



Contribution ID: 520

Type: **Talk**

Cosmic ray ionisation rate and Beryllium-10 modelling with inhomogeneous interstellar medium and time-dependent cosmic ray sources

Wednesday 16 July 2025 16:20 (15 minutes)

We use the GALPROP cosmic ray (CR) propagation and associated diffuse emissions framework to investigate the CR-induced ionisation rate and distribution of radioactive CR species in the presence of an inhomogeneous interstellar gas distribution and stochastic, finite lifetime CR sources. The interstellar gas model is based on recent reconstructions of the gas survey line intensity data and stellar extinction (for interstellar dust). It exhibits a large dynamic range of gas densities, and traces filaments, shells, and features associated with the Local Bubble at sub-10 parsec resolution. Compared to CR solutions using smooth spatial gas distributions and steady-state CR injection, there is a significant variability in the ionisation rate spatial distribution. Moreover, the radioactive CR species differ, compared to the homogeneous/steady-state case. Implications for studies of interstellar chemistry, CR propagation models, and other relevant topics will be discussed.

Collaboration(s)

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Session Classification: CRD

Track Classification: Cosmic-Ray Direct & Acceleration