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Accurately constraining the primordial power spectrum using minihalos[1] STEN DELOS, ADRIENNE ERICKCEK, University of North Carolina at Chapel Hill, AVERY BAILEY, Princeton University, MARCELO ALVAREZ, University of California, Berkeley — Small-scale fluctuations in the primordial density field are difficult to probe today due to the complexity of physics at small scales. However, these fluctuations can still leave observable effects. Primordial density contrasts with $\delta\rho/\rho \sim 10^{-3}$ collapse into dark matter halos at early times, leading to an abundance of so-called ultracompact minihalos (UCMHs). The absence of observational signatures of UCMHs then yields an upper bound on the primordial power spectrum of density fluctuations at small scales. UCMHs have attracted considerable interest, but most previous treatments assumed that halos collapsing at early times possess an extremely steep $\rho \propto r^{-9/4}$ radial density profile. We recently found that UCMHs forming due to a spike in the power spectrum develop $\rho \propto r^{-3/2}$ inner profiles instead, but these halos are still highly concentrated due to their early formation. We discuss these results and show how new power spectrum constraints are obtained in this more accurate picture by relating the distribution of UCMHs today to that of primordial density peaks. Since we are now able to include halos that collapse at any time, our preliminary constraints are stronger than prior constraints from UCMHs.

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