



Contribution ID: 97

Type: **not specified**

Intensity Mapping and One-Point Statistics

Tuesday, September 8, 2015 2:40 PM (20 minutes)

Intensity mapping is a promising new technique for studying the large-scale structure of the universe at redshifts inaccessible to traditional galaxy surveys. Intensity mapping studies typically focus on two-point statistics of a map such as the power spectrum. However, because these maps are highly non-Gaussian, there is a wealth of additional information which can be obtained by studying the one-point statistics. We illustrate this using a simple model of an intensity mapping survey targeting CO at redshift 3. Using a P(D) analysis, we demonstrate how to calculate the one-point PDF of a map from a galaxy luminosity function. We also study the effects of emission lines from foreground galaxies by considering a population of HCN emitting galaxies at redshift 2, and show that the one-point statistics can be used to recover information about the target CO population without resorting to cross-correlation studies. We then demonstrate how this one-point analysis can be used to break degeneracies present in the two-point statistics of an intensity map to obtain useful cosmological information.

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Session Classification: CMB, LSS and cosmological parameters