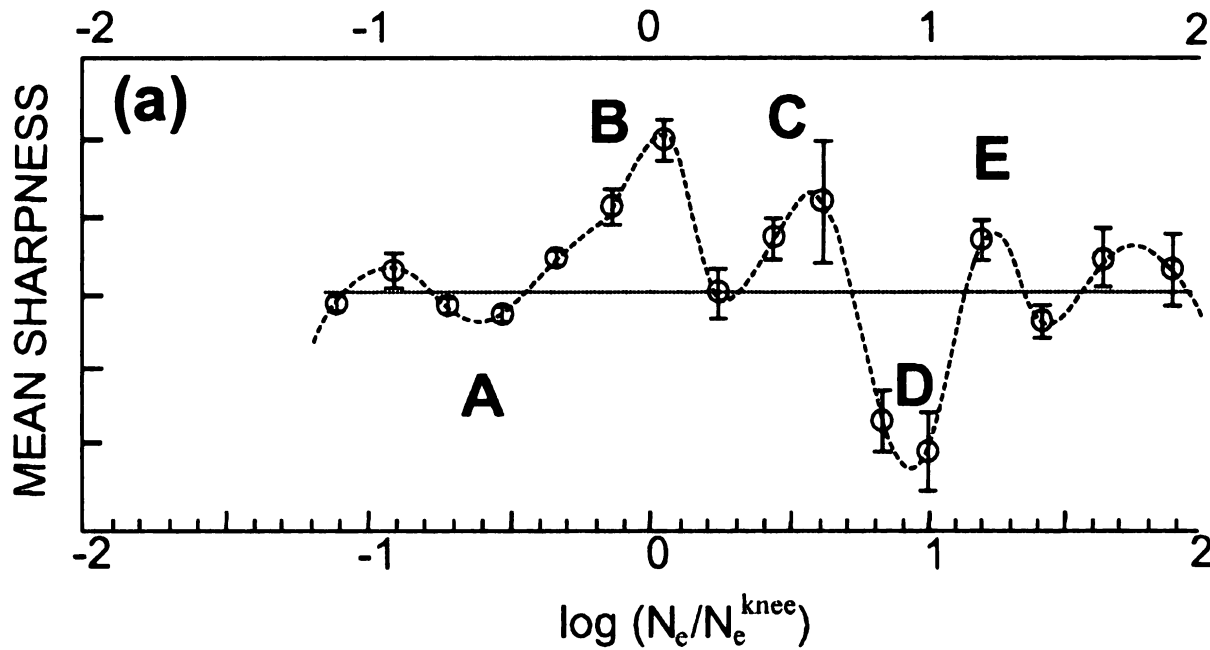
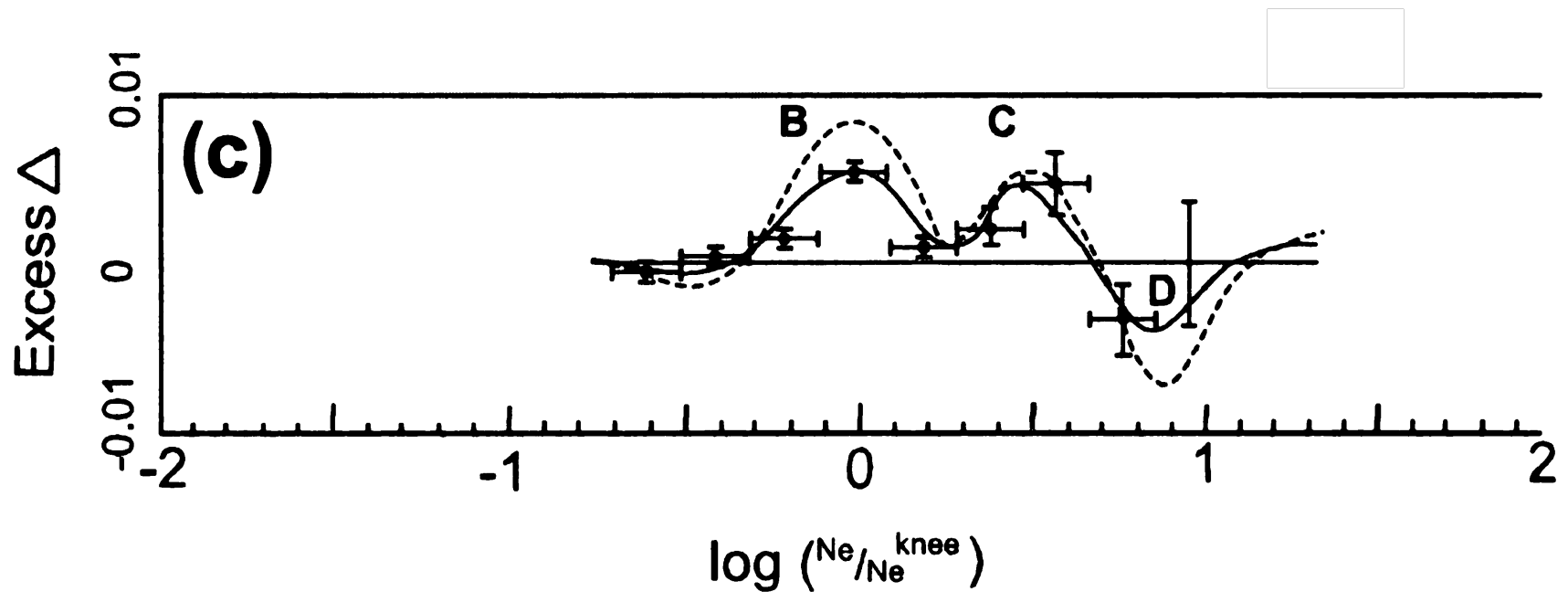


