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Cosmic-ray propagation analyses and implications of current spallation cross sections parametrisations with the DRAGON2 code

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The transport of Galactic cosmic rays (CRs), governed by the magnetic collisionless interactions they suffer with interstellar plasma waves, is commonly studied as a diffusive movement, characterised by a diffusion coefficient following a power law as function of rigidity. The accuracy of current CR data allows us to precisely test our propagation models, usually by reproducing the secondary-to-primary CR flux ratios (e.g., B/C). Nevertheless, the precision of cross sections data for production of secondary CRs is very poor (>20%), considerably limiting our studies.
Therefore, in this talk we explore the consequences of the spallation cross sections uncertainties in the evaluation of the secondary CRs B, Be and Li and in the determination of the Galactic halo size, in addition to compare different cross sections parametrisations. We also demonstrate that there is no hint of primary sources producing these secondary CRs and show that it is possible to reproduce the antiproton-over-proton spectrum considering these uncertainties. Then, we report the results of a Markov chain Monte Carlo analysis of the propagation parameters obtained from the ratios of B, Be and Li to C and O. Employing two different methods for including the uncertainties associated to the spallation cross sections we can simultaneously reproduce the flux ratios of these secondary CRs and find clear evidence that the cross sections describing Li production are highly discrepant with respect to B and Be.

Keywords

Cosmic ray transport; spallation cross sections; cross sections parametrizations; secondary cosmic rays

Collaboration

other Collaboration

Subcategory

Theoretical Results

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