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Dynamical Heating by Superbubbles and the Cusp-Core Transformation

mercredi 9 avril 2025 17:00 (15 minutes)

Recent JWST observations have revealed superbubbles (SBs)—cavity-shell structures distributed across the galactic disk—formed by successive supernova explosions. The potential fluctuations generated by SBs can dynamically heat galactic systems. Using the orbit-averaged Fokker-Planck equation, we investigate the role of SB-driven stochastic heating in the context of cusp-core transformation. This formalism describes the cumulative impact of weak, local encounters induced by stochastic noise sources. By modeling the expansion and collapse of SBs, along with their inhomogeneous spatial distribution, we derive diffusion coefficients linked to the power spectrum of SB-induced fluctuations. Furthermore, we find simple analytic scaling relations that provide an intuitive understanding of how diffusion efficiency depends on noise source and system parameters.

Astrophysics Field

Galaxy, Superbubble, Theory

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