Fig. 1

Single sources

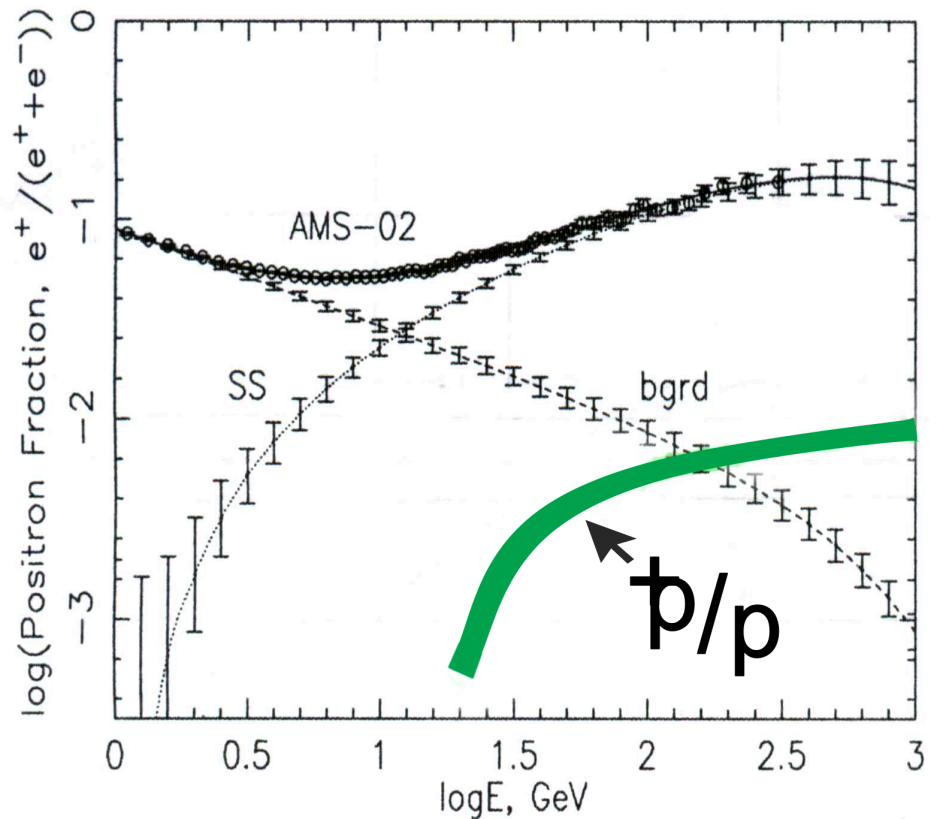
Fig. 2

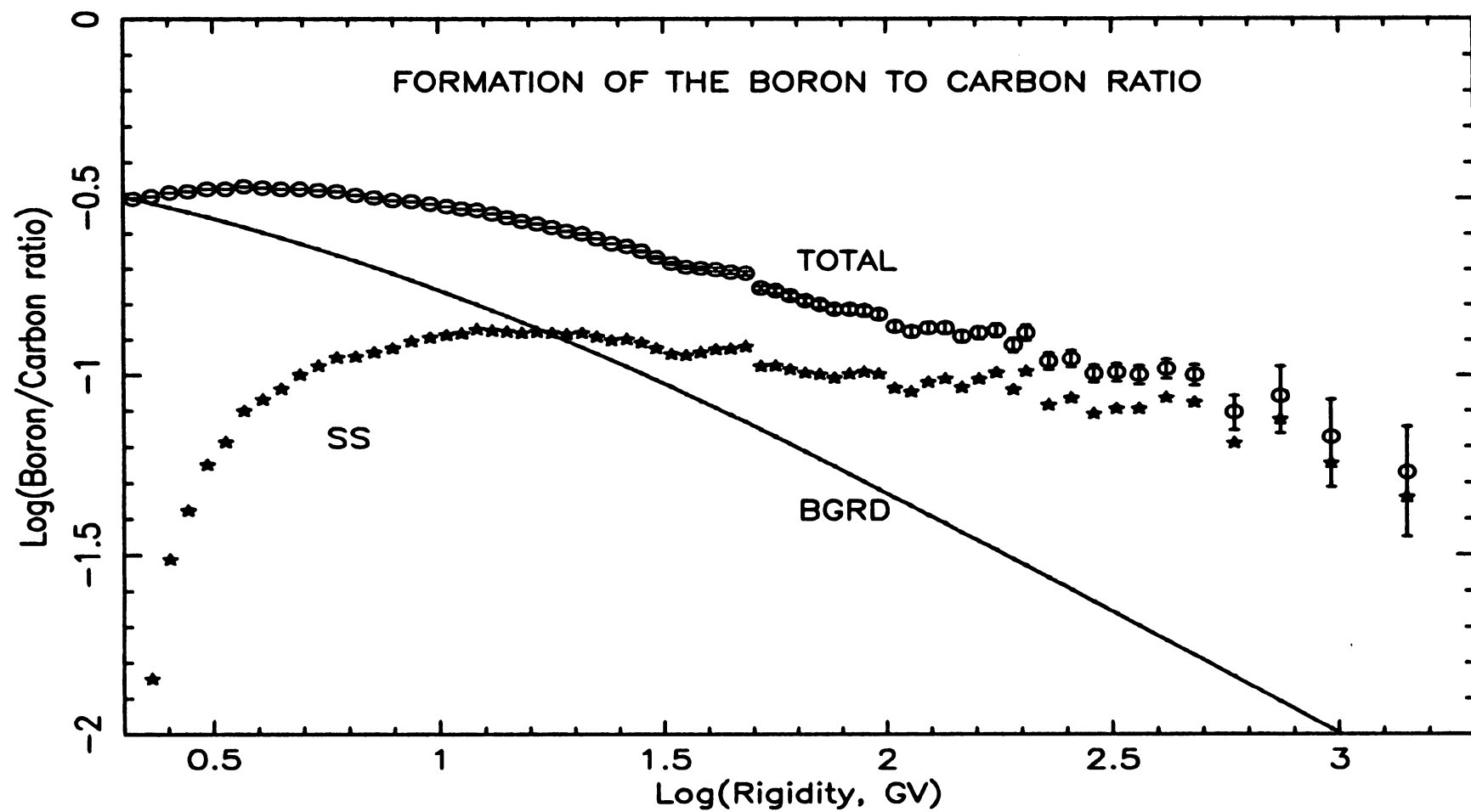


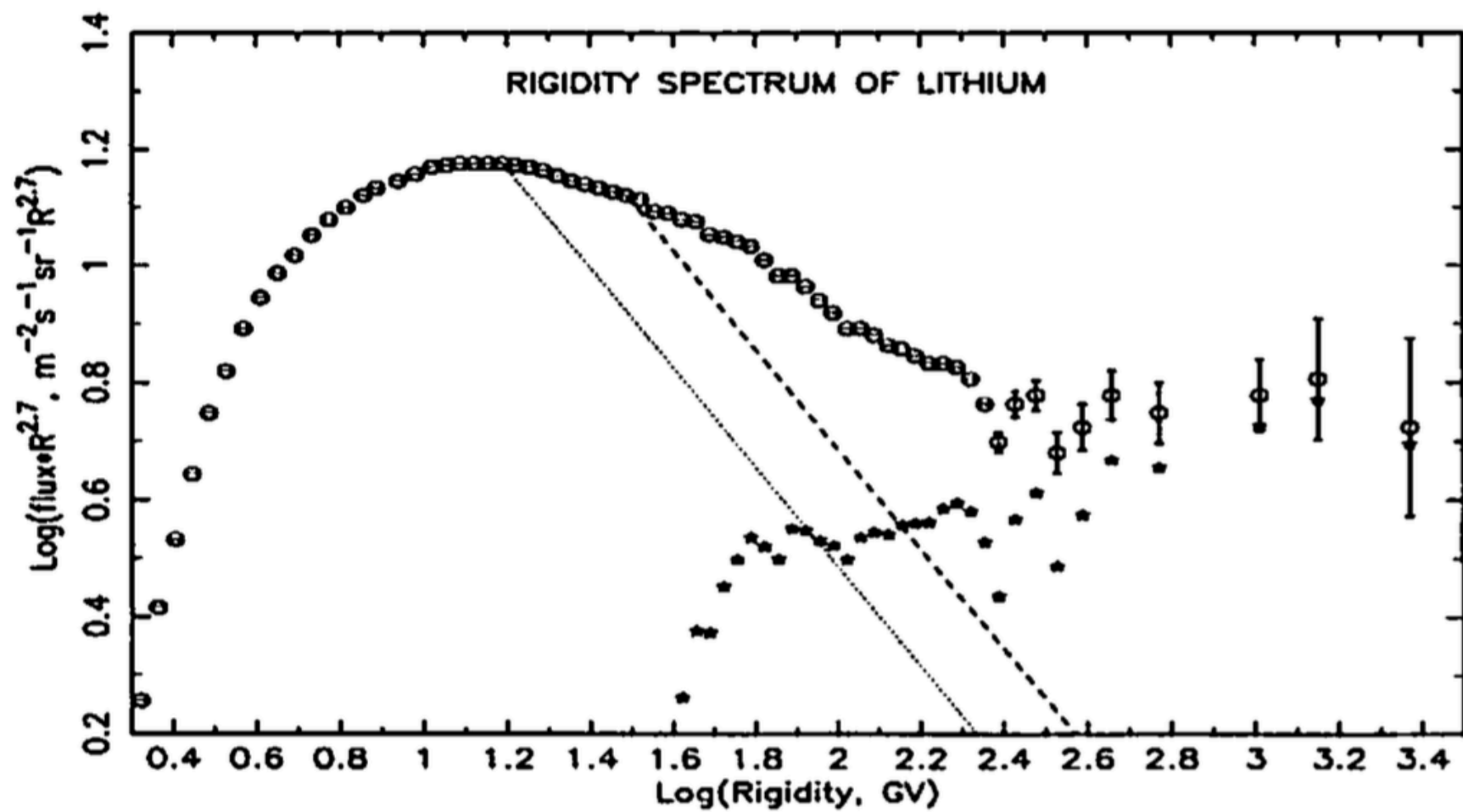
Single sources

