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## Probing the Ionized Gas Thermodynamics in Distant Galaxies with the Sunyaev-Zel'dovich Effect

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“The Cosmic Microwave Background (CMB) data not only provide powerful constraints on the early Universe physics, but also information from the late Universe, as the CMB photons interact with matter while propagating through cosmic time. One of such powerful probes of late-time physics is the Sunyaev-Zel'dovich (SZ) Effect—inverse-Compton scattering of the CMB photons off free electrons in galaxies and clusters. Its two main constituents are the kinematic SZ effect (kSZ), where electrons have a non-zero line-of-sight (LOS) velocity and which probes the electron momentum, and the thermal SZ effect (tSZ), where electrons have high temperatures, and which probes the electron integrated pressure. These two effects provide complementary information, which can be combined with probes of total mass to constrain the thermodynamic profile of the ionized gas residing in distant galaxies and study baryonic feedback, a poorly understood set of high-energy processes affecting galaxy formation.

In this talk, I will present several ongoing SZ–LSS cross-correlations with the Atacama Cosmology Telescope (ACT) data, including the tSZ–DES Maglim galaxies to constrain their pressure profile, as well as tSZ and projected-fields kSZ with the unWISE galaxy catalog to probe gas pressure and density, respectively. The projected-fields kSZ estimator squares the temperature field to avoid the cancellation of the signal due to electron velocity. I will also discuss various ways to mitigate the Cosmic Infrared Background (CIB) contamination, a large foreground to SZ cross-correlations.”

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