Spectroscopic Redshifts to 1300 Low-Mass Galaxies with 0.3<z<0.4 in the COSMOS Field

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Overview

Recent theoretical models and hydrodynamic simulations of galaxy evolution give predictions for the star-forming properties and sizes of low-mass galaxies.

We measured spectroscopic redshifts to over 1100 low-mass galaxies in the UltraVISTA Catalog (Muzzin et al. 2013), which can be used to determine their star-formation rates over time.
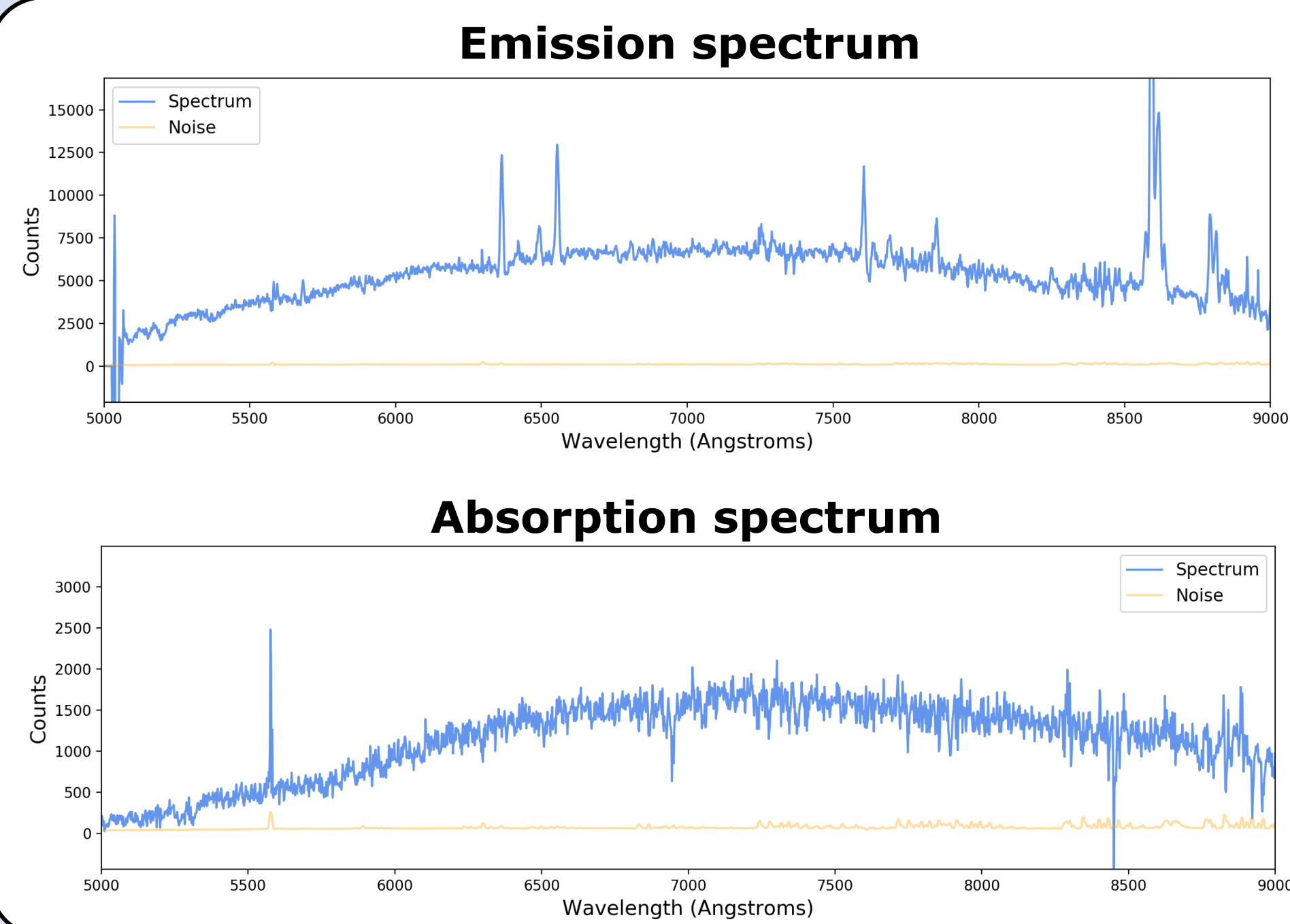
Spectral Data

1400 galaxy spectra were taken in February 2016 and February 2017 with the IMACS Spectrograph at Magellan using an exposure time of three hours. We extracted the spectral files and corrected for atmospheric absorption. Examples of typical spectra from our dataset are shown here.

