Joseph Munoz (UCSB, postdoc)

Peng Oh (UCSB)
Steven Furlanetto (UCLA)
Kristian Finlator (Dark Cosmology Centre)

Presentation Requested: oral
Category: Evolution of the Interstellar Medium and Star formation over Cosmic Time
Question: What have we or will we learn about the chemical evolution of galaxies over cosmic time with ALMA, JWST and other telescopes? Is there a metallicity density w/ redshift relationship? What molecular and atomic species have we detected with ALMA and how have they helped us better understand the composition and evolution of galaxies?

Connecting high-redshift galaxy formation and reionization to molecular physics with ALMA.

While stellar feedback is thought to decouple the star formation rates of galaxies from detailed microphysics, metals and dust play a crucial role in the molecule formation and cooling that produces stars. Fortunately, HST has discovered large populations of galaxies at $z \gtrsim 6$ with surface densities similar to present-day ULIRGs and metallicities comparable to that of the SMC. ALMA will transform these systems into extreme laboratories for the relationship between self-regulated star formation on galactic scales and the molecular physics within GMCs. First, I will discuss growing evidence suggesting a non-equilibrium relationship between dust and metal abundances at these early times and how it can be understood theoretically. I will then explore whether we should expect a corresponding evolution in star formation efficiencies and investigate observational signatures for the FIR and carbon emission lines observable with ALMA.