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Effect of reionization on the small-scale thermal structure of the IGM and implications for dark matter constraints

The thermal history and structure of the intergalactic medium (IGM) at $z \geq 4$ is an important boundary condition for reionization, and a key input for studies using the Lyα forest to constrain the masses of alternative dark matter candidates. Most such inferences rely on simulations that lack the spatial resolution to fully resolve the hydrodynamic response of IGM filaments and mini-halos to HI reionization heating. We have used high-resolution hydrodynamic and radiative transfer simulations to study how these affect the IGM thermal structure, an important aspect of modeling the high-redshift forest and extracting dark matter constraints. I will discuss how the adiabatic heating and cooling driven by the expansion of initially cold gas filaments and mini-halos sources significant small-scale temperature fluctuations, and how long these fluctuations persist after reionization ends. I will also discuss how ignoring or failing to resolve these effects could impact constraints on the particle masses of alternative dark matter candidates inferred from the high-redshift Lyα forest.

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