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M. Aravena, and the SPT SMG collaboration

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?

The properties of the ISM in the dusty star-forming galaxies at $z=2-6$ discovered by the SPT

The South Pole Telescope (SPT) unveiled a population of rare gravitationally lensed, highly magnified, submillimeter galaxies (SMGs) in a deep mm wavelength survey over 2500 deg² the sky. In order to investigate the properties of the ISM of these sources, we have conducted a systematic multi-wavelength follow-up campaign with ALMA, APEX, ATCA, Herschel and the Hubble Space Telescope. In this talk, we will present a summary of our most recent results. In the first continuum imaging and blind CO-based redshift survey of a sample of 26 SPT SMGs with ALMA, we conclusively demonstrated the lensed nature of these sources and determined their redshifts, including some of the most distant SMGs known, at $z=5.7$. We have recently demonstrated the feasibility of detecting emission from faint molecular lines in stacked ALMA band-3 spectra and thereby measured the average properties of the ISM in these galaxies. Furthermore, we have obtained observations of [CII] and low-J CO! line emission for a statistical sample of these sources. We show a comparison between [CII], CO(1-0), L_{rmFIR} and T_d for these high-redshift galaxies, and argue that some of the previous measurements might have been biased due to the use of $J > 3$ CO lines. Finally, we present our first resolved CO images of some of these sources obtained with ATCA.