Emission spectrum

Absorption spectrum

Noisy absorption spectrum

Too noisy to identify
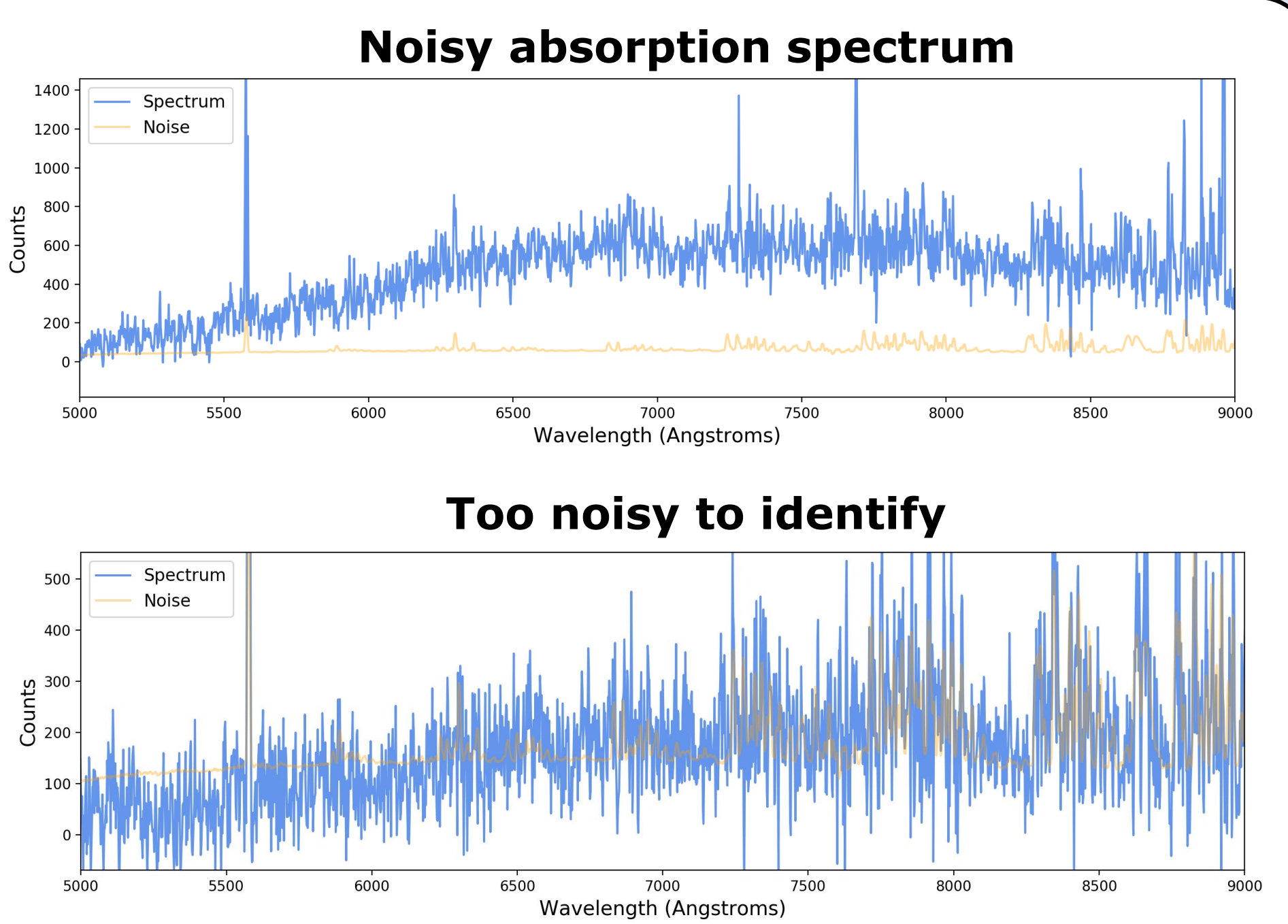
New GUI for Measuring Redshifts

