Gas contents in the local Universe from Sunyaev-Zel'dovich effects

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Abstract

Observations have found that there is a deficiency in total amount of baryons in galaxy systems (groups, galaxy clusters, or equivalently, dark matter halos) compared to what is expected from cosmologies. This is so-called missing baryon problem. Gas content left today in DM halos is a result of evolution of galaxies, reflecting physical processes that form galaxies such as gas cooling, star formation, and stellar and AGN feedbacks. Recently, different groups used thermal Sunyaev-Zel'dovich effect (tSZE) to study the gas content of DM halos but reached to different conclusions: cosmic mean vs lower baryon fraction. Also, some studies used kinematic SZE (kSZE) to avoid uncertainties in estimate of gas temperature to have found all the missing baryons, but their studies were limited to large-scale structures (LSS) and only the average signals from LSS of all different scales mixed. I will present results from recent studies (Lim et al. 2018a (https://arxiv.org/abs/1710.06856, accepted for publication in ApJ), and Lim et al. 2018b (https://arxiv.org/abs/1712.08619, will be revised to be submitted to ApJ)) where the authors analyzed the tSZE and kSZE using the Planck CMB maps, with matched filter technique to maximize signal-to- noise, to probe the gas content and temperature in and around DM halos as a function of halo mass. I also present early results from my on-going work where I expanded the similar approach to outside halos to constrain pressure-density relation of gas at any point within 3D-volume of SDSS on _˜1Mpc scale. Interesting findings on relation between local large-scale tidal field and gas temperature at given density will be presented as well as its comparison to simulations.

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