CR transport and feedback in galaxies

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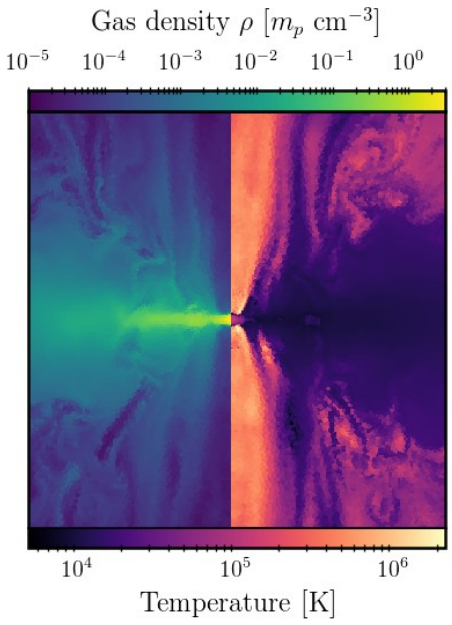
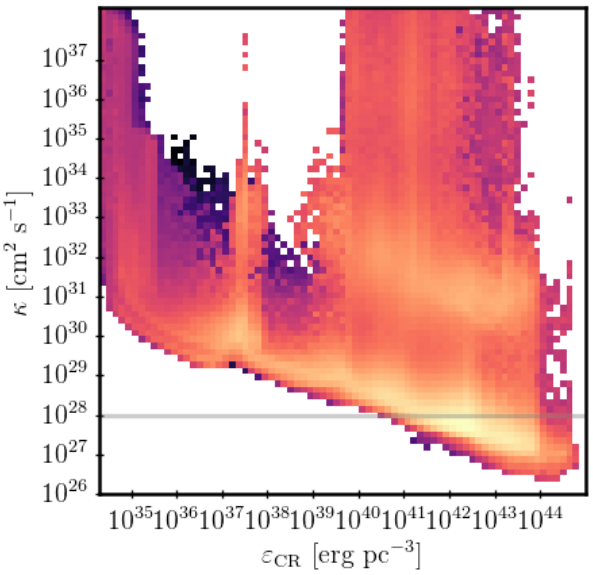


We present the first of its kind galaxy formation simulation of a halo $M = 10^{11}\mathrm{M}_\odot$ including two-moment CR hydrodynamics that consistently models the interaction between GeV CRs and gyroresonant Alfvén waves through the streaming instability.

Star formation and CRs drive a powerful and turbulent galactic wind in the simulation with a resulting interesting spatio-temporal behaviour of CRs and Alfvén waves, e.g., with regions that are of devoid of Alfvén waves and a have high CR diffusion coefficient.

A statistical evaluation of the realized GeV CRs propagation shows that it cannot be described by steady-state CR transport model (advection, diffusion, and/or streaming).



The CR diffusion coefficient has values

$\kappa = 10^{27} - 10^{29}\,\mathrm{cm}^2\,\mathrm{s}^{-1}$

with mass-weighted harmonic mean

$\kappa = 10^{28}\,\mathrm{cm}^2\,\mathrm{s}^{-1}$