Contribution ID: **10** Contribution code: **GAL** Type: **Oral**

On the origin of the spectral features observed in the cosmic ray spectrum

Monday 2 September 2024 14:00 (15 minutes)

Recent measurements revealed the presence of several features in the cosmic ray spectrum. In particular, the proton and helium spectra exhibit a spectral hardening at ~ 300 GV and a spectral steeping at ~ 15 TV, followed by the well known knee-like feature at ~ 3 PV. The spectra of heavier nuclei also harden at ~ 300 GV, while no claim can be currently done about the presence of the ~15 TV softening, due to low statistics. In addition, the B/C ratio seems to become rather flat at ~ 1 TeV/n.

We present a novel scenario for cosmic ray sources and transport in the Galaxy that may explain such features. The proposed model is based mainly on two assumptions. First, in the Galactic disk, where magnetic field lines are mainly oriented along the Galactic plane, particle scattering is assumed to be very inefficient. Therefore, the transport of cosmic rays from the disk to the halo is set by the magnetic field line random walk induced by large scale turbulence. Second, we propose that the spectral steepening at ~ 15 TV is related to the typical maximum rigidity reached in the acceleration of cosmic rays by the majority of supernova remnants, while we assume that only a fraction of sources, contributing to ~ 10 – 20% of the cosmic ray population, can accelerate particles up to ~ PV.

We show that, within this framework, it is possible to reproduce the proton and helium spectra from GV to multi-PV, and the p/He ratio, the spectra of cosmic ray from lithium to iron, the pbar flux and the pbar/p ratio and the abundance ratios B/C, B/O, C/O, Be/C, Be/O, Be/B. We also discuss the 10Be/9Be ratio in view of the recent AMS-02 preliminary measurements.

Primary authors: RECCHIA, Sarah (Istituto Nazionale di Astrofisica (INAF)); GABICI, Stefano

Presenter: RECCHIA, Sarah (Istituto Nazionale di Astrofisica (INAF))

Session Classification: Parallel 1