The UV Luminosity Function of High Redshift Star-forming Galaxies in DRAGONS

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1 Motivation

N-body simulations (dragon: Tiamat)
Semi-analytic models (dragon: Meraxes)
Observables
High redshift observations

2 Method

galaxy merger tree
Starburst99
stellar population
model SEDs
stellar population syntheses

Transitions
(Dust extinction, Lyman alpha absorption)
Lyman break selection
UV luminosity functions

3 UV Luminosity Functions

Figure 1. UV luminosity functions of galaxies at z ~ 5 – 8 for the whole sample (blue solid) and Lyman break galaxies selected by using color-color criteria (red dashed). Black circles are the observational data from Bouwens et al. 2014. Red and blue lines show a close agreement due to most galaxies passing the Lyman break selection criteria. These plots show that our model can successfully reproduce the UV luminosity function for high redshift star-forming galaxies.

4 From UV Luminosity to SFR

Figure 2. UV luminosity versus instantaneous star-formation rate (SFR) for 1% galaxies at z ~ 5. The black line shows the Kennicutt L-SFR relation of

\[
\frac{\text{SFR}}{M_\odot \text{yr}^{-1}} = 1.25 \times 10^{-28} \frac{L_{\text{UV,corr}}}{\text{erg s}^{-1} \text{Hz}^{-1}}
\]

The observed SFR of a galaxy can be estimated from its UV luminosity using the Kennicutt L-SFR relation, which is a modeled relation between UV flux and a constant SFR over 100Myr. Our model galaxies are distributed around the mean Kennicutt relation with a scatter that depends on UV Flux.

5 Star Formation Rate Functions

Figure 3. Star formation rate functions of LBGs at z ~ 5. The blue line shows the model SFRs converted from UV luminosity using the Kennicutt relation. The green line shows the raw SFRs generated directly from the semi-analytic model Meraxes. The black circles are the SFR functions converted from the UV luminosity function of Bouwens et al. (2014). There is a close agreement between the true and UV derived SFR functions. This indicates that the conversion between high-redshift UV luminosity and star-formation rate functions is not significantly biased by the scatter of the L-SFR distribution.