We developed a graphic interface to analyze all 1400 spectra using an inverse-variance weighted cross-correlation (Kelson et al. 2005). We take five templates from SDSS, ranging from quiescent to star-forming, then cross-correlate them with the galaxy spectrum. The most template is overlaid on the galaxy at the maximally correlating redshift, and the user can modify settings on the interface to fine-tune the measurement.
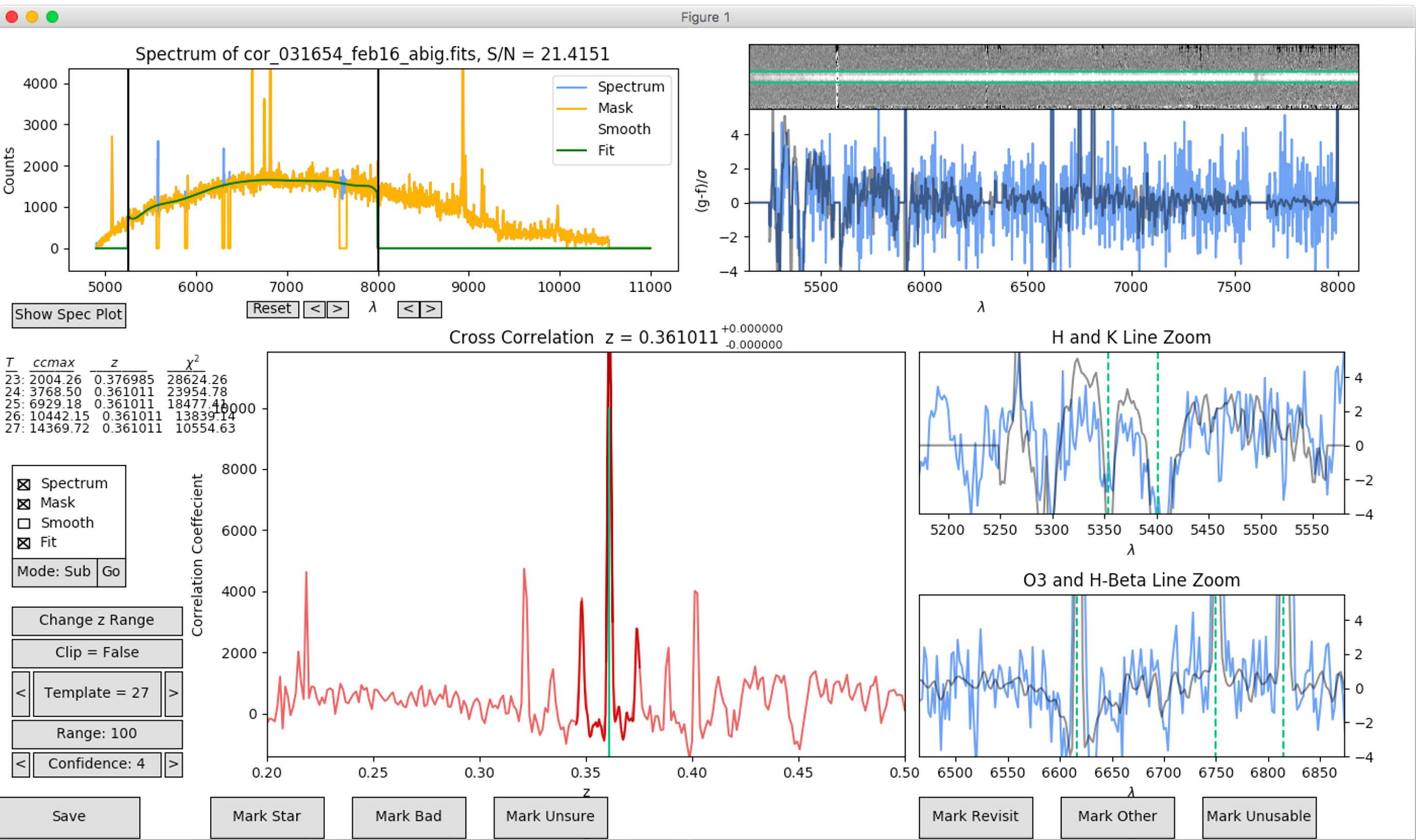

