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The misleading nature of the leaky box models in cosmic ray physics

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Abstract content

Many experimental results around and above the energies where the solar modulation affects cosmic ion fluxes were quantified, debated and conceptualized using leaky box models. These models basically exploit the notion of equilibrium between creation and destruction processes of cosmic ions in an undifferentiated arbitrary volume representing the Galaxy, ignoring the galactic magnetic field, the size of the Galaxy, the position of the solar, the spatial distribution of the sources, the space variation of the interstellar matter and other pertinent observations. The progress in the measurements of these observational parameters, which regulate cosmic ray properties, makes obsolete the use of the leaky box models. Specific examples substantiating the inadequacy of the leaky box models are analyzed like the conversion of the boron-to-carbon flux ratio into grammage and the residence times of cosmic ions in the Galaxy. The unphysical and misleading nature of the leaky box models is ascertained and illustrated at very high energies.

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Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 2 (OG part 1), pages 191-194

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