PROCEEDINGS OF SCIENCE

ZFOURGE: UV to FIR Luminosities and Dust Attenuation Determined From ∼4000 K-selected Galaxies at 1<z<3

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We build a set of composite galaxy SEDs by de-redshifting and scaling multi-wavelength photometry from galaxies in the ZFOURGE survey, covering the CDFS, COSMOS, and UDS fields. From a sample of 4000 K_s-band selected galaxies, we create 38 composite galaxy SEDs that yield continuous low-resolution spectra ($R\sim45$) over the range 0.1-4 μm. Additionally, we include far infrared photometry from the *Spitzer Space Telescope* and the *Herschel Space Observatory* to characterize the infrared properties of our diverse set of composite SEDs. From these composite SEDs we analyze the rest-frame UVJ colors, as well as the ratio of IR to UV light (IRX) and the UV slope (β) in the IRX$-\beta$ dust relation at $1<z<3$. While blue star-forming composite SEDs show IRX and β values consistent with local relations, dusty star-forming composite SEDs are offset above the local IRX$-\beta$ relations by as much as 0.5 dex, i.e., dusty star-forming galaxies have more UV flux (are bluer). We measure a tight linear relation between rest-frame UVJ colors and dust attenuation for star-forming composites, providing a direct method for estimating dust content from either $(U-V)$ or $(V-J)$ rest-frame colors for galaxies at intermediate redshifts.

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‡This work includes data gathered with the 6.5 meter Magellan Telescopes located at Las Campanas Observatory, Chile.

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1. Method

Galaxies are grouped together by scaling and de-redshifting public photometry from the CDFS, COSMOS, and UDS fields covered by the ZFOURGE survey [1]. We then compute synthetic photometric points using EAZY [2] and compare these to find similar galaxies, termed analogs [3, 4]. We take median points of de-redshifted, scaled analog photometry to create composite SEDs with $R \sim 45$ in the optical (Figure 1). Rest-frame colors are calculated using EAZY to place composites on the UVJ diagram (Figure 2). We compute IR and UV fluxes to derive an IRX$-\beta$ relation for our $1 < z < 3$ sample (Figure 3).

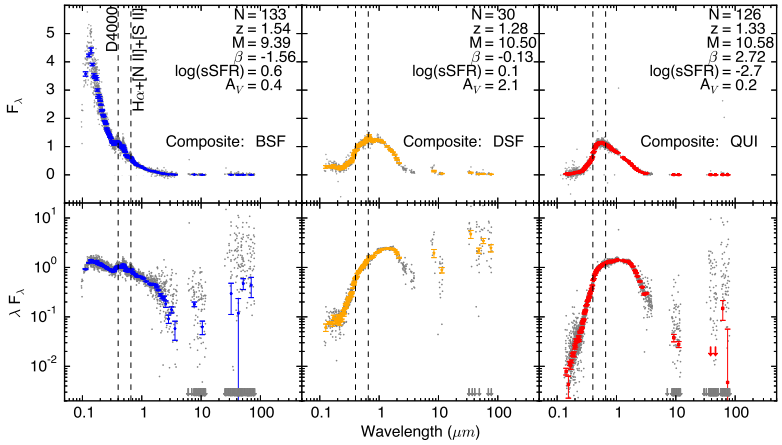

Figure 1: Examples of our composite SEDs, including a blue star-forming composite SED (BSF), a dusty star-forming composite SED (DSF), and a quiescent composite SED (QUI). Colored points represent the composite SEDs with NMAD scatter on the median as errorbars, while the gray points are the de-redshifted, scaled photometry from observations.

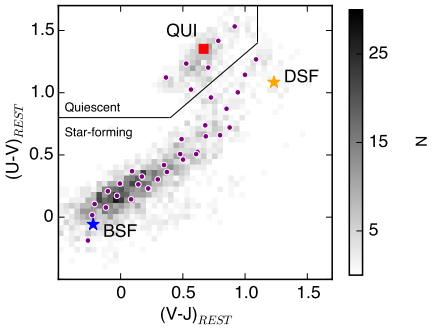

Figure 2: UVJ diagram of our composites, also showing locations of analog galaxies as a 2D histogram. Our composites track the underlying population nicely, including blue and red star forming galaxies (lower left and upper right) and quiescent galaxies (upper left).

2. Analysis

We find a discrepancy between our IRX$-\beta$ fit and fits from the literature calculated for local samples [5, 6]. This relation parameterizes the efficiency with which UV light from young, massive

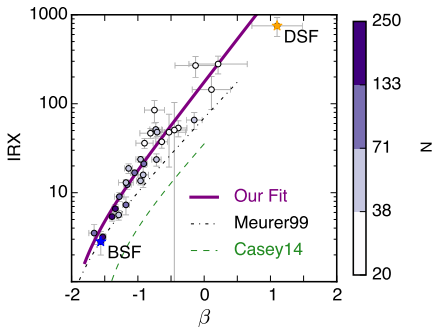

Figure 3: IRX−β diagram, showing our fit (purple) compared to fits to the local samples of Meurer, et al. (1999; black) and Casey, et al. (2014; green). Our fit diverges from these relations, particularly for dusty star-forming galaxies.

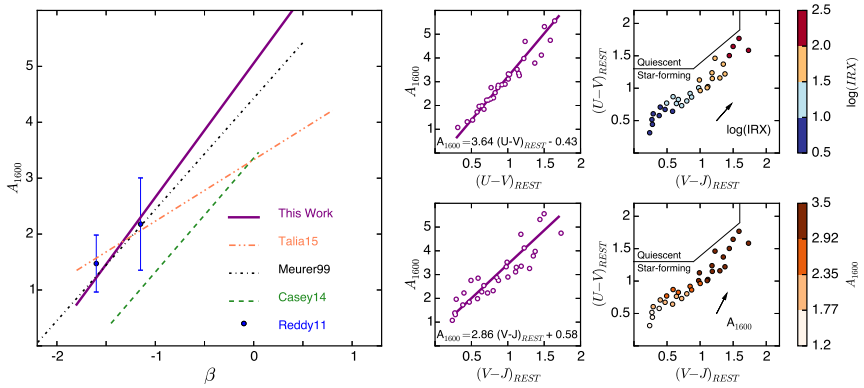

Figure 4: Dust attenuation as a function of UV slope (left). Relation between UV dust attenuation derived from IRX−β and UVJ rest-frame colors (center). UVJ diagrams colored by IRX and A_{1600} (right).

stars is transformed into IR radiation by dust. The discrepancy suggests that dusty star-forming galaxies at intermediate redshifts are obscured differently than local galaxies, and are intrinsically bluer.

We also find trends with low scatter between dust attenuation in the UV and rest-frame UVJ colors for star-forming galaxies, which can be used to parameterize dust of star-forming galaxies without spectra. Future work will explore other properties of our composite SEDs, such as Hα equivalent widths and morphological characteristics.

References

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