Results

Most of the galaxies fall within 0.3<z<0.4 and roughly 20% are quiescent, in agreement with the photometric redshifts from Muzzin et al. (2013)
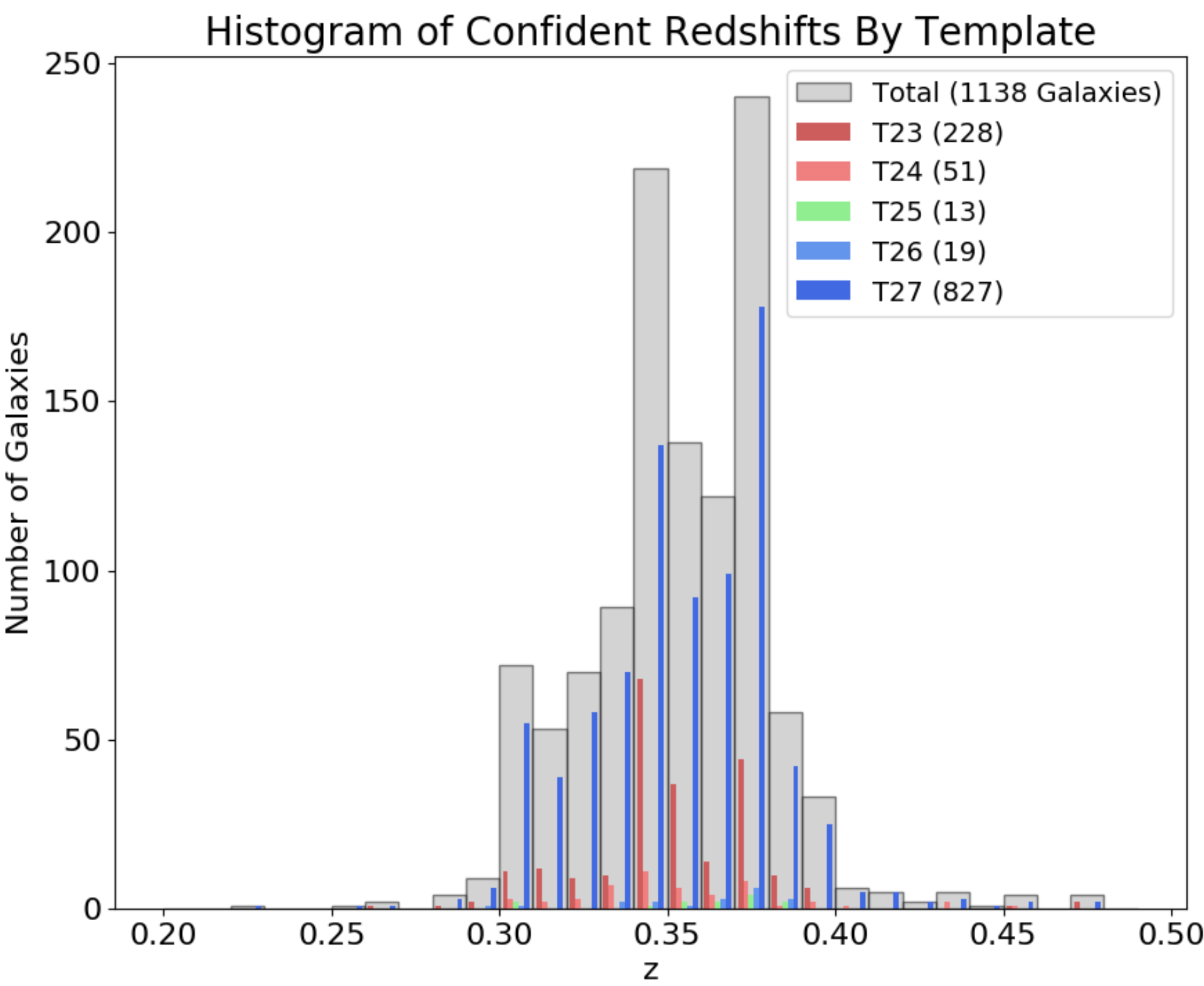
Our sample is statistically complete down to log(M)=9.5, as shown below in the plot of specific star formation rate (SSFR) vs. galaxy mass. With this in mind, we can compare theoretical predictions to the sizes and star formation histories of these galaxies.
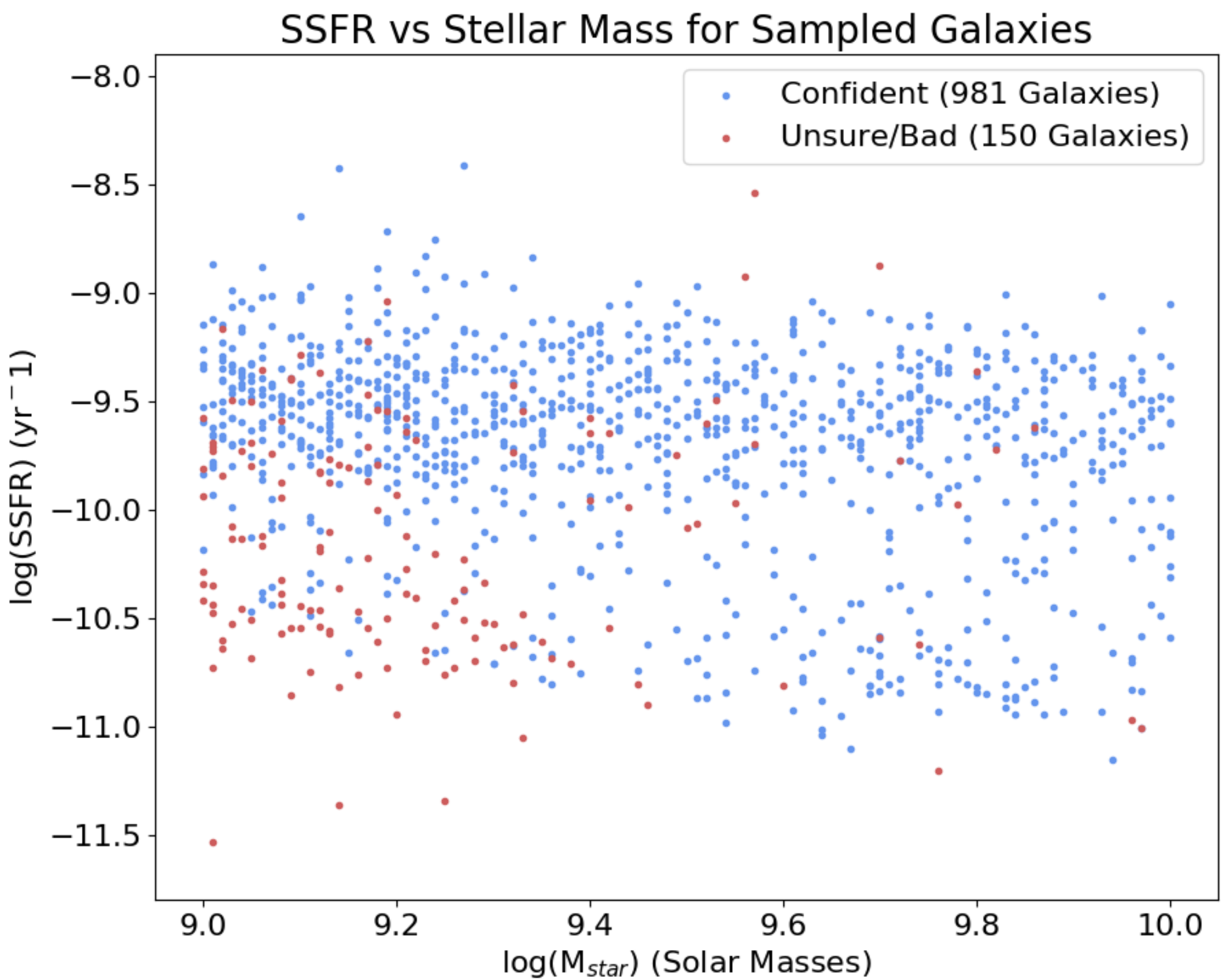
References

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Kelson, D. D. 2014, arXiv:1406.5191
Kelson D. D., Benson A. J. and Abramson L. E. 2016, arXiv:1610.06566
El-Badry K., Wetzel A., Geha M. et al. 2016, ApJ, 820, 131
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Repository with Redshift GUI and SDSS Templates found at https://github.com/brianlorenz/COSMOS_IMACS_Redshifts

Acknowledgements