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Cosmic Rays and the Circumgalactic Medium

Tuesday 27 April 2021 19:00 (50 minutes)

Galaxies evolve embedded in a vast gaseous halo that dwarfs the mass and spatial extent of stars in the galactic disk. Photoionization modeling suggests that cold circumgalactic gas has significantly lower densities than expected by theoretical predictions based on thermal pressure equilibrium with hot CGM gas. In this talk, I will demonstrate the impact of cosmic ray physics on the formation and physical properties of cold gas in the circumgalactic medium (CGM). Using a combination of idealized and cosmological zoom-in simulations, I will demonstrate how cosmic ray pressure can help counteract gravity to keep cold gas in the CGM for longer, thereby increasing the predicted cold mass fraction and decreasing the predicted cold gas inflow rates. Efficient cosmic ray transport, by streaming or diffusion, redistributes cosmic ray pressure from the cold gas to the background medium, resulting in cold gas properties that are in-between those predicted by simulations with inefficient transport and simulations without cosmic rays. Cosmic rays can significantly reduce galactic accretion rates and resolve the tension between theoretical models and observational constraints on the properties of cold CGM gas.

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