B. Contributions at Energies below 1000GV.

e^+ , \bar{p} , B/C, Li...

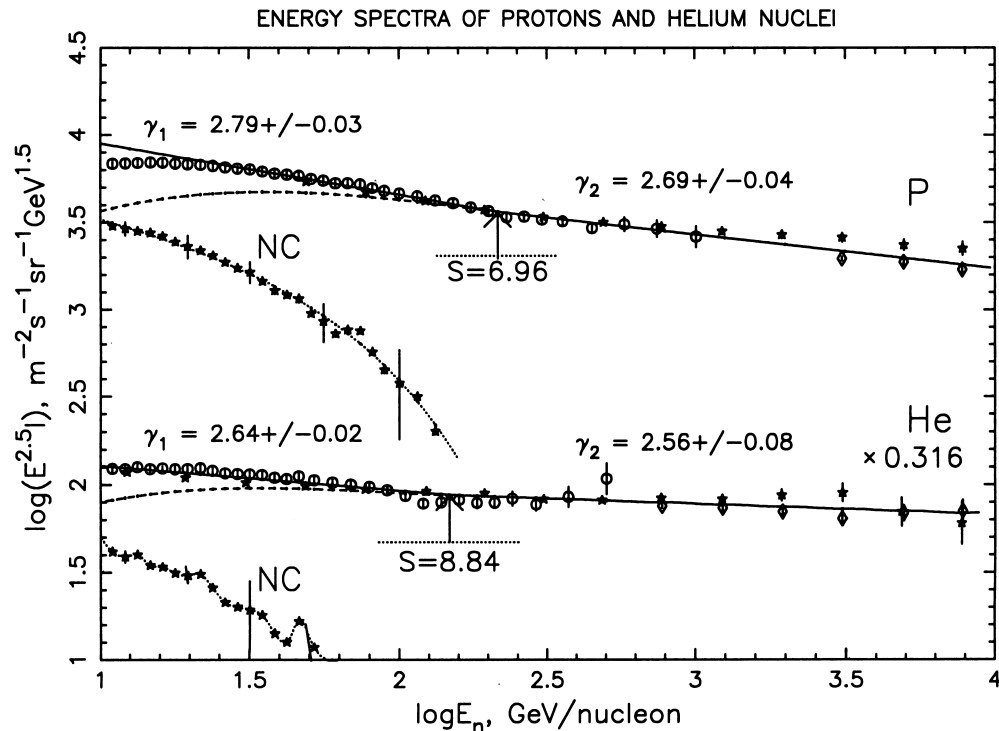






Plural sources

The 'New Component': 'NC'
due to 10 or so sources in the Local Bubble



Multiple Sources

+ The background in
the P,He (Z...)
spectra

Conclusions

+ The single / plural and multiple source idea for Galactic CR sources needs to be taken seriously.