Predictions for joint JWST and ALMA surveys

- In anticipation of upcoming high-z JWST observations, we present predictions for observable properties for galaxy populations at $z = 4 - 10$, utilizing the well-established Santa Cruz semi-analytic model (SAM) with the recently implemented multiphase gas partitioning and $H_2$-based star formation recipes (Somerville, Popping $&$ Trager 2015). Our model can efficiently sample halos of masses over a wide dynamic range, covering galaxies forming in haloes near the atomic cooling limit to the most massive ones forming at these epochs.

- Future joint JWST-ALMA surveys will provide observations that jointly constrain the stellar and gas content of high-redshift galaxies. We provide forecasts for these observations by incorporating the latest addition to our SAM that predicts CO/CII luminosity (Popping+2019). We provide predictions for $L_{CO}(5-4)$ and $L_{CII}$ at $z = 6$, which are expected to be detected with ALMA band 3 and 6, respectively.

- The free parameters in our model are only calibrated to a subset of observations at $z = 0$ and it is intriguing that our results agree so well with a wide range of observational constraints across $z = 4 - 10$. By interfacing our SAM with an analytic reionization model, we also find that the predicted galaxy populations are able to fully reionize the universe in the timeframe required by IGM & CMB constraints.

Paper I: Luminosity Functions

- In this work, we present predictions for the rest-frame and observed-frame UV LFs. We showed that JWST will be able to detect plenty of galaxies up to $z = 10$. We also showed that our results are in good agreement with observations. (arxiv:1803.09761).

Paper II: Physical Properties

- Currently, the properties of high-redshift galaxies remain largely unconstrained, and putting additional constraints on these galaxy populations is one of the primary mission goals of JWST.

- Our physically motivated, computationally efficient model is able to make predictions for a wide range of physical and observable properties, allowing us to study the correlation among these properties and the sensitivity of these predictions to modeling uncertainties. (arxiv:1901.05964).

The predictions from our self-consistent modeling pipeline matches most observational constraints for high-z galaxies and cosmic reionization.

Tell me what predictions you would like to see for joint ALMA-JWST surveys!