

Explaining low diffusivity and CR bubbles around SNRs

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In the typical picture of cosmic ray transport in the region around their sources cosmic rays escape along the local magnetic field lines. We investigate this phenomenon using 2D and 3D hybrid particle-in-cell simulations.

The escaping cosmic rays excite resonant and non-resonant streaming instabilities resulting in enhanced particle scattering. This leads to a large pressure gradient that causes the formation of an expanding bubble of gas, cosmic rays and self-generated magnetic fields. We find that the gas density and diffusion coefficient inside the bubble are reduced with respect to the ambient interstellar medium providing a possible explanation for the low diffusion coefficient inferred by γ -ray observations of interactions of accelerated particles leaving a supernova remnant with nearby molecular clouds.

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Cosmic rays

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