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Spectra of Cosmic Ray Fluorine, Sodium and Aluminum and the Hints of Low-energy Excesses

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Since its launch, the Alpha Magnetic Spectrometer-02 (AMS-02) has delivered outstanding quality measurements of the spectra of cosmic-ray (CR) species, which resulted in a number of breakthroughs. Some of the most recent AMS-02 results are the measurements of the spectra of CR fluorine, sodium and aluminum up to 2 TV. Given their low solar system abundances, a significant fraction of each element is produced in fragmentations of heavier species, predominantly Ne, Mg, and Si. Using AMS-02 together with ACE-CRIS and Voyager 1 data, our calculations within the GALPROP–HELMOD framework provided updated local interstellar spectra (LIS) for these species, in the rigidity range from few MV to few TV. While the sodium spectrum agrees well with the predictions, fluorine and aluminum LIS show excesses below 10 GV, hinting at primary components. In this context, the origin of other previously found excesses in Li and Fe is discussed. The observed excesses in Li, F, and Al appear to be consistent with the local Wolf-Rayet stars hypothesis, invoked to reproduce anomalous 22Ne/20Ne, 12C/16O, and 58Fe/56Fe ratios in CRs, while excess in Fe is likely connected with a past supernovae activity in the solar neighborhood.

In-person participation

Yes

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