Contribution ID: **50** Type: **not specified**

From the AMS-02 isotope fluxes to their production cross sections [10'+5']

Friday 18 October 2024 10:50 (15 minutes)

The AMS-02 collaboration has reported preliminary results on beryllium and lithium isotope fluxes, extending the energy range beyond that of previous experiments. As secondary CRs, the Be isotopes include both stable and unstable species, which are crucial for constraining the propagation parameters of the Galactic CRs. The $^{10}\mathrm{Be}/^{9}\mathrm{Be}$ ratio measured by AMS-02 can better resolve the degeneracy between the CR diffusion coefficient and the diffusion halo height. However, the inadequate production cross-section measurements introduce significant uncertainties in the propagation parameters.

In this study, we innovatively use $^{7}\mathrm{Be}$ instead of $^{9}\mathrm{Be}$ to provide better constraints on the propagation parameters, benefiting from the much more precise cross-section measurements of $^{7}\mathrm{Be}$. More intriguingly, using the derived propagation parameters, we inversely constrain the production cross sections of $^{9}\mathrm{Be}$ by interpreting its CR energy spectrum. Our findings suggest remarkably lower cross sections of $^{9}\mathrm{Be}$ than previously estimated. This method demonstrates the potential of using precise isotope measurements from space-based CR experiments to calibrate the production cross sections of nuclei. Our next step is to apply this method to examine the production cross sections of lithium isotopes.

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Session Classification: Relevant XS reactions and precision